











1.5 Million Natural Gas Connections Project in 11 Governorates

Low Pressure Natural Gas Network Environmental and Social Management Plan

Gharbeya Governorate

(Zefta, Kafr El Zayat, Seberbay, Ghofran district, Qotour, Mahalet Zeyad, Kherset – kafr Essam, Akhnaway and Perma areas)

Executive Summary

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EGAS
Egyptian Natural Gas Holding Company

Developed by

EcoConServ Environmental Solutions

Petrosafe
Petroleum Safety & Environmental Services Company

List of acronyms and abbreviations

AFD	Agence Française de Développement (French Agency for Development)
BUTAGASCO	The Egyptian Company for LPG distribution
CAPMAS	Central Agency for Public Mobilization and Statistics
CDA	Community Development Association
CO	Carbon monoxide
CRN	Customer Reference Number
CULTNAT	Center for Documentation Of Cultural and Natural Heritage
EEAA	Egyptian Environmental Affairs Agency
EGAS	Egyptian Natural Gas Holding Company
EGP	Egyptian Pound
EHDR	Egyptian Human Development Report 2010
EIA	Environmental Impact Assessment
ER	Executive Regulation
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESIAF	Environmental and Social Impact Assessment Framework
ESM	Environmental and Social Management
ESMF	Environmental and Social Management framework
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GAC	governance and anticorruption
GDP	Gross Domestic Product
GIS	Global Information Systems
GoE	Government of Egypt
GPS	Global Positioning System
GRM	grievance redress mechanisms
HDD	Horizontal Directional Drilling
HDPE	High-Density Polyethylene pipes
HH	Households
HHH	Head of the Household
hr	Hour
HSE	Health Safety and Environment
IBA	Important Bird Areas
IDSC	Information and Decision Support Center
IFC	International Finance Corporation
IGE/SR	Institute of Gas Engineers/Safety Recommendations
LDCs	Local Distribution Companies
LGU	Local Governmental Unit
LPG	Liquefied Petroleum Gas
mBar	milliBar
MDG	Millemium Development Goal
MOP	Maximum operating pressure
MP	Management Plan
MTO	Material take-off
NG	Natural Gas
NGO	Non-Governmental Organizations
NO_2	nitrogen dioxide
OSH	Occupational Safety and Health
P&A	Property and Appliance Survey
PAP	Project Affected Persons
PE	Poly Ethylene
PM_{10}	particulate matter
PPM	Parts Per Million
PRS	Pressure Reduction Station
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SDO	Social Development Officer
SIA	Social Impact Assessment

SO_2	sulphur dioxide
SSIAF	Supplementary Social Impact Assessment Framework
SYB	Statistical Year Book
T.S.P	Total Suspended Particulates
Town Gas	The Egyptian Company for Natural Gas Distribution for Cities
WB	The World Bank
WHO	World Health Organization
$	United States Dollars
€	Euros

Exchange Rate: US$ = 18.15 EGP as of April 2017

Exchange Rate: € = 19.26 EGP as of April 2017

1 Introduction

1.1 Project Objectives

The proposed project represents an integral component of the National Energy Strategy which aims for greater use of natural gas for domestic users and reduction of government subsidies of (LPG) in Gharbeya Governorate mainly in Zefta, Kafr El Zayat, Seberbay, Ghofran district, Qotour, Mahalet Zeyad, Kherset – kafr Essam, Akhnaway and Perma areas.

Objectives of the Environmental and Social Management Plan (ESMP)

- Describing project components and activities of relevance to the environmental and social impacts assessments
- Identifying and addressing relevant national and international legal requirements and guidelines
- Describing baseline environmental and social conditions
- Assessing project alternatives if different from those presented in 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 has been prepared based on the Terms of Reference prepared by EGAS and cleared by the World Bank. Additionally, the ESMP follows national and WB requirements regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation.

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

Table 1-1: Areas and Number of Household

Governorate	Local Distribution Companies	Area	Households connections (thousands)[1]
Gharbeya	Egypt Gas	Zefta	15,500
		Kafr El Zayat	15,500
		Seberbay	9,378
		Ghofran district	3,846
		Qotour	7,000
		Mahalet Zeyad	5,000
		Kherset – kafr Essam	4,400
		Akhnaway	3,250
		Perma	9,000
Total		**9 areas**	**72,874**

1.2 Contributors

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

[1] Client's data; EGAS

2 Project Description

2.1 Background

Key construction activities include excavation and pipe laying of the distribution network, in addition to, installation of pipes on buildings, internal connections in households, and conversion of appliances' nozzles to accommodate the switch from LPG to NG.

The red box below denotes project activities covered by this ESMP. Figure 2-1 illustrates the components of the city distribution network:

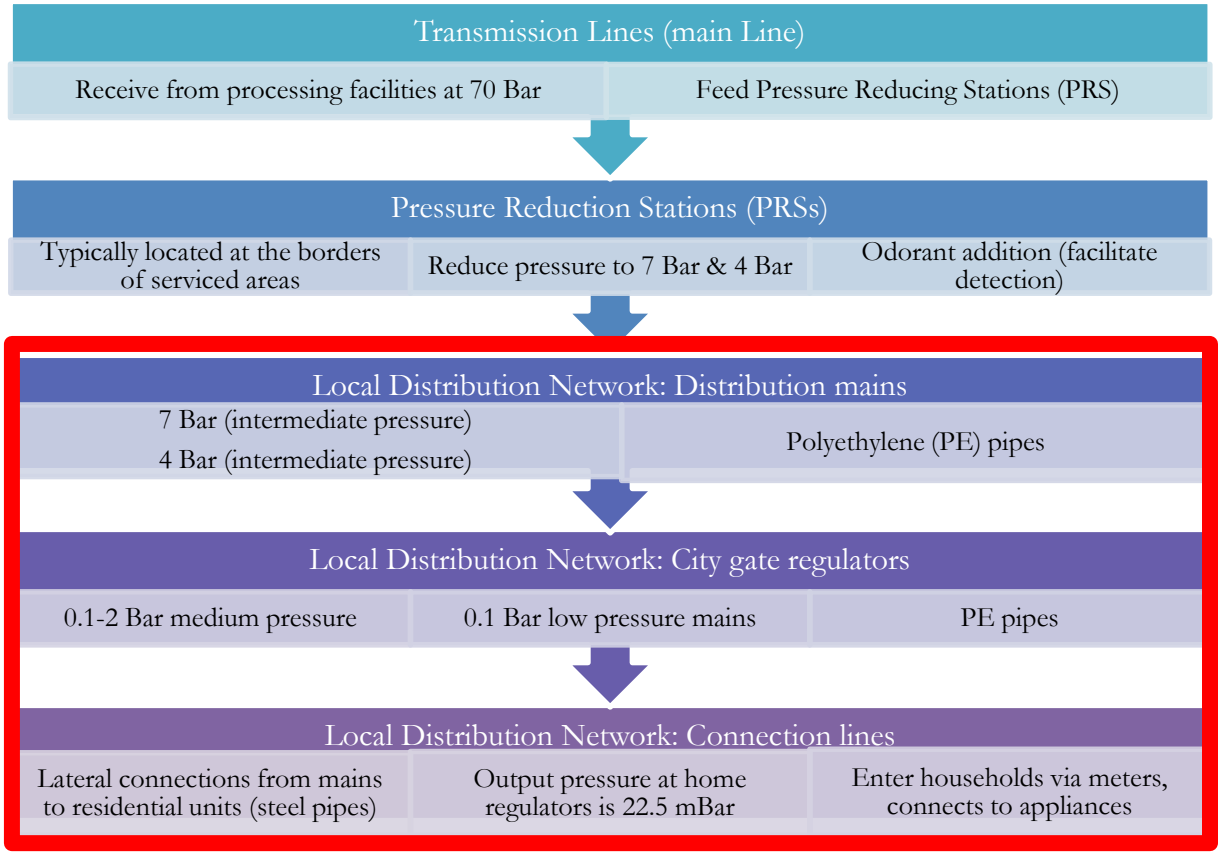

Figure 2-1: General components of the city's distribution network

2.2 Project Work Packages

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

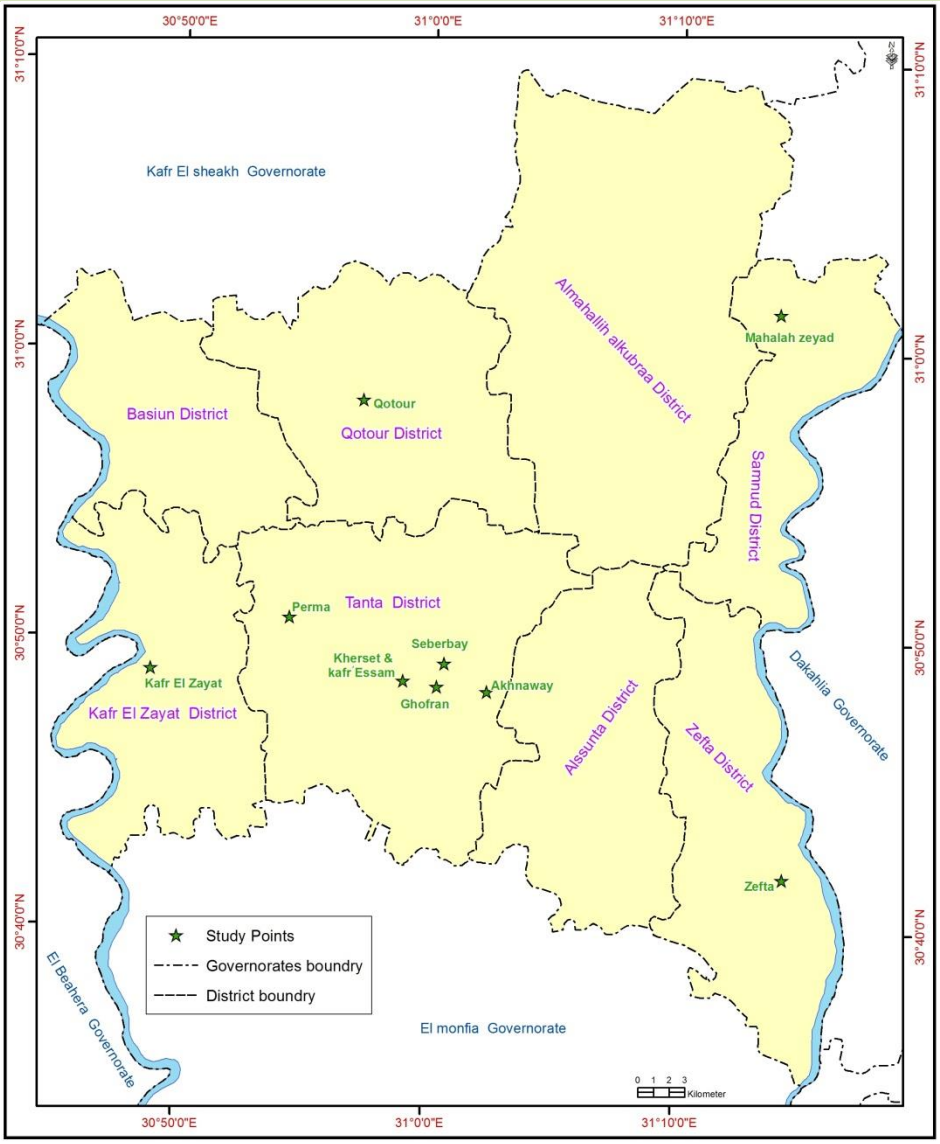

Figure 2-2: Nine Proposed area at Gharbeya Governorate

Table 2-1: Natural Gas pipeline routes

Area	Route	New feeding line
Zefta	Zefta area will be supplied from the outlet (operating pressure: 7 bar) of the new proposed Zefta PRS with capacity of 10,000 m^3/h; which can be further increased to 20,000 m^3/h. The construction of the PRS will be undertaken by Egypt Gas. This PRS will be around 500 m far from Zefta City; where the feeding line will extend from Zefta –Banha main road to Al Gaish road at the entrance of Zefta city (about	The main regulator (operating from 7 bar to 4 bar) is located at Al Gaish road; where the proposed pipeline route will cut 2.7 km across the city of Zefta through Al Gaish road then branches off to the right to pass through Mohamed Farid Street (about 800 m) to intersect with Tahrir Street (Elkornish Street).

Area	Route	New feeding line
	1km).	
Kafr El Zayat	Kafr El Zayat area will supplied from the outlet (operating pressure: 7 bar) of the new proposed PRS. The construction of the PRS will be undertaken by Egypt Gas. The capacity of the PRS is 10,000 m^3/h., which can be further increased to 20,000 m^3/h. The PRS is about 2km-far from Kafr El Zayat City. The feeding line will be extended to kafr El Zayat – Qasr Nasr El Din road (about 800m). The route includes three crossing points.	The pipeline route will pass in parallel with El Gaish Street inside the city, after crossing the railway. The route will be extended at Al Gaish Street and branch off westward, for about 2 km, until it reaches el Sharkat square. Design specifications for crossing railway will be presented in the crossing section. The pipeline will cross Kafr el Zayat –Berket El Sabaa road with approximate length of 30 m. The pipeline, crosses Cairo-Alexandria Agriculture road with approximate length of 50 m. The pipeline will cross railway located between Kafr El Zayat and Tanta city. with approximate length of 150m.
Seberbay	The main feeding pipeline comes from the existing intermediate (7 bar) gas network of Tanta pipeline, which is affiliated with Egypt Gas. There will be one crossing at the beginning of the pipeline route.	The new feeding line will branch off from the existing (7 bar) gas network. This gas network is affiliated with Egypt Gas. The starting point of the new feeding line will be at the intersection between Cairo-Alexandria Road, Seberbay road and Al Moaahada El Kadiema Street where the (7 bar) gas network of Egypt Gas exists. A new pressure regulator, with filtering and metering units, will be installed (1 km) away from the existing network, in front of the university located in Omar Ebn Khatab Street. Omar Ebn Khatab Street is considered as the main street that cut across Seberbay. The new regulator will reduce the pressure, from 7 bar to 4 bar, to link with the new 4 bar pipeline. The route crosses the intersection of Cairo-Alexandria Road with approximate length of 80 m
Ghofran	The main feeding line that supplies Ghofran District area is coming from the existing intermediate (7 bar) gas network of Tanta pipeline affiliate to Egypt Gas.	The new feeding line will branch off from the existing (7 bar) gas network affiliated to Egypt Gas. The starting point of the new feeding line will be at the intersection between Cairo-Alexandria Road, Seberbay road and Al Moaahada El Kadiema Street where the gas network (7 bar) of Egypt Gas exists. A new pressure regulator, with filtering and metering units, will be installed 120m away from the entrance of Al Moaahada - El Kadiema Street. This new pressure regulator will reduce the pressure from 7 bar to 4 bar in order to make a link with the new 4 bar pipeline network. The new pipeline extends 200 m at Moaahada - El Kadiema Street until reach El Iman Mosqueat Nour El Iman Street; then it will pass through Al Ismailya - Al kadima road (parallel to the drainage).
Qotour	The routing of intermediate pressure network pipeline was not available at the time of the submission of the report	
Mahalet Zeyad	The starting point of the new feeding line will be at the intersection between El Galaa road and Mahlah –Baltim road,	The new feeding line will branch off from the existing 7 bar gas network, affiliated with Egypt Gas. The main feeding line supplying Mahalet Zeyad area comes from

Area	Route	New feeding line
	where the gas network (7 bar) of Egypt Gas exists.	the existing intermediate (7 bar) gas network of El Mahalah El Kubra pipeline; affiliated with Egypt gas.
Kherest-Kafr Essam	The main feeding line supplying Kherest-Kafr Essam area comes from the existing intermediate (7 bar) gas network of Tanta pipeline, affiliated with Egypt gas	The new feeding line will begin from the existing 7 bar gas network, affiliated with Egypt Gas. The starting point for the new feeding line will be at the intersection between El Hayah Street and El Estad Street. The pipeline extends to El Estad road for 700m. The pipeline will pass through Kherest Street, which is considered as the main street in the area. A new pressure regulator, with filtering and metering units, will be installed at the intersection of Kherest Street and Tallat Harb Street (south of Kafr Essam area). The regulator reduces the pressure, from 7 bar to 4 bar, to link the feeding line with the new 4 bar pipeline network. Crossing one side of Asphalt (paved) road (El Estad road), with approximate length of 22m
Akhnaway	The routing of the intermediate pressure network pipeline was not available.	
Perma	The exact route of intermediate pressure network pipeline is not determined to date. The proposed design introduces two alternatives. The first option is to link the new feeding line with the new 7-bar gas pipeline located in Kherest- Kafr Essam, which is currently under construction. The second option is to link the new feeding line with the existing 7-bar gas network affiliate with Egypt gas in Mahalah Marhoum.	

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

The city low pressure gas regulators are distributed across the gas distribution piping system. The pressure of gas in the 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.

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.

2.4 Construction works

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 working, clean the land from any rubbish and /or remove weeds. Grading is conducted where necessary to provide a reasonably level work surface.

