



2.3 Million Natural Gas Connections Project in 20 Governorates

Environmental and Social
Management Plan
Cairo Governorate
(Twenty districts)

Final Report

June, 2021



EGAS

Egyptian Natural Gas Holding Company

Developed by



“Petrosafe”

Petroleum Safety & Environmental Services Company



List of acronyms and abbreviations

AFD	Agence Française de Développement (French Agency for Development)
CAPMAS	Central Agency for Public Mobilization and Statistics
CDA	Community Development Association
EEAA	Egyptian Environmental Affairs Agency
EGAS	Egyptian Natural Gas Holding Company
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management framework
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GoE	Government of Egypt
GPS	Global Positioning System
HH	Households
HSE	Health Safety and Environment
IFC	International Finance Corporation
LDC	Local Distribution Companies
LGA	Local Governmental authority
LPG	Liquefied Petroleum Gas
mBar	milliBar
NA	Not Available
NG	Natural Gas
NGO	Non-Governmental Organizations
P&A	Property and Appliance Survey
PE	Poly Ethylene
Project districts	NG Connection areas in 15 May, El Bassateen, Ather El Nabi, Ezbat El Nasr (El Bassateen), Helwan, Zahraa El Maadi, El Hikestep, Tora, Magra El Ayon, Misr El Qidima, El Sayda Zeineb, Bab El Sharia, El Magharplyn, Ain Helwan, Ard Sherif, El Darb El Ahmar, Darb Saada, Hadaak Helwan, Mantket Al Estsmar (El Katamia), Hekr El Tebeen districts.
PRS	Pressure Reduction Station
SDO	Social Development Officer
SIA	Social Impact Assessment
Town Gas	Town Gas (LDC)
WBG	The World Bank Group
WHO	World Health Organization
\$	United States Dollars
€	Euros

Exchange Rate: US\$ = 15.74 EGP as of June, 2021

Exchange Rate: € = 19.14 EGP as of June, 2021



Contents

0.	EXECUTIVE SUMMARY	7
0.1	INTRODUCTION	7
0.2	PROJECT DESCRIPTION	8
0.3	LEGISLATIVE AND REGULATORY FRAMEWORK	8
0.4	ENVIRONMENTAL AND SOCIAL BASELINE	9
0.5	ENVIRONMENTAL AND SOCIAL IMPACTS	12
0.6	ANALYSIS OF ALTERNATIVES	13
0.7	ENVIRONMENTAL AND SOCIAL MANAGEMENT & MONITORING PLAN	14
0.8	STAKEHOLDER ENGAGEMENT AND PUBLIC CONSULTATION	14
0.9	ESMP DISCLOSURE	15
1.	INTRODUCTION	16
1.1	PROJECT OBJECTIVES	16
1.2	METHODOLOGY	18
1.3	CONTRIBUTORS	19
2.	PROJECT DESCRIPTION	20
2.1	BACKGROUND	20
2.2	PROJECT WORK PACKAGES	20
2.3	PROJECT EXECUTION METHODOLOGY	36
3.	LEGISLATIVE AND REGULATORY FRAMEWORK	45
3.1	APPLICABLE ENVIRONMENTAL AND SOCIAL LEGISLATION IN EGYPT	45
3.2	WORLD BANK SAFEGUARD POLICIES	47
3.3	PERMITS REQUIRED	49
4.	ENVIRONMENTAL AND SOCIAL BASELINE	50
4.1	DESCRIPTION OF THE ENVIRONMENT	50
4.2	SOCIOECONOMIC BASELINE	64
5.	ENVIRONMENTAL AND SOCIAL IMPACTS	73
5.1	IMPACT ASSESSMENT METHODOLOGY	73
5.2	IMPACTS DURING CONSTRUCTION	73
5.3	IMPACTS DURING OPERATION	74
6.	ANALYSIS OF ALTERNATIVES	80
6.1	PIPELINE INSTALLATION TECHNOLOGY ALTERNATIVES	80
6.2	ROUTING, REGULATORS, WORKING TIME AND PAYMENT	81