2.4.2 Site Preparation

Before any excavation activities, Egypt gas shall coordinate with the different authorities to determine the existing infrastructure in the project's area (e.g. water lines, sewage lines, electrical cables and telecommunication lines)so as to avoid any undue damage. In case of lacking sufficient information on the available infrastructure, th ey will carefully excavate a trial pit.

2.4.3 Excavation

Horizontal Directional Drilling (HDD) technique is only utilized in the case of railway crossings, waterways, and major streets where traffic cannot be interrupted. In the case of HDD under railway crossings steel, a reinforced concrete sleeves will be installed to further protect the piping from fatigue **.It should be noted that there are no crossing with waterways of the Nile or its major branches in the studied areas**.

2.4.4 Pipe laying

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

2.4.5 Welding

During the excavation works, welding works may take place above-ground.

Two types of welding are used, butt fusion welding technique will be used for pipe welding (hot plate softening the tips of the PE pipes before joining) and electro fusion welding (fittings with heating coils installed inside) will be used to weld fittings. Once the trench is excavated and cleared, the pipe stretch shall be laid down.

2.4.6 Backfill and road repair

After laying and welding works, the trench containing the PE pipe is backfilled with sand either by a front loader or manually. The trench will be backfilled immediately after the pipeline has been laid considering that the finished backfilling level will be the same as the road level. The initial backfill will be to a minimum height 20 cm of fine sieved sand to protect the pipeline. The backfill will be then compacted by wet sand layers of 15 cm thickness in order to avoid road settlements and subsequent cracks. Natural gas PE pipes are surrounded by sand in order to absorb loads from the road.

2.4.7 Leakage testing:

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

- ***Pneumatic testing***

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

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

2.4.8 Regulators

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

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

2.4.9 Construction works of household installation

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

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

2.4.10 Commissioning

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

2.5 Machines Used

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

2.6 Conversion of home appliance

The installation contract between the household owner and the local distribution company includes the cost of converting 2 appliances (stove and water heater). Conversion involves drilling injector nozzles to become 1.25 to

1.5 times larger in diameter. Conversion works are practiced at the client's household. Typical drill bit sizes used for conversions are either 35 or 70mm.

2.7 Activities of Operation Phase

2.7.1 Operation of the network

The operation of the system is undertaken by local distribution companies (Egypt gas). Normal operation will include routine audits on pressures and condition of the network. Normal maintenance and monitoring works for the network include:

- Monitoring valves at selected points on the pipeline. Gas leaks are routinely monitored using gas detection sensors;
- Checking cathodic protection on "Flange Adaptors" by taking voltage readings and changing anodes whenever needed.

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

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

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

2.7.2 Repairs in households

Repairs include appliance adjustments or piping/metering replacement.

2.7.3 Hotline

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

2.8 Resources Consumption

2.8.1 During Construction

- ***Water***

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

- ***Fuel***

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

- ***Workers***

An estimated number of 51 workers from Egypt gas will be needed during the construction period for the project. A section of the site may be used as a laydown area where shelters, equipment, washing and toilet facilities (portable) and containers will be located.
Workers accommodation will not be required on site because all the workers will be local.

2.9 Waste Generation

2.9.1 During Construction

Solid waste, during construction phase, will be comprised of domestic waste, construction waste and some hazardous wastes from the activities. It is worth mentioning Construction wastes will be generated only during a relatively short period.

All solid wastes generating during the construction phase (excavated soils, broken asphalt and other waste materials during excavation) will be managed and disposed in accordance with applicable regulations and established best management practices. But common practice, the wastes are loaded onto trucks, which transfer it to disposal areas. Because of the limited available space on most Gharbeya streets, loading waste trucks shall be done upon excavation, whenever possible, in order to avoid stockpiling waste on site.

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

2.9.2 During operation

The operation of the intermediate and low pressure networks is not expected to generate any type of solid waste during the operation phase

3 Legislative and Regulatory Framework

3.1 Applicable Environmental and Social Legislation in Egypt

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

  Executive Regulation(ER) No 338 for Year 1995 and the amended regulation No 1741 for Year 2005, amended with ministerial decree No 1095/2011, ministerial decree No 710/2012, ministerial decree No 964/2015, and ministerial decree No 26/2016
- Law 38/1967 for General Cleanliness
- Law 93/1962 for Wastewater
- Law 117/1983 for Protection of Antiquities
- Traffic planning and diversions
  - Traffic Law 66/1973, amended by Law 121/2008 traffic planning during
  - Law 140/1956 on the utilization and blockage of public roads
  - Law 84/1968 concerning public roads
- Work environment and operational health and safety
  - Articles 43 – 45 of Law 4/1994, air quality, noise, heat stress, and worker protection
  - Law 12/2003 on Labor and Workforce Safety

3.2 World Bank Safeguard Policies

Three policies are triggered for the project as a whole: Environmental Assessment (OP/BP 4.01), Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP 4.12). However,

OP/BP 4.12 will not be applicable to the low pressure pipelines of Gharbia governorate since 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 the project areas. The pipelines network will not cross agricultural land in the project areas and accordingly no compensation will be applied

In addition to the above mentioned safeguards policies, the Directive and Procedure on Access to Information[2] will be followed by the Project.

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

The General EHS Guidelines are designed to be implemented together with the relevant industry Sector EHS Guidelines. Gas distribution system – HSE Guideline (provided in Annex (3) from the report) are applicable to the project.

3.3 International Finance Corporation (IFC) EHS Guidelines

The IFC Environmental Health and Safety (EHS) Guidelines describes pollution prevention and abatement measures and emission levels that are normally acceptable to the Bank. However, it is taking into account borrower country legislation and local conditions.
In 2007, IFC Environmental, Health, and Safety (EHS) Guidelines were released which replace World Bank Guidelines previously published in Part III of the Pollution Prevention and Abatement Handbook.
The IFC EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards.

3.4 Permits required

- 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.
- Railway Authority permit for crossing railways
- Constructions permit to be obtained from the Local Governmental Unit.
- Road and Bridges Directorate permission for excavation of main roads in accordance to 84 of year 1968 pertaining to the public roads

Achievable permits will be presented in the progress report.

4 Environmental and Social Baseline

4.1 Introduction

Gharbeya Governorate located in the middle of the Nile delta and is divided into 8 administrative centers including 8 cities: Tanta, El Mahalla El Kibar, Samannoud, Zefta, As-Santa, Basion, Qotour, Kafr El-Zayyat. Five of the proposed areas (Akhnaway- Seberbay-Ghofran District-Kerset/Kafr Essam and Perma) are located within the administrative borders of Tanta (Gharbeya's capital). The rest of the areas are spread across the whole governorate, as follows: Zefta area (south east to the governorate's borders), Mahalet Zeyad area (at Smannoud district- North East of the governorate), Qotour area (north of the governorate), Kafr El Zayat area (west of the governorate).

4.2 Environmental Baseline

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

4.2.1 Climate[3]

The average annual temperature ranges between 20.3 to 26.6°C in the nine project areas. The warmest month of the year is July, with an average temperature of 26.9 °C. January has the lowest average temperature of the year at 13.1 °C.

4.2.2 Air Quality

4.2.2.1 Site Specific Air Measurement

The selection of 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 locations were chosen to include sensitive receptors' locations such as schools and nearby residential areas, located beside a main road and close to the pipeline route. The GPS coordinates of the selected Ambient Air monitoring locations are shown in table (4-1).

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

4.2.2.2 Results

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

Construction equipment is certified that their exhaustion 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 chapter 6 and 7.

During the construction phase, excavation and construction activities are most likely to cause dust levels to surpass permissible levels in the construction areas. As the excavation and construction are done in the same working day, therefore, the duration of surpassing permissible levels will be intermittent throughout the working day (8-10 hours). Management and mitigation plans for dust concentration going beyond permissible levels are further addressed in chapters 7.

4.2.3 Noise

- *Site specific noise measurements*

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

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

-Results

The noise measurements in the studied areas are below national and WB guidelines. They are complying with the maximum allowable limits stipulated in law 4/1994 for Environment protection, and its amendments by law No.9/2009, and the executive regulation issued in 1995, and its amendments no. 710/2012 and 964/2015.

The excavation and construction activities may cause noise levels to further surpass permissible levels at the site. As the excavation and construction are done in the same working day, therefore, the duration of surpassing permissible levels will be intermittent throughout the working day (8-10 hours). Management and mitigation plans for noise levels beyond permissible levels are further addressed in chapter 7.

[3] Source: http://www.weatherbase.com/weather/weather.php3?s=601818&cityname= Zefta-Egypt

4.2.4 Hydrology

We have to mention that the pipeline network will not cross any water body

4.2.4.1 Surface water

- The main canal, at the entrance of Zefta, feeds cultivated areas with water needs.
- Al Qassed canal, at the entrance of Qotour, feeds cultivated areas with water
- The main canal, at the entrance of Mahalet Zeyad, feeds cultivated areas with water

4.2.4.2 Subsurface water /Ground water

There are no site-specific data available on groundwater in the nine areas of the project. **Groundwater is irrelevant. The excavation for the gas pipeline is shallow (1 meter depth) and will not reach the groundwater.**

4.2.5 Terrestrial Biological Environment

The project is planned to take place along existing roads. No pipelines will pass through any of the natural habitats. The gas route will be located in mixed rural-urban area.

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

4.2.6 Solid Waste Management in the Area

The waste management service in the nine project areas falls under the responsibility of the Cleansing Departments, affiliated to the municipality and Local Governmental Units. They are responsible for the delivery and monitoring of waste primary collection, and transferring wastes to open transfer stations. Most of the primary collection depends on skips (containers) situated in the streets. The collected wastes are transferred to Defra recycling plant. Thereafter, wastes are removed to El-Sadat controlled-landfill that is located in Menoufia Governorate (145 km from project areas).

4.2.7 Physical cultural resources

Low pressure Natural Gas installation pipework shall only take place in the urbanized and semi-urbanized areas of the nine project sites. These areas have been excavated previously for installing other public utilities such as water, sanitary, sewage and electricity networks. For this reason, it is presumably less likely to chance find any artifacts or antiquities in the construction areas. Additionally, there are no identified archeological sites or sites with cultural or historical value, located within urban and semi-urban areas, shall be affected by the NG construction works. In case of any unanticipated archeological discoveries within the project areas; 'Chance Find Procedure,' details the set of measures and procedures to be followed in such case. **Annex** (2)

4.2.8 The Physical structures

The characteristics of buildings and street conditions vary among the project sites. However, almost all buildings were constructed using concrete and red bricks. There is a remarkable diversity in the conditions and height of buildings in the project sites. Additionally, the façade of buildings vary between the project sites.

4.2.9 Traffic profile

The traffic profile in the nine areas is relatively identical. However, the nature of project site might be different in terms of human activities implemented in the cities and villages.

Following is the traffic profile of each project site:

Area	Traffic profile	Site photos

Zefta	The traffic in Zefta city is relatively of moderate density. The rush hours can be divided into two major periods. The first is between 7-10 a.m., and the second one is between 2-4 p.m. There are many types of vehicles moving inside and outside Zefta city including private cars, microbuses, (Tuk Tuk). Main streets were defined in this study. They were Yosef El Gendy St. El Geish st. and El Tahrir st. The traffic is relatively of high density in the main streets, particularly, as many of them are of commercial nature.	
Kafr El-Zayat	The City of is one of the biggest urban areas in Gharbeya Governorate. The city hosts many industrial activities. Consequently, the traffic tends to be dense. There are many commercial areas in Kafr El Zayat. The biggest area can be noticed in the vicinity of the municipality. Tuk Tuks made traffic conditions in the city worse as they pass in small alleys and in narrow streets. This might cause disturbance to the project as well as the mobility of tuk tuks. Microbuses and private cars were noticed in the whole areas. The traffic is congested between 8 a.m. – 11 a.m. and 2 p.m. – 6 p.m. (during winter season)	
Qotour	The traffic is not dense in most of the city. However, in the main streets the traffic tends to be of intense density, especially in the morning and in the afternoon. Various markets were observed in Qotour. They are not of the same size or activity. Some markets trade only in vegetables and fruit, while others trade in electronics. The markets are crowded almost all day. In the electronic markets, they are more crowded during weekends. In Qotour, the main means of transportation are the microbuses and Tuk Tuks. They don't move in organized routes. Therefore, they might pass across the project sites, especially during excavation period. Excavation in the markets should be handled carefully in order to avoid any disturbance to the local communities.	
Mahalet Zeyad	Given the limited number of population and the street width, there was a limited probability of traffic congestion. The village is classified as a semi-urban area. The main street in the village is Port Said Street. It segregates the village into two halves. The second main street is El Sharea El Kebeair. The village has four access roads. The village tends to be of semi-urban character. Therefore, small trucks and tractors can be noticed in the village.	

Seberbay	It is of semi-urban character. It hosts the main bus stop in the district of Tanta. The majority of streets are paved out. The alleyways and side streets are relatively of bad condition as they are not paved. The traffic is dense in the main road of Qotour and Tanta, especially, in the bus stop area. The density of traffic is lower inside the village	
Ghofran	The traffic assessment reflected that Ghofran Sub-District is of low traffic dense. The majority of main streets are two lanes. Various types of vehicles were noticed in the project sites. There are private cars, trucks, motorcycle, (Tuk Tuk) carts, microbuses, tricycles and few number of tractors. The observation conducted by the study team reflected low traffic congestion. The peak time is during 7-9 in the morning and 1-4 in the afternoon. This is the time when school children get inside and outside their schools	
Kherset and Kafr Essam	The characteristics of traffic in Kherset and Kafr Essam villages seem to be of low congestion. There was no dense traffic along the day. Yet, there are various types of vehicles noticed in the two villages. There were small markets in the villages of permanent nature. The vendors of the two markets did not affect the traffic flow in the two areas.	
Akhnaway	The traffic in Akhnaway tends to be of low density. One main two lanes street surrounds the village. The density of traffic on this street is relatively moderate. There is no weekly markets in the village. However, the congestion of traffic might be seen in the morning and afternoon for one hour. The main street is Menyat El Bandra needs to be dug in accordance to clear plan as it represents the main arterial road in the village.	
Hesset Perma	The traffic in Hesset Perma can be described as of low density. There is specific characteristic of Perma which is being famous for being one the major centers for raising poultry (mass production). Based on the observation conducted in the areas, there were some trucks that transfer chickens to various areas. This does not influence the traffic as the streets are relatively wide.	

4.3 Socioeconomic profile

4.3.1 Administrative affiliation

The project will be implemented in nine areas in Gharbeya. The project areas are located in six districts:

- In Zefta District: Zefta City
- In Kafr El Zayat: Kafr El Zayat City
- In Tanta Thany: Ghofran sub-district in Qohafa
- In Qotour District: Qotour city
- In Samannoud: Mahalet Zeyad
- In Tanta District: Seberby, Kherset and Kafr Essam, Akhnaway and Perma

Following is a summary about each project site:

- The City of Kafr el-Zayat is located in the western part of Gharbeya governorate. It lies on the bank of Rosetta branch, and is bordered to the west by al-Beheira governorate. To the East lies Markaz Tanta. The city of Kafr el-Zayat is the capital city of Kafr el-Zayat Marakaz, which is administratively affiliated to Gharbeya governorate. The total area of the city of Kafr el-Zayat is 873 km^2. The total population, according to the latest consensus is 88,425 people.
- The city of Zefta is affiliated to Markaz Zefta which also includes 8 Local Governmental Units (LGUs) and many other towns, villages and hamlets. The total area of the City of Zefta is 1230 km^2.
- Seberbay is administratively affiliated to Tanta Markaz, which falls under the jurisdiction of Gharbeya governorate.
- Ghofran Sub-District falls under the jurisdiction Hai Qohafa of the Tanta Thany Qism, which is part of Gharbeya governorate.
- The villages of Perma and Hesset Perma are located to the north west of Tanta City. The total area of Perma is 16,577 km^2, and the total area of Hesset Perma is 3,876 km^2. The only demarcating line between the two villages is a narrow two-direction street.
- The villages of Perma and Hesset Perma are administratively affiliated to Tanta Markaz which lies within the jurisdiction of Gharbeya governorate.
- Qotour City is administratively affiliated to Qotour Markaz which is one of Gharbya's markazs.
- Mahalet Zeyad is one of the villages of Samannoud Markaz, which is located in the eastern part of Gharbeya governorate.
- Mahalet Zeyad village is administratively affiliated to Samannoud Markaz which is, in turn, affiliated to Gharbeya governorate.
- The villages of Kherset and Kafr Eassam are administratively affiliated to Tanta Markaz which lies within the jurisdiction of Gharbeya governorate. The villages of Kherset and Kafr Essam are located in Tanta Markaz. The total area of Kerset is 1376 feddans, and the total area of Kafr Essam is 431 feddans. The demarcating line between the two villages is a narrow two-direction street.
- Akhnaway village is one of the many villages under the jurisdictions of Tanta Markaz. It is located to the east of Tanta City. Akhnaway is administratively affiliated with Tanta Markaz which, in turn, is under the jurisdiction of Gharbeya governorate.

4.3.2 Demographic characteristics

4.3.3 Total Population

According to statistics provided by the Information Center of the municipality and the information shared by CAPMAS, the total estimated number of population is382,613 people in 2013. According to the statistics collected, it was obvious that the area of biggest population is Zefta city. The areas with the least population were mainly the villages located in Tanta Markaz (e.g. Perma village).