7.	ENVIRONMENTAL AND SOCIAL MANAGEMENT & MONITORING PLAN	82
7.1	OBJECTIVES OF THE ESM&MP	82
7.2	ENVIRONMENTAL AND SOCIAL MANAGEMENT MATRIX DURING CONSTRUCTION	83
7.3	ENVIRONMENTAL AND SOCIAL MANAGEMENT MATRIX DURING OPERATION	100
7.4	MONITORING AND REVIEW	103
7.5	ENVIRONMENTAL AND SOCIAL MONITORING MATRIX DURING CONSTRUCTION	104
7.6	ENVIRONMENTAL AND SOCIAL MONITORING MATRIX DURING OPERATION	110
7.7	REPORTING OF MITIGATION AND MONITORING ACTIVITIES	112
7.8	EMERGENCY RESPONSE PLAN	113
7.9	INSTITUTIONAL FRAMEWORK FOR ESM&MP IMPLEMENTATION	115
7.10	MANAGEMENT OF GRIEVANCES (E&S GRIEVANCE REDRESS MECHANISM)	116
8.	STAKEHOLDER ENGAGEMENT AND PUBLIC CONSULTATION	122
8.1	LEGAL FRAMEWORK FOR CONSULTATION	123
8.2	CONSULTATION OBJECTIVES	123
8.3	DEFINING THE STAKEHOLDER	124
8.4	CONSULTATION METHODOLOGY AND ACTIVITIES	126
8.5	SUMMARY OF CONSULTATION ACTIVITIES	131
8.6	SUMMARY OF CONSULTATION RESULTS	132
8.7	ESMP DISCLOSURE	133

Annexes

ANNEX 1:	CONTRIBUTORS TO THE ESMP
ANNEX 2:	UPDATED EGAS HSE GUIDELINES
ANNEX 3:	EQUIPMENT USED AND EMISSION MEASUREMENTS
ANNEX 4:	IFC GUIDELINE
ANNEX 5:	NOISE AND AIR MEASUREMENTS
ANNEX 6:	CHANCE FIND PROCEDURE
ANNEX 7:	IMPACT ASSESSMENT
ANNEX	8-A: EGYPTIAN MINISTRY OF PETROLEUM AND MINERAL RESOURCES COVID-19 EMERGENCY RESPONSE PLAN
	8-B: WBG RESPONSE TO COVID-19 CONTINGENCY PLANNING FOR PROJECT SITES
ANNEX 9:	CODE OF CONDUCT
ANNEX 10:	TOWN GAS ERP INCLUDING EGAS EMERGENCY RESPONSE PLAN MAIN ELEMENTS & NOTIFICATION PROCEDURES SUMMARY
ANNEX 11:	GRM & COMPLAINT FORM
ANNEX 12:	STAKEHOLDER ENGAGEMENT AND PUBLIC CONSULTATION FOR PHASE II OF THE PROJECT (9 NEW GOVERNORATES 2016)
ANNEX 13:	CONSULTATION ACTIVITES (LISTS OF PARTICIPANTS) IN THE SLECTED DISTRICTS IN CAIRO GOVERNORATE (5 DISTRICTS) – 2020/2021



List of Tables

Table 0-1: Summary of Impact Assessment during construction and operation	13
Table 1-1: Number of Districts and Potential clients	17
Table 1-2: Main Characteristics of the Selected Districts	19
Table 1-2: Shortlist of Main Contributors	19
Table 2-1: Existing PRSs and regulator feeding the project districts.....	20
Table 2-2: Types of Equipment used	43
Table 3-1: Maximum limits of outdoor air pollutants.....	45
Table 3-2: Power generation by diesel engines	46
Table 3-3: Maximum allowable emissions from vehicles that operate using gasoline fuel	46
Table 3-4: Maximum allowable emissions from vehicles that operate using diesel fuel.....	46
Table 3-5: Maximum permissible noise level limits.....	46
Table 3-6: WHO Ambient Air Quality Guidelines	47
Table 3-7: Small Combustion Facilities Emissions Guidelines (3MWth – 50MWth) – (in mg/Nm ³ or as indicated).....	48
Table 3-8: Noise Level Guidelines.....	48
Table 4-1: Location of Air measurements	56
Table 4-2: El Hikestep air Quality Measurements.....	57
Table 4-3: Bab El Sharia air Quality Measurements.....	57
Table 4-4: 15 May air Quality Measurements.....	57
Table 4-5: Helwan air Quality Measurements	58
Table 4-6: Zahraa El Maadi air Quality Measurements	58
Table 4-7: El Hikestep, Bab El Sharia, 15 May, Helwan and Zahraa El Maadi Noise Measurements	58
Table 4-8 Distribution of population in the project districts.....	65
Table 4-9 Distribution of the project districts' population by educational status	67
Table 4-10 Unemployment Rate in Cairo Governorate	68
Table 5-1 Impact Assessment Methodology.....	73
Table 5-2 Impact Assessment.....	75
Table 7-1: Environmental and Social Management Matrix during CONSTRUCTION.....	83
Table 7-2: Environmental and Social Management Matrix during OPERATION	100
Table 7-3: Environmental and Social Monitoring Matrix during CONSTRUCTION	104
Table 7-4: Environmental and Social Monitoring Matrix during OPERATION	110
Table 7-5 Means of verification and indicators	120
Table 8-1: Stakeholders identified in Cairo Governorate.....	124
Table 8-2: Summary of Consultation Activities in Cairo Governorate (2016 - 2021)	127
Table 8-3: Key comments and concerns raised during the different consultation activities, and the way they were addressed during in the ESMP study.....	131