Table 4-1: Population distribution in the project sites

Name of project site	Total population 2013
Zefta City	**106,249**

Name of project site	Total population 2013
Kafr el-Zayat City	**80,783**
Ghofran sub-district	**41,653**
Qotour City	**27,789**
Mahalet Zeyad village	**38,238**
Seberbay village	**34,008**
Kherset village	**11,417**
Kafr Essam village	**10,841**
Akhnaway village	**22,846**
Perma village	**8,789**
Total	382,613

Source: the Information Center's statistics 2013 and Poverty Mapping data 2013

4.3.4 Rate of Natural Increase

According to 'Governorates' Description by Information 2010,'developed by the Information and Decision Support Center, the birth rate in Gharbeya governorate stands at 26.80 per 1000 persons. Mortality rate is 6.60 deaths per 1000 .

Neonatal mortality rate is 5.40 per 1000 live births. Infant mortality rate is 12.30 per 1000 infants below 28 days of age. Below five years old mortality rate is 15.90 per 1000 children. Population natural growth rate is 20.20 per 1000 persons.

4.3.5 Living Conditions

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 household size varies in the project areas. The lowest average household size reported in Ghofran sub-district 3.8 person/household. The biggest household size reported in Perma village 4.6.

Table 4-2: Household average size in the project sites

Name of project site	Household average size
Zefta City	3.98
Kafr el-Zayat City	3.81
Ghofran sub-district	3.80
Qotour City	4.21
Mahalet Zeyad village	3.92
Seberbay village	3.84
Kherset village	4.00
Kafr Essam village	3.91
Akhnaway village	4.12
Perma village	4.60

Source: the Information Center's statistics 2013 and Poverty Mapping data 2013

4.3.6 Access to Basic Services

4.3.6.1.1 Access to Electricity

According to CAPMAS Poverty Mapping data of 2013, approximately all of individuals, living in the project sites use electricity for lighting. The majority of focus groups' participants use electricity for water heating. The electricity grid covers 1352.94 subscribers in the entire governorate of Gharbya, according to 'Governorates' Description by Information 2010.'

4.3.7 Human development Profile

The project areas vary in terms of employment, educational level and illiteracy. Following is a summary about educational status and employment in each project site

4.3.8 Educational status

The CAPMAS developed in 2013 a poverty mapping data that reflected the educational status of project areas in Gharbeya Governorate:

The majority of educated people have completed their intermediate education. About a quarter of individuals above 10 years have finalized their basic education, while only fifth have university degrees.

4.3.9 Unemployment and Work Status

4.3.9.1.1 Unemployment and Work Status in Kafr El Zayat City

According to 'Governorates' Description by Information 2010,' Kafr el-Zayat markaz is a host of a number of industries such as oils, soaps, fertilizers, pesticides, chemicals, paper and fragrances. Kafr el-Zayat also hosts the International Center for Potatoes. The city of Kafr el-Zayat, also, encompasses 451 feddans of agrarian lands. With regards to the project areas the following figure summarizes employment status

Table 4-3: Employment in the project sites

Project Areas	Government /public sector	Private sector	Permanent jobs	Temporary jobs	Wage workers	Unpaid worker
Zefta City	31.44%	46.7%	79.8%	21%	71.7%	0.45%
Kafr el-Zayat City	45.1%	38.1%	82%	18.6%	74.3%	0.32%
Ghofran sub-district	47.8%	37.86%	82.24%	19%	70%	0.27%
Qotour City	45.2%	43.8%	86.5%	13.7%	79 %	0.3%
Mahalet Zeyad village	38.3%	41.17%	84.6%	16%	77%	0.3%
Seberbay village	43%	28.7%	66.5%	34.2%	65.5%	0.7%
Kherset village	48.8%	36.2%	72.18%	28%	84.6%	0.58%

Project Areas	Government /public sector	Private sector	Permanent jobs	Temporary jobs	Wage workers	Unpaid worker
Kafr Essam village	43.6%	32.65%	60.8%	39.3%	81.6%	0.32%
Akhnaway village	34.75%	47.6%	78%	22.3%	82%	0.5%
Perma village	25.4%	52.1%	70%	30.4%	97.5%	0.3%

Source: CAPMAS Poverty Mapping, 2013

4.3.10 Health Facilities

Information about health facility available in the project areas is essential in terms of providing health care to the employees and workers of the project. The project areas have various levels of health facilities i.e. central hospital, equipped with emergency department, private hospitals, ambulance stations, and a number of urban and rural medical units.

4.3.11 Poverty index

CAPMAS managed to develop a Poverty Mapping data that describes the poverty incidence in the project sites. This was supplemented by the focus group discussions conducted in the areas.

Table 4-4: Summary of some poverty indicators

Project Areas	% of poor people	Per capita consumption rate	% of female headed families
Zefta City	4.63	8198.22	14.6
Kafr el-Zayat City	4.48	7954.12	17.5
Ghofran sub-district	6.64	8416.99	14.5
Qotour City	8.32	7498.43	15.3
Mahalet Zeyad village	12.43	5855.61	20.1
Seberbay village	6.2	6977.62	12.6
Kherset village	5.35	6843.27	13.8
Kafr Essam village	6.13	6984.17	11.9
Akhnaway village	6.17	7082.72	13.8
Perma village	9.04	6566.52	12.0

Poverty Mapping data developed by CAPMAS in 2013

5 Environmental and Social Impacts

The environmental and social impact assessment (ESIA) is a process used to identify and evaluate the significance of potential impacts on various environmental and social receptors as a result of planned activities during (construction and operation) phases of the Project. Furthermore, the analysis of environmental and social impacts is important to detail an effective management and monitoring plan which will minimize negative impacts and maximize positives. The evaluation of the potential impacts on various receptors is based on a significance ranking process described in the following subsection.

5.1 Impact Assessment Methodology

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

The second approach is based on Buroz's Relevant Integrated Criteria and is used to determine the total importance, I, of the impact for each activity on all receptors and of the project overall.

Detailed assessment matrices for both approaches are in Annex (5). Following are the impact assessment scoring classification and results.

On the basis of the value of the importance of impact, I, obtained, the severity of the impact of an activity is assessed. The table below presents the classification of impact ratings and respective importance of impact values.

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

5.2 Potential Positive Impact

5.2.1 Positive impacts during construction phase

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

Many variables affect the number and type of workers needed in specific time during construction. This includes but not limited to; the number of connections, nature of work required, and time plan. . According to information shared by Egypt Gas, the daily average number of workers during the peak time will be about 1540 workers in the network installation, house internal and outside installations, chimneys installation and maintenances. About 60 % of these workers (estimated number is 924 worker) are of semi-skilled, 30% of low skilled (estimated number is 462 worker) and 10% engineers and foremen (estimated number is 154 worker). Almost all low skilled workers will be locally recruited and the remaining are the permanent workers in the LDC.

Table 5-1: Total estimated number of workers

Area	Total
Seberbay	188
Ghofran	77
Qotour	140
Mahlet Zayed	100
Kafr El Zayat	361
Zefta	341
Khersit and Kafr Esam	88
Ekhnaway	65
Perma	180
Total	1,540

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

5.2.1.2 Create indirect job opportunities

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

5.2.2 Positive Impact during Operation Phase

- On a national level, reduced expenditure on imported LPG cylinders and subsidies
- As indicated in Baseline Chapter, women are key players in the current domestic activities related to handling LPG and managing its shortage. Being the party affected most from the shortfalls of the use of LPG, the NG project is expected to be of special and major benefits to women. This includes but is not limited to; clean and continuous sources of fuel that is safe and does not require any physical effort and is very reasonable in terms of consumption cost. Time saving is among the benefits to women. The use of a reliable source of energy will allow women to accomplish the domestic activities in less time and this will potentially open a space for better utilization for the saved time.

- The NG connection will help the household achieve a higher level of privacy by eliminating the need for informal LPG distributers from entering private homes.
- Constantly available and reliable fuel for home use.
- Significantly lower gas leakage and fire risk compared to LPG.
- Improved safety due to low pressure (20 mBar) compared to cylinders.
- Beneficiaries to benefit from good customer service and emergency response by qualified personnel/technicians.
- Eliminate the hardships that special groups like persons with disabilities, women, and the elderly had to face in handling LPG.
- Limiting possible child labor in LPG cylinder distribution

5.2.3 Negative Impacts during construction phase Summary of Impact assessment

The impacts pertaining to groundwater, ecology, effect on vulnerable structures, and effect on culturally valuable site, labor influx, and lands tend to be irrelevant during construction and operation phase. Noise, waste related impacts, air emissions and soil are irrelevant during operation phase.