List of Figures

Figure 2-1: General components of the Twenty-Nine districts distribution network	20
Figure 2-2: The proposed El Hikestep Intermediate Pressure pipeline route.....	22
Figure 2-3: Pictures showing El Hikestep intermediate pressure pipeline route.	23
Figure 2-4: The proposed Bab El Sharia Intermediate Pressure pipeline route.....	25
Figure 2-5: Pictures showing Bab El Sharia intermediate pressure pipeline route.	26
Figure 2-6: The proposed 15 May Intermediate Pressure pipeline route.....	28
Figure 2-7: Pictures showing 15 May intermediate pressure pipeline route.	29
Figure 2-8: The proposed Helwan Intermediate Pressure pipeline route.	31
Figure 2-9: Pictures showing Helwan intermediate pressure pipeline route.....	32
Figure 2-10: The proposed Zahraa El Maadi Intermediate Pressure pipeline route.	34
Figure 2-11: Pictures showing Zahraa El Maadi intermediate pressure pipeline route.....	35
Figure 2-12: Picture showing sample of typical trench for PE pipes	38
Figure 2-13: Pictures showing the proposed location HDD crossing in Cairo districts	39
Figure 2-14: Pictures showing Horizontal Directional Drilling (HDD) Technique.....	40
Figure 4-1: Distribution of project districts in Cairo governorate	50
Figure 4-2: Satellite map showing El Hikestep district and surrounding communities	51
Figure 4-3: Satellite map showing Bab El Sharia district and surrounding communities.....	52
Figure 4-4: Satellite map showing 15 May district and surrounding communities.....	53
Figure 4-5: Satellite map showing Helwan district and surrounding communities	54
Figure 4-6: Satellite map showing Zahraa El Maadi district and surrounding communities	55
Figure 4-7: Shows 15 May dumpsite and Helwan waste trucks	61
Figure 4-8: Shows some of sewage treatment plants in project districts	62
Figure 4-9: Shows Typical Traffic in Project Districts within the Cairo Two Rush Hours	63
Figure 4-10: Shows Type of vehicles, Traffic density and main streets in some of project districts	63
Figure 4-11: Shows Building Condition in some of project districts.....	65
Figure 4-12: Shows some of LPG vendors and LPG outlet in project districts.....	69
Figure 4-13: Shows woman carrying the LPG cylinder from Bab El Sharia outlet.....	70
Figure 7-1: Town Gas H&S organizational structure.	115
Figure 7-2 Proposed Grievance and Redress Mechanism.....	117
Figure 8-1: Shows ESIAF Public consultation, October 2016.....	129
Figure 8-2: Shows consultation activities in Cairo districts during 2020/2021.....	130



0. Executive Summary

0.1 Introduction

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

It is worth mentioning that World Bank has partially financed the Greater Cairo Gas Connections project which was completed by the year 2012, and more than 350 thousand residential customers were connected with Natural Gas services. ESIAF for the Greater Cairo Gas Connections project has been cleared by the WBG and disclosed on EGAS website. Two public consultation meetings were held for the Greater Cairo Connection Project in November, and December 2006.

In December 2018, Cairo governorate has joined the current Natural Gas Connection Project financed by the WBG (as one of the new nine Governorates that joined the project). Cairo Governorate has currently more than 2.6 million residential customers using Natural Gas services. Therefore, the new household connections in Cairo governorate are supplementary to the current existing natural gas connection network there. The 20 districts (15 May, El Bassateen, Ather El Nabi, Ezbat El Nasr (El Bassateen), Helwan, Zahraa El Maadi, El Hikestep, Tora, Magra El Ayon, Misr El Qidima, El Sayda Zeineb, Bab El Sharia, El Magharplyn, Ain Helwan, Ard Sherif, El Darb El Ahmar, Darb Saada, Hadaak Helwan, Mantket Al Estsmar (El Katamia), Hekr El Tebeen) of the current project will be connected to NG and are found significantly homogeneous in terms of environmental and social aspects. Because of the great number of project districts in Cairo governorate (20 districts), 5 districts were chosen to give a good representation for the environmental and social characteristics which can be affected by the project execution. As such, this report will present the study findings by groups of homogenous project districts. This ESMP has been prepared based on the Simplification Guidelines agreed upon between the World Bank and EGAS. Currently there are five existing PRSs (Helwan, El Mokattam, North Heliopolis, Maadi and Warak) and one regulator (Zahraa El Maadi) will supply the expansion of NG connections in project districts. No major environmental or social risks can be foreseen which would prevent the project from reaching the targeted customers.