Table 5-2: Summary of impact assessment

Receptor	Description of impact	Type of impact	Significance
Construction			
Air Emissions	*Environmental impacts* Construction of the network pipeline will include several activities which are expected to emit air pollutants to the ambient air with exceeding the permissible limits, however it will be conducted for a short periods. The following air pollutants are foreseeable for most of the construction activities: - Particulate matter and suspended solids from excavation/backfilling operations - Possible dispersion from stockpiles of waste or sand used for filling trenches. - Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SO_x, NO_x, CO, VOCs, etc. - Traffic congestions resulting from road closure or slowing down of traffic due to excavation works. - Fugitive dust emissions (PM10, PM2.5) **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 (paved) to the dusty status of those roads.	Negative impact	Medium

Receptor	Description of impact		Type of impact	Significance
Construction				
	Gaseous pollutants emissions Provided machinery used during construction is certified and maintained as per guidelines, the increase in emissions stemming from the exhaust of machinery is unlikely to increase ambient levels beyond national and WB permissible levels. On urban roads, traffic congestion may lead to increased exhaust emissions. Traffic management with local authority will reduce the impact of works on road congestion and associated emissions.		Negative impact	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 impact	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. Soil disturbance at higher depths will also take place in case of applying HDD technologies in crossing the railway at Kafr El Zayat . In addition, potential soil contamination may take place as a result of spillage or leaks		Negative impact	Medium
Hydrology	**Surface Water**	Surface waters consisting of canal branches may be susceptible to pollution resulting from uncontrolled dumping of wastes generated during construction.	Negative impact	Minor
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 impact	Medium

Receptor	Description of impact	Type of impact	Significance
Construction			
Traffic & Accessibility	The excavation works of the project which does not exceed one day or two days at most may result in some adverse impacts: • Traffic congestion and loss of access due to the excavation and installation works will be vary from village to another according to the population, time of excavation work and the services within each village. • In the nine project areas, traffic tends to be dense in the urban roads and in the vicinity of local governmental units. Additionally, Tuk Tuks and small vehicles might add to the density of traffic • Affect the drivers and vehicles in case of non-rehabilitation of streets after the project implementation • Reduction of Traffic Flow Mobilization of heavy machinery, asphalt breaking, excavation, placement of piping, and backfill activities are bound to limit traffic and accessibility during construction. This may entail narrowing major roads by longitudinal and/or lateral excavation or totally blocking narrow or side roads. • In addition to reducing the lanes/space available for traffic, impacts May also entail limiting or prohibition of parking along the length of the works. • Access to buildings and shop entrances may be limited or constricted in cases where excavations form obstacles for persons and cargo. Negative effects on the business of neighboring shopkeepers due to excavation close to such shops. The excavation activities affect having access to the shops.	Negative impact	Medium

Receptor	Description of impact	Type of impact	Significance
Construction			
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. **Vibrations** The use of jackhammers will results in the generation of hand-arm vibrations; the typical vibration value is of 9 m/s^2, which exceeds the ACGIH Threshold limit value of 5 m/s^2 (8 hour equivalent total value), but is below the exposure limit of 12 m/s^2 for a total daily duration of less than an hour. Typical drilling activities for excavation works are intermittent. **Electrical** Faulty equipment or exposed cables can cause risks of electrocution. **Working at heights** Household installations will require working at heights, which can result in falls and pose a safety hazard.	Negative impact	Medium
Risk pertaining to child labor	As mentioned in the baseline, child labor is a common practice in Egypt at large. This could be also an applicable risk in the project areas in Gharbia Governorate.. 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.	Negative	Low-Medium

Receptor	Description of impact	Type of impact	Significance
Construction			
Risk on Infrastructure and underground utilities	*Environmental Impacts* Prior to excavation the LDC (Egypt gas) performs exploratory drills to investigate the presence of underground utilities that may have been installed without accurate documentation and maps for its routes and depths. Therefore, the risk of damage to such utilities during excavations for natural gas pipeline installation is possible but minimal. 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.	Negative impact	Minor
Community health and safety	The excavation works within the project areas will affect the community health and safety by the following means: • **Waste accumulation** • **Project infrastructure** • **Child labor and school dropout**	Negative impact	Medium
Street condition deterioration	Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression (ردالشئ لأصله) that signifies the responsibility to "restore to original condition". In the context of the project, it applies to the responsibility of the implementing company to provide the necessary resources to re-pave roads and streets to the original state after natural gas excavation and installation works. The current arrangement is that the implementing entity performs the backfilling of the excavated trenches and agrees a restoration fee with the local government unit (district) to cover the balance of the restoration and pavement cost. The local unit uses the fee to include the restoration and re-pavement of the streets in its "pavements plan".	Negative impact	Minor
	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.		
Visual resources and landscaping	Project activities will entail piling of sands and moving of vehicles in various construction sites. Moreover, the temporary storage areas will be used to store pipes, painting materials and safety equipment. That will result in significant visual intrusion impact.	Negative impact	Minor

Receptor	Description of impact	Type of impact	Significance
Operation			
Occupational health and safety	Possible impacts to health and safety during operations include exposures to odorant, noise, accidental injury to workers. In addition; health and safety issues include working around energized equipment, and possible contact with natural hazards. However, during the operation and maintenance phase, the impacts on workers tend to be low.	Negative	Minor
Community health and safety	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 to the current practice of LPG), such impact tends to be of minor relevance.	Negative impact	Minor
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. Sabotage: pipelines and other components may be targeted for sabotage.	Negative impact	Minor

Receptor	Description of impact	Type of impact	Significance
Operation			
Economic disturbance	• For those who will pay in installments, this may be an added financial burden on the poor families (a grant for poor through AFD is already in place for poor families based on an eligibility criteria (section 6.4.) • 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. •	Negative impact	Minor

6 Analysis of Alternatives

6.1 Pipeline Installation Technology Alternatives

To install a natural gas pipeline beneath the ground level, this can either be done by excavation a trench or using trenchless technologies. Trenchless technologies can be further classified as guided methods and non-guided methods. In this analysis, the most famous technology in each category will be considered; namely, horizontal directional drilling representing the guided trenchless technology, auger boring representing the non-guided trenchless technology, and the open-cut representing the trench technology. This technology will be applied in Kafr el Zayat since the pipeline route will cross by railway. Also, the pipeline route of Zefta, Seberbay, Kherset-Kafr Essam will use HDD technology to cross Cairo –Alexandria agriculture road and main road between districts.

6.1.1 Trenchless Technologies

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

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

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

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

6.1.2 Open-Cut Method

This is the traditional method for pipeline installation. It is very simple technology which just depends on excavating the soil, laying the pipeline, and backfilling. However, it is technically not possible to be used in crossings with major waterways. It can be used in crossings with major roads and railways; however, this will cause huge interruption to traffic as this will necessitate either re-routing or reducing the number of lanes. This will lead to reduction in the average speed of the vehicles on the road, and may affect the areas devoted for parking. This may also increase the probability of having car accidents, in addition to negative socio-economic impacts as a result of interrupting the flow of people and goods. Open-cut method may be the only possible recommended solution in the 9 studied areas since the pipeline route passes through urban and local roads and does not cross any main road or railway (Except in Kafr El Zayat), 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:

- The underground utility maps is the bases to select pipelines route. Electricity underground cables, water pipelines and sanitary system must be avoided

- 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 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. 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

6.4 Installation Costs

The average natural gas connection installation cost is about 7000 EGP and consumers contribute a part of it because the balance is subsidized by the Government. 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. . No financial assistance will be provided by the NGOs for the poor to install the NG. All NGOs interviewed expressed their willingness to act as communication channels with poor but no one of them will provide financial aid to the poor. However, the AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG. 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.