For the current ESMP study 15 May, Helwan, Bab El Sharia, Zahraa El Maadi and El Hikestep districts have been chosen to represent Cairo governorate due to their longer low-pressure networks, variety of socioeconomic activities, in addition to the greater number of households NG



connection, comparing to rest of project districts. The locations for environmental measurements (receptors) also have been carefully selected to avoid any potential risks and could be followed up and monitored during the construction phase.

0.2 Project Description

According to the agreement between Town Gas Company and the Egyptian Natural Gas Holding Company “EGAS” signed for supplying natural gas to more than 92,017 residential customers in the project districts (New communities, old districts, Population density, urbanization trend, etc) within Cairo governorate.

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

Town Gas Company will start the necessary installations needed to feed natural gas for the customers in project districts as follows: -

- project districts will be connected by polyethylene intermediate pressure feeding pipeline from the existing PRS stations and regulator.
- Low-pressure gas distribution piping system consisting of low-pressure service lines (100 mbar). They are mainly constructed from medium density polyethylene pipes (MDPE). And will be installed horizontally underground for the project districts sectors.

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

0.3 Legislative and Regulatory Framework

The project will adhere to Egyptian legislations, WBG operational policies and World Bank Group (WBG) General Environmental, Health, and Safety Guidelines & WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems as per following:

- **Applicable Environmental and Social Legislation in Egypt:** Law 217/1980, Law 4 for Year 1994 amended by Law 9/2009 and law 105 for the year 2015 and its Executive Regulation (ER), Law 38/1967, Law 93/1962, Law 117/1983, Law 66/1973 amended by Law 121/2008, Law 140/1956, Law 84/1968 and Law 12/2003.



- **World Bank Safeguard Policies:** During the early stages of the 2.3 million customer NG connections project, a framework study was prepared where, 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). OP/BP 4.01 will apply to this sub-project whereas, it is not envisaged that the Low-Pressure Natural Gas Network in Cairo Gov. in the 20 aforementioned districts, will result in any physical or economic dislocation of people in the project location, so OP/BP 4.12 will not be applicable. 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. Physical Cultural Resources OP/BP4.11 will be applicable since Cairo governorate is known for archeological and cultural sites. Chance find procedures will be part of the contracts of the contractors.
- **World Bank Group General Environmental, Health, and Safety Guidelines & WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems:**
 - The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues in specific industry sectors.
 - Gap Analysis showed that there are no significant differences between the requirements outlined by the WBG EHS guideline on gas distribution systems and the management and monitoring actions outlined by the ESMP

0.4 Environmental and Social Baseline

Methodology of the ESMP:

Based on the site visit conducted by the consultants in 2020/2021 and the secondary data collected, the subproject sites are classified as urban residential areas, located in Cairo Governorate. and found significantly homogeneous in terms of environmental and social aspects.

The environmental measurements were conducted in the selected locations based on the sensitivity of receptors (environmental and/or social) and significance of the impact (air and/ or noise)

Environmental Baseline:

Air Quality and noise measurements:

According to the study methodology the measurement locations was chosen on the basis that it is beside sensitive receptors close to the intermediate pipelines' routes.

The noise measurements and the concentrations of measured air pollutants in the studied districts are below national and WBG guidelines.

**Climate:**

The average annual temperature is 21.7 °C and the average annual rainfall ranges between 0.0 and 5.1 mm.

Water resources:

The main surface water resource of Cairo Governorate is the River Nile used for agriculture, industrial and domestic uses.

The groundwater aquifer in Cairo Governorate is the late Pleistocene. During the project construction activities, the excavation depth does not exceed 1.5 meter, therefore groundwater is unlikely to be encountered in the 20 studied districts.

Terrestrial Biological Environment:

The proposed gas pipeline route and pipeline network are planned to be implemented in existing urban roads in urban residential areas where flora and fauna of significance do not occur.

Waste Management:

Solid wastes in Cairo Governorate delegated to Cleansing and Beautification Agency managed by Presidency of the City Council. In Helwan, 15 May and Zahraa El Maadi districts waste transferred to waste recycle factory (EKAM) located in 15 May district by trucks then the rejected wastes transferred to 15 May dump site, while in Bab El Sharia wastes transferred by trucks to Manshaat Nasser dumpsite and finally El Hikestep wastes transferred by trucks to El-Obour dumpsite. The project districts are well covered by public sanitation network which take all the municipal sewage to be treated in existing sewage treatment plants. There are no hazardous wastes certified disposal sites within Cairo district, any hazardous Waste generated will be transported- by licensed hazardous waste handling vehicles and personnel for final disposal at a licensed hazardous waste facility (Nassreya or UNICO in Alexandria).

Socioeconomic Baseline:**Administrative Division:**

The project districts lie within the jurisdiction of the Cairo Governorate. Cairo Governorate is the capital of Egypt, and one of the largest cities in Africa. Cairo has stood for more than 1,000 years on the same site on the eastern bank of the Nile. It is located in the northeastern part of the country. Cairo is the gateway to the Nile delta, where the lower Nile separates into the Rosetta and Damietta branches. The project will be implemented in 20 districts in Cairo governorate

**Urbanization Trends:**

All the project districts are classified as urban residential areas, the majority of buildings are more than eight stories high, the average width of main streets range between (3 to 5) lanes wide, and side streets range between (2 to 3) lanes wide, they are mostly paved out and convenient for NG installations.

Demographic Characteristics:

The total population for the selected project districts is about 1.2 million; the birth rate in Cairo Governorate is 25.4 births per 1000 persons. The adult mortality rate is 9 per 1000 people. That gives a natural growth rate of 16.4 per 1000 persons. The average household size is about 3.6 persons in Cairo Governorate, which is similar to the average at the project districts, which range between 3 – 3.8 persons.

Access to basic services:

The project districts have access to basic services, nearly 100% of individuals are using electricity, and have access to the public water and sanitation network So Natural gas will be connected to all project districts.

Human development profile:

Education is one of the main determinants of any awareness campaign for the project. The level of education in Cairo governorate is relatively high comparing to other governorates. The intermediate education is privilege in Cairo governorate, which it represents about 33% on the governorate level, and the percentage of the illiterate rate is 16%. According to the data collected, the medical services are available and very close to all project districts, so if any injuries occurred to the workers, they will be immediately transferred to the nearest hospital. The average monthly income for each household is estimated to be about 6258.7 EGP. Cairo governorate embraces different economic activities and includes more than 20 thousand governmental institutions. The governorate hosts several industrial zones which makes it a destination for capital polarization and investment. The governorate offers multiple potential investment opportunities including establishment of hotels, tourist facilities, malls and exhibitions, in addition to investments in real estate. The consulted community members recommended to pay NG installation costs in installment, they strongly asked for a flexible payment in installment that vary between one year to five years.

Fuel currently used in households:

The main type of fuel used for cooking in project districts are the LPG cylinders. The formal price of LPG cylinder is 65 EGP, an additional cost (10-20 EGP) is usually, informally, added up for



transportation and services cost. The average household consumption of LPG ranges between 1 to 2 cylinders monthly in summer and 1 to 3 cylinders in winter.

Willingness and affordability to pay:

The installation fee which goes around 2,350 EGP is too high to be paid in one installment. All participants demanded a system of monthly installments to settle the Installation fee as they can pay around (50 to 100 EGP) per month. The community socioeconomic characteristics and the willingness of people to convert from LPG cylinders to household NG are remarkable; the AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG. Moreover, the Ministry of Petroleum has adopted an initiative to encourage more people to connect natural gas to their homes by paying the installation cost in installment for 6 years with a zero-interest rate (about 30 EGP per month).

Physical cultural resources

There are no identified archeological sites or sites with cultural or historical value, located within the project districts that would be affected by the NG pipework (since these districts have been excavated several times before for other public utilities). In case of any unanticipated archeological discoveries within the project districts; [Annex-6](#), entitled 'Chance Find Procedure' details the set of measures and procedures to be followed.

0.5 Environmental and Social Impacts

Impacts during Construction:

- **Potential positive impacts:**
 - Provide direct job opportunities to skilled and semi-skilled laborers:
 - According to information gained from LDC, the daily average number of workers during the peak time will be about 100-150 excavation workers, 10 engineers and 50 technicians.
 - Create indirect job opportunities, in terms of supporting services to the workers and contractors who will be working in the various locations. This could include, but not be limited to; accommodation, food supply, transport, trade, security, manufacturing... etc.

- **Potential Negative Impacts:**

Some receptors have irrelevant impacts due to the locations where the networks will be installed. Those receptors include surface and ground water, Ecological (fauna or flora), vulnerable structures and cultural vulnerable sites. The evaluation of the potential negative impacts on various receptors is based on a significance ranking process.