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

7.2 Management of Mitigation and Monitoring activities During Construction Phase

7.3 Management of Mitigation and Monitoring activities During Construction Phase

Table 7-1: Environmental and Social Management Matrix during CONSTRUCTION

Receptor	Impact	Mitigation measures	Residual Impact	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Ambient air quality	Increased emissions of dust and gaseous pollutants	• Controlled wetting and compaction of excavation/backfilling surrounding area • Excavated soil stockpiles and stored sand should be located in sheltered areas. Stored fine sand should be covered with appropriate covering material[4], such as polyethylene or textile sheets to avoid soil dispersion. • Transportation of excavation/construction waste should be through licensed and sufficiently equipped vehicles with a suitable special box or provided with a cover to prevent loose particles of waste and debris from escaping into the air or dropping on the road. • Appropriate maintenance, engine tuning and servicing of construction equipment to minimize exhaust emissions • Minimize unnecessary journeys and switching off machinery and equipment when not in use (idle mode).	Minor	- LDC - contractor	LDC HSE department	Contractual clauses + Field supervision	_ Contractor costs _ LDC management costs
Noise	Increased noise levels	• Ear muffs, ear plugs, certified noise PPE for workers • Avoid noisy works at night whenever possible • Complaints receipt from local administration	Minor	_ LDC _ Contractor	LDC HSE department	Contractual clauses + Field supervision (audits)	_ Contractor costs _ LDC management costs
Soil	Degradation of soil quality	• Decrease erosion by minimizing disturbances and scarification of the surface • Best practices for soil management should be followed • Good housekeeping to minimize spills/leaks • Proper handling and management of wastes	Minor	_ LDC _ Contractor	LDC HSE department	Field supervision (audits)	_ Contractor costs _ LDC management costs
Surface water	Uncontrolled dumping of waste in canals can result in water pollution	• Control all onsite wastewater streams and ensure appropriate collection, treatment and discharge. Prevent discharge of contaminants and wastewater streams to ground. • Adequate management and proper handling and storage of construction materials, oils and fuel to avoid spillages	Irrelevant	_ LDC _ Contractor	LDC HSE department	Field supervision (audits)	_ Contractor costs _ LDC management costs

[4] Sufficient sheets should accompany work groups during the construction phase.

Receptor	Impact	Mitigation measures	Residual Impact	Responsibility		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Waste generation	Hazardous waste accumulation	• Temporary storage in areas with impervious floor • Safe handling using PPE and safety precautions • Empty cans of oil-based paint resulting from painting the steel connection pipes to households are to be collected and sent back to nearest Egypt gas depots (at Abo Rawash)for temporary storage until disposal at a hazardous waste facility (Nasreya or UNICO in Alexandria). • Transfer to Egypt gas (at Abo Rawash) depots for temporary storage • Disposal at licensed Alexandria hazardous waste facilities (Nasreya or UNICO). Table 7-2 shows the solid wastes generated during construction and means of disposal. • In case of damaging of asbestos pipes during excavation, the Water Authority, which will carry out the repairs, will be responsible for handling the waste asbestos according to their procedures. • 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: ○avoid inhalation and sources of ignition ○cover and mix with sufficient amounts of sand using PPE ○collect contaminated sand in clearly marked secure containers/bags ○ Add sand to inventory of hazardous waste	Irrelevant	_ LDC _ Contractor _ Water Authority	LDC HSE department	Field supervision and review of certified waste handling, transportation, and disposal chain of custody	Indicative cost items included in contractor bid: Chemical analysis of hazardous waste Trucks from licensed handler Pre-treatment (if needed) Disposal cost at Nasreya Approximate cost of the above (to be revised upon project execution): 8,000-10,000 LE per ton
	Non Hazardous waste accumulation	1. Allocating certain areas, in each Sector, for stockpiling waste soil and construction waste, in coordination with the local authority. 2. No soil stockpiling is allowed on banks of waterways. 3. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable 4. Maximize re-use of excavation waste as backfill for natural gas pipeline trenches. 5. Normally asphalt waste could be disposed of with other excavation waste/aggregates in the local non-hazardous waste site. 6. Solid waste from unlikely scenarios such as domestic site activities (such as temporary offices or rest areas) should be addressed in specific waste management plans, as appropriate <u>If septic tanks are used in case of temporary toilet facilities, make contractual arrangements with a wastewater removal contractor (in coordination with the local unit) to purge and dispose of possible septic tanks in the case they are utilized in work sites</u>	Irrelevant	Excavation Contractor	LDC HSE department	Official coordination proceedings signed by representatives of utility authorities _ Examination of site-specific reports and records _ Field supervision	_ Contractor management costs _ LDC management costs
Social receptor	Grievance and redress mechanism	The detailed grievance mechanism (GRM) is presented in **Annex (7).** It will be shared with the community beneficiaries. The GRM presented various tiers of complaints, time to respond to the aggrieved person and reporting requirement for grievances. It is crucial to notify that time frame allocated for responding to a complaint will not exceed 15 business days.		_ Contractor	_ LDC – HSE department	Contractual clauses + Field supervision	- Contractor costs LDC management costs
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	Minor	_ Excavation contractors	_ LDC + Traffic department _ LDC HSE _ Local Unit 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 Contractor	LDC HSE	Ensure inclusion in contract + Field supervision 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	

Receptor	Impact	Mitigation measures	Residual Impact	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 ESIA 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	Minor	-LDC Excavation Contractor	LDC–HSE department	Field supervision and review of HSE report+ Field supervision (audits)	- Contractor costs LDC management costs
	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/subcontractors' ToR in order to warrantee no child labor is occurred in the project • The ToR also will oblige the contractor/subcontractor to keep a copy of IDs of laborers in order to monitor the hired staff below 18 years old The contractor/subcontractor also will be obliged to maintain daily attendance sheets in order to verify the attendance of workers not include staff below 18 years old	Minor	• LDC Excavation Contractor/subcontractor	LDC–HSE department	Field supervision and review of HSE report+ Field supervision (audits)	• Contractor costs - LDC management costs
Risk on Infrastructure and underground utilities	Damage to underground utilities resulting in water/wastewater leaks, telecommunication and electricity interruptions	If maps/data are unavailable: • Perform limited trial pits or boreholes to explore and identify underground utility lines using non-intrusive equipment • In case of breaking underground utility and infrastructure line, the company supervisor stops work in the affected area, calls the Police Department and emergency department in the relevant utilities company for immediate repair of the damage, which the contractor is invoiced for. The mitigation measures on preventive measures and documentation: • Preparation and analysis of accidental damage reports • Arrange Restoration and re-pavement (ردالشئ لأصله) with local unit • Communication with local community on excavation and restoration schedules. Standard protocols adhering to national/local administrative requirements are to be followed: • Close and early coordination between the LDC (and the excavation contractor, if applicable), the local unit, and any other relevant authorities (in the case of public roads, the Roads and Bridges Directorate may become the counterpart to the LDC) • Agreement on the restoration arrangements, schedules, fees, and payment schedules • Coordination with the General Utilities before starting work especially the Traffic Department, sewerage, water, telephones and electricity departments. • Payment of restoration fees by the LDC before works commencement • Documentation of the agreement and adoption by all involved parties • Communication with the Public and relevant authorities (such as the security and the traffic departments) regarding excavation and restoration plans	Minor	• LDC • Local Governmental unit	LDC	Field supervision and review of complaints Coordination minutes of meeting with the local governmental unit	LDC management costs

Receptor	Impact	Mitigation measures	Residual Impact	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 excavation out the streets will be mitigated through enabling alternative entrances to the business. Also special wooden bars will be used to enable the shoppers to get into the markets. Additionally, the duration of work will not exceed one working day. In case of excavation main streets in the commercial areas, this can be only done during night after business closing • Follow up the procedure of Grievance Redress Mechanism (please see Annex 7) • Ensure transparent information sharing • The telephone numbers of the social development officer responsible for grievances should be shared with the community people	Minor	- LDC - contractors	LDC and EGAS SDO	_ Ensure the implementation of GRM Supervision on Contractors performance	No cost
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 excavation areas, especially, on the wooden bars	Minor	LDC	LDC and EGAS SDO	_ List of awareness activities applied _ Lists of participants _ Documentation with photos Awareness reports	LDC management costs

Table 7-2 Solid waste Management during construction

Waste Type	Description	Treatment and Disposal
Non-Hazardous		
Excavated soil and excess sand	Excess sand not used in construction, and excavated soil other than broken asphalt.	Dispose to an approved non-hazardous waste disposal facility: Municipal solid waste Gharbeya (to be agreed with local unit)
Paint Containers – Water Based	Pails used for latex paint and paint related solvent containers.	
Welding Rods	Generated from piping welding. Remaining portions of used rods or unused but opened packaged.	
Concrete and bricks waste	Excess liquid cement that not used in cementing operations, loose fragments of solidified cement , concrete debris from construction, and bricks waste	
Broken asphalt	Streets excavation will produce broken asphalt	
Domestic Waste	Food waste, paper and packaging discarded from kitchens, living quarters, bathrooms, laundries, warehouses and offices.	(Mahalah Rooh open transfer station consider the nearest dumpsite to Tanta City 11km.)
Metal - Scrap	Includes sheet metal, piping, tubing, wire, cable , welding residue, valves, fittings, and vehicle and equipment parts.	Temporarily stored in isolated area on-site, then transported to Abu Rawash storage site (Egypt Gas facility) to be sold as scrap.
Hazardous		
Paint Containers – Oil Based	Pails used for oil based paints, solvents and paints that contain lead, silver, chromium or other toxic heavy metals.	Temporarily stored in isolated area on-site, then disposed of daily to an approved hazardous waste disposal facility Nasreya Hazardous Waste Treatment Centre.
Oil Containers – (Including Drums and Barrels)	Drums and barrels used for bulk oils and lubricants.	
Possibly damaged asbestos water pipes during excavation	Any waste material containing more than 1 wt% asbestos including piping/equipment/vehicle gaskets, pump packing brake pads, etc.	
Contaminated Soil	Contaminated soil from routine activities and minor accidental releases spills or leaks.	
Used oil waste	Used oil result from vehicles and/or equipment.	Temporarily stored in isolated area on-site, then transported to Abu Rawash storage site, Petrotrade will be the final disposal.