It is worth mentioning that impacts related to land tends to be of no significance, as the Local Distribution Company, Town Gas will establish temporary workshops and storage areas in the side roads near to installation site. The lands are state owned lands that require a kind of arrangement with the Local Governmental authority. Using the side road will never entail any land acquisition. Accordingly, no socio-economic impacts on lands have been identified. Potential negative impacts addressed in [Table 0-1](#).

Impacts during Operation:

- **Potential Positive impacts:**
 - Reduce expenditure on imported LPG cylinders and subsidies.
 - Help the household achieve a higher level of privacy.
 - Constantly available and reliable fuel for home use
 - Improved safety due to low pressure (20 mBar) compared to cylinders
 - Eliminate the hardships that special groups like physically challenged, women, and the elderly had to face in handling LPG
 - Limiting possible child labor in LPG cylinder distribution
- **Potential Negative Impacts:**

A Summary of Negative Impact Assessment during construction and operation is illustrated in the following table:

Table 0-1: Summary of Impact Assessment during construction and operation

Impact	Type	Significance	Impact	Type	Significance
During Construction					
Deterioration of soil quality	Negative	Medium	Waste generation	Negative	Medium
Air emissions	Negative	Medium-Minor	Reduction of Traffic Flow	Negative	Medium
Vibration	Negative	Minor	Water Pollution	Negative	Minor
Noise	Negative	Medium	Risk on Community health and safety	Negative	Medium
Risks on Occupational health and safety	Negative	Medium	Risk on Infrastructure and underground utilities	Negative	Minor
Impacts due to Covid-19 pandemic	Negative	Medium	Street Condition Deterioration	Negative	Minor
Risk of Temporary Labor Influx	Negative	Medium	Effect on Visual resources and landscaping	Negative	Minor
Risk of Child labor	Negative	Medium-Minor			
During Operation					
Risk on Community health and safety	Negative	Minor	Risk of Economic disturbance	Negative	Minor

0.6 Analysis of Alternatives

Pipeline Installation Technology Alternatives:

The Framework study of the Project discussed extensively and analyzed all possible project alternatives, this ESMP discusses the alternative Pipeline installation technologies and concluded that open cut technology is recommended since it has minor negative impacts on the environment and for being a cheap and safe option, in addition the study recommend using HDD technique in



crossing of main roads with high traffic or subway (where we cannot close the road or stop the subway) where the open cut technique has more adverse impacts.

Pipeline Installation Technology Alternatives:

Trenchless Technologies:

The 1st HDD Crossing will be about 60 m of Gohar Al Kaed street in El Magharplyn district and the 2nd HDD Crossing will be about 100 m of the Subway (first line) in Tora district. HDD has some advantages compared to auger boring and open-cut technique as it doesn't cause interruption to traffic flow, it causes fewer disturbances to the surface and sub-surface soil layers, it can be used for larger distances and wider range of pipeline diameters and it is a surface-launched process which doesn't require drive pits.

Open-Cut Method:

It is very simple technology which just depends on excavating the soil, laying the pipeline, and backfilling. Open-cut method is the recommended solution in the project studied districts (except for the above-mentioned HDD 2 crossings) since the majority of pipeline route will pass through urban and local roads

0.7 Environmental and Social Management & Monitoring Plan

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 (Tables: 7-1, 7-2, 7-3 & 7-4). The ESMMP identifies roles and responsibilities for different stakeholders for implementation and monitoring of mitigations, as well as estimate costs for these mitigations. It also presents an assessment of the institutional capacity and institutional responsibilities for implementing the ESMMP. In addition, it is designed to accommodate alternative context-specific mitigations and monitoring measures. Also, a special emphasis on the Grievance Redress Mechanism GRM was addressed.

0.8 Stakeholder Engagement and Public Consultation

It is worth mentioning that the households natural gas connection projects in Cairo governorate have started the beginning of 1990s., and the current project sites are complementary of the existing natural gas connection network there. Cairo, Assiut, Menia, Bani Suef, Fayum, Kafr Elshekh, El Behira and Damitta Governorates have been added to the scope of the current natural gas connection project financed by the WBG in December 2018. A public consultation session for the new nine governorates was held in October 2016. An updated ESIAF for the whole project (20 governorates) was prepared and cleared by the WBG and disclosed on EGAS website. Due to the current situation of Covid-19 pandemic and the required precaution, measures, the research



team has adopted a new methodology for consultation. Small group meetings have been arranged at the project districts (more than 20 group meetings) with a total number of about 140 persons, as a replacement of the public consultation session. Stakeholder engagement activities were conducted at the project districts. Cairo governorate has conducted different consultation activities since 2008 for other Natural Gas Connection Projects, including the preparation of the framework study for the WB Greater Cairo Connection Project in 2006, to reach out to the different communities through the following phases:

- a. Phase I: Preparation of the updated ESIAF for Natural Gas Connection project in 20 governorates, 2016.
- b. Phase II: The Consultation activities for the current ESMP conducted in Cairo selected districts during December and January, 2020 - 2021.

A work plan was developed, information adequately disclosed, used different engagement instruments. Fair gender-based participation and engagement of the different stakeholders and documentation of all conducted events were made. Public concerns were responded to and addressed in the ESMP and the updated ESIAF of the project. Consultation activities showed an overwhelming acceptance of the consulted participants to host the NG and their willingness to be connected to the NG. Some potential beneficiaries expressed their willingness to pay the installation cost in cash, while others were much in favor to pay in installments. This high level of enthusiasm from the local communities towards the project is attributed to the high level of awareness of the benefits of the natural gas and the current hardships that the households are facing to secure LPG provision and usage.

The key message from the consultation events carried out for this project is that Public and government entities acceptance for and support to the project are very strong.

0.9 ESMP disclosure

As soon as the ESMP gets clearance from the World Bank and approval from EEAA, a final report will be published on the WBG, EGAS and Town Gas websites. A copy of the ESMP report in English and a Summary in Arabic will be made available in the customer service office and contracting offices.

1. Introduction

1.1 Project Objectives

The proposed Natural Gas Connection project represents an integral component of the national energy strategy, which aims for greater use of natural gas for residential users.

The Government of Egypt (GoE) has immediate priorities to increase household use of natural gas by connecting 1.2 million households per year to the gas distribution network to replace the highly subsidized, largely imported Liquefied Petroleum Gas (LPG). The GoE is implementing an expansion program for residential natural gas connections to an additional 3 to 5 million households. In December 2018, Cairo governorate have joined the current Natural Gas Connection Project financed by the WBG (as one of a new nine Governorates joined the project). Cairo Governorate has currently more than 2.6 million residential and commercial customers using Natural Gas services. The current plan will add up 92,017 residential customers. Therefore, the new household connections in Cairo governorate are supplementary to the current existing natural gas connection network there. As part of the program, the project involves extending the network and accompanying infrastructure to connect 2.3 million households in 20 Governorates between 2016 and 2021.

It is worth mentioning that in **March 2014** an Environmental and Social Impact Assessment Framework (ESIAF) was developed for 11 of the project's Governorates followed by update of the ESIAF in **January 2017** to cover the expansion of the project in a new 9 Governorates including Cairo Governorate.

The proposed Low-Pressure Natural Gas Network ESMP study for Cairo Governorate will cover the following Twenty districts as follows:

- | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. 15 May
2. El Bassateen
3. Ather El Nabi (Misr El Qidima)
4. Ezbat El Nasr (El Bassateen)
5. Helwan
6. Zahraa El Maadi
7. El Hikestep (El Nozha) | 8. Tora
9. Magra El Ayon (Misr El Qidima)
10. Misr El Qidima
11. El Sayda Zeineb
12. Bab El Sharia
13. El Magharplyn (El Darb El Ahmar)
14. Ain Helwan (Helwan)
15. Ard Sherif (Abdeen) | 16. El Darb El Ahmar
17. Darb Saada (El Darb El Ahmar)
18. Hadaak Helwan (El Maassara)
19. Mantket Al Estsmar (El_Katamia)
20. Hekr El Tebeen (El Tebeen) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

This ESMP has been prepared based on the Simplification Guidelines agreed upon between EGAS and the World Bank in 2018. Additionally, the ESMP follows the Egyptian legislations, WBG operational policies and World Bank Group General Environmental, Health, and Safety Guidelines &

WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation.

The ESMP objectives include:

- Describing project districts components and activities of relevance to the environmental and social impacts assessments
- Identifying and addressing relevant national and international legal requirements and guidelines
- Describing relevant baseline environmental and social conditions
- Assessing project alternatives if different from those presented in ESIA framework
- Assessing potential site-specific environmental, social and OHS impacts of the project
- Developing environmental & social mitigation, management and monitoring plans in compliance with the relevant environmental laws
- Documenting and addressing environmental and social concerns raised by stakeholders and the Public in consultation events and activities.

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

The districts and the total number of households which will be covered in this ESMP are illustrated in table 1-1.