Egypt Gas apply rigid environmental performance as illustrated in Annex 8

Table 7-3 Monitoring During Construction

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Local traffic and accessibility	Reduction of traffic flow and accessibility to local community	Comments and notifications from Traffic Department	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports Complaints log	LDC management costs
Ambient air quality	Increased air emissions	HC, CO% and opacity	LDC HSE	Once before construction + once every six months for each construction machine.	Vehicles licensing Department	Measurements and reporting of exhaust emissions of construction activities machinery Complaints log	LDC management costs
Ambient noise levels	Increased noise levels	Noise intensity, exposure durations and noise impacts	LDC HSE	Regularly during site inspections and once during the night in every residential area or near sensitive receptors such as hospitals	Construction site	Measurements of noise levels Complaints log	LDC management costs
		Complaints from residents	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs
Underground utilities	Damages to underground utilities and infrastructure	Official coordination reports with relevant authorities Accidents documentation	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs
Physical state of street	Waste generation	Observation of accumulated waste piles	LDC HSE	During construction. Monthly reports	Construction site	Observation and documentation	LDC management costs
		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
		Chain-of-custody and implementation of waste management plans	LDC HSE	Area reports	Construction site and document examination	Site inspection and document inspection	LDC management costs
Local community	Damaging to the streets	– Streets quality after finishing excavation Number of complaints due to street damage	LDC, EGAS	Four times per year, each three months	Site and Desk work	Checklists and complaints log	No cost
Local community	Threat to Safety of users and houses (due to limited level of awareness and misconceptions)	– Number of awareness raising implemented – Number of participants in information dissemination	LDC, EGAS	Quarterly monitoring	Office	Reports Photos Lists of participants	No cost
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

7.4 Management of Mitigation and Monitoring activities During Operation Phase

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

Receptor	Impact	Mitigation measures	Residual Impact	Responsibility		Means of supervision	Estimated Cost
				Mitigation	Supervision		
Integrity of natural gas piping	**Network integrity**	_ Detailed review of the geotechnical and geological history of the project area _ Random inspections and awareness campaigns to ensure that NG piping and components (both inside the household and outside) are not be altered, violated, or intruded upon in any way without written approval from, or implementation of the alteration by, the LDC. _ Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies _ evacuation of the affected area - Repair or replacement of failed component	Minor	LDC	LDC HSE.	- Map and local geotechnical report review - Site inspections - Awareness actions Periodical trainings and drills	LDC management costs

Receptor	Impact	Mitigation measures	Residual Impact	Responsibility		Means of supervision	Estimated Cost
				Mitigation	Supervision		
Economical disturbance	• **Financial burden on economically disadvantaged due to the installments** • **Loss of revenue for LPG distributors**	- Petro Trade should collect the installment immediately after the installation of NG - The installments should be collected on monthly basis in order not to add burden to the poor, as it will be easier for them to pay on monthly basis - The installment should not be high - LPG distributors should be informed about the NG potential areas in order to enable them to find alternative areas - They should be informed about the GRM in order to enable them to voice any hardship	Minor	Petro trade (Company responsible for collecting the consumption fees and the installments Egypt Gas	EGAS EGAS	Banks loans log Complaints raised by poor people due to the frequency of collecting the installments Information sharing activities with the LPG vendors Grievance received from them	No cost 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 - The complete integrated, comprehensive and robust Emergency Response Plan of the LDC (in Arabic) is in annex 6	Minor	LDC	LDC	Complaints raised due to Gas leakage	No cost

Receptor	Impact	Mitigation measures	Residual Impact	Responsibility		Means of supervision	Estimated Cost
				Mitigation	Supervision		
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 the commitment of workers to use the protective equipment - Inspection and recording of the performance -Reports about the workers and complaints	LDC management costs

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

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

8. Stakeholder Engagement and Public Consultation

The public consultation chapter aims at highlighting the key consultation and community engagement activities that took place as part of the preparation of the Environmental and Social Management Plan Report (ESMP) and their outcomes.

8.1 Legal framework for consultation

Consultation activities 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:
  - 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 modified with ministerial decrees no. 1095/2011 and no. 710/2012

8.2 Objective of consultations

Objectives of various consultation activities are summarized as follows:

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

8.3 Consultation Methodology and Activities

The consultation process was a dynamic and evolving process which adapted with the nature and expectations of the host community. Following is a summary of community engagement activities during the preparation of the ESIAF 2013 and the site specific ESMP in 2017.

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

Participants		Number		Methods	Date
		Males	Females		
During the preparation of framework					
Various stakeholders		55	24	Public Consultation event	29th of December 2013
Community residents		25	36	Structured questionnaire	December 2013
Potential beneficiaries and governmental entities		16	8	FGD	
Governmental entities		4		In-depth interview	
Total					
During the ESMP					
Potential beneficiaries and	Ekhnaway	12	8	FGD	January- February 2017
	Perma	11	7		

Participants		Number		Methods	Date
		Males	Females		
governmental entities	El Ghofran	6	7		
	Kherset	5	6		
	Zefta	5	5		
	Seberbay	8	7		
	Qotour	10	6		
	Kafr El Zayat	4	17		
	Mahlet Zeyad	11	7		
Governmental and public sector	Ekhnaway	4	1	In-depth interview	January- February 2017
	Perma	4	1		
	El Ghofran	5	1		
	Kherset	5			
	Zefta	5	1		
	Seberbay	2	2		
	Qotour	1	1		
	Kafr El Zayat	4	1		
	Tanta Markaz	5	2		
	Mahlet Zeyad	8			
Civil society	Tanta Markaz		1	In-depth interview	January- February 2017
	Qotour	2			
	Kafr El Zayat	1			
	Mahlet Zeyad	1			
LPG Street vendors	Zefta	2	0	In-depth interview	January- February 2017
	El Ghofran	5	1		
Governmental, NGOs and community people	Kafr El Zayat	34	1	Group meeting in Kafr El Zayat	15th of February 2017
	Zefta	11	1	Group meeting in Zefta	16th of February 2017
Total		**171**	**84**		
Governmental, NGOs and community people				Public Consultation event	

Annex 9 includes the Stakeholder Engagement and Public Consultation lists of participants.

Figure 8-1: Group meeting with women in Kherset

Figure 8-2: Group meeting in a café in Kherset

Figure 8-3: Group meeting in Ekhnaway

Figure 8-4: Group meeting with women in Ekhnaway

8.4 Final consultation event

Consultation activities were conducted in Gharbeya governorate on the 11th of April 2017.

The consultation activities passed through along cycle of communication with the potential beneficiaries, stakeholders and Local Governmental Units. Such dense consultation activities reflected an overwhelming acceptance to the project. The nature of communities and similarity of their conditions was obvious along various consultation events.

The semi-urban areas raised their concern about the probability to be deprived of the NG installation as the majority of their buildings are illegally constructed on agriculture lands.

In most of the project areas, the consulted groups raised their concern about street restorations, the time plan of rehabilitating and repaving streets. It was recommended to have the streets rehabilitated by the LDC.

Some residential units in Tanta suffer due to not installing the NG in their houses. The consulted groups expressed their eagerness to be included in the future plans of NG installation.

The cost of NG installation was one of the main concerns raised, particularly, after the inflation of the NG installation cost and the absence of paying in installment systems in some areas.

The efficiency of NG installation's workers was asserted by the community people. However, it is strongly recommended to establish a dialogue between these workers and the community people in order to comprehend the reasons for installing the NG to certain houses and placing the NG meter in specific places.

8.5 ESMP Disclosure

The site specific ESMP after being approved by the World Bank and EEAA, the final report will be disclosed on the WB website, EGAS and Egypt Gas websites. An executive summary in Arabic will be disclosed in EGAS and Egypt Gas websites. A copy of Gharbeya Site specific reports will be disclosed in EEAA and in the Governorate level. A copy of the ESMP report in English and a Summary in Arabic will be made available in the customer service office. Additionally, an Arabic summary will be made available in the contracting offices. An A3 poster will be installed in the contracting office informing about the results of the ESIA and the website link for the full ESMP study.