Table 1-1: Number of Districts and Potential clients

Governorate	LDC	Districts	Potential clients
Cairo	Town Gas	15 May, El Bassateen, Ather El Nabi, Ezbat El Nasr (El Bassateen), Helwan, Zahraa El Maadi, El Hikestep, Tora, Magra El Ayon, Misr El Qidima, El Sayda Zeineb, Bab El Sharia, El Magharplyn, Ain Helwan, Ard Sherif, El Darb El Ahmar, Darb Saada, Hadaak Helwan, Mantket Al Estsmar (El Katamia), Hekr El Tebeen	92,017
	TOTAL:	20	92,017

Currently there are five existing PRSs (Helwan, El Mokattam, North Heliopolis, Maadi and Warak) and one regulator (Zahraa El Maadi) will supply the expansion of NG connections in project districts. No major environmental or social risks can be foreseen which would prevent the project from reaching the targeted customers.

The extensive experience gained, by EGAS and affiliates; through implementation of the previous WBG and GoE funded Natural Gas Connection project in Greater Cairo (and all over Egypt) plays a critical role in minimizing environmental and social risks and maximizing public ownership and acceptance.

1.2 Methodology

Based on the site visit conducted by the Petrosafe consultants in 2020/2021 and the secondary data collected, the subproject sites classified as urban residential areas located in Cairo Governorate. the majority of the project districts were classified as significantly homogeneous in terms of environmental and social aspects.

The study team has adopted a methodology, which helps accelerating the project implementation plan. The methodology aims to simplify the process of conducting the ESMPs studies depending on merging the homogenous districts. Because of the great number of project districts in Cairo governate (20 districts), 5 districts were chosen to give a good representation for the environmental and social characteristics which can be affected by the project execution **(Represents about 73% of the proposed total NG connections in the 20 districts)**. The 5 districts were chosen depending on the following criteria:

- The length of the pipeline's networks.
- The number of households to be connected by NG connection.
- The nature of the districts (New communities, old districts, Population density, urbanization trend, etc).
- The economic activities of the different districts (Touristic, Commercial, Industrial, etc.).
- The environmental measurement to be conducted in five locations from the project different sites, based on the significance of the impact (air and/ or noise) and/or area of potential sensitivity (environmental and/or social).

Based on the above-mentioned criteria, 15 May, Helwan, Bab El Sharia, Zahraa El Maadi and El Hikestep districts have been chosen to represent the project districts in Cairo accordingly to their main characteristics (Table 1-2). The locations for environmental measurements (receptors) also have been carefully selected to avoid any potential risks and could be followed up and monitored during the construction phase. The measurements' locations were chosen on the basis that it is close to the intermediate pipelines' routes and potential sensitive areas.

Table 1-2: Main Characteristics of the Selected Districts

District	Main characteristics	Represents
15 May	<ul style="list-style-type: none"> – New community – The 4th longest length of the pipeline's networks 	<ul style="list-style-type: none"> – 15 May
Helwan	<ul style="list-style-type: none"> – The highest number of households to be connected by NG connection (39,765 out of 92,017: About 43.2 % of total project potential clients) – The longest length of the Project pipeline's networks 	<ul style="list-style-type: none"> – Tora, Ain Helwan, Hekr El Tebeen, Hadaak Helwan.
Bab El Sharia	<ul style="list-style-type: none"> – Old district – High population density – Narrow streets – Commercial Activities 	<ul style="list-style-type: none"> – Magra El Ayon, El Sayda Zeineb, El Magharplyn, El Darb El Ahmar, Ard Sherif, Darb Saada, Misr El Qidima, Ather El Nabi.
Zahraa El Maadi	<ul style="list-style-type: none"> – The 2nd highest number of households to be connected by NG connection (19,875 out of 92,017: About 21.6 % of total project potential clients) – The 3rd longest length of the pipeline's networks – High and Modern buildings (about 11 stories high) – Intertreatment and shopping areas 	<ul style="list-style-type: none"> – El Bassateen, Ezbat El Nasr (El Bassateen), Mantket Al Estsmar (El Katamia)
El Hikestep	<ul style="list-style-type: none"> – Main traffic high way (towards Cairo International airport, Ring Road, Misr El Gedida and Cairo Ismailia desert road) – The 2nd longest length of the Project pipeline's networks – Industrial Activities 	<ul style="list-style-type: none"> – El Hikestep

1.3 Contributors

The ESMP prepared by Petrosafe (Petroleum Safety & Environmental Services Company) (Cairo, Egypt) with collaboration and facilitation from EGAS, Town Gas HSE and Engineering Departments. The full names and roles of the Petrosafe experts who have participated in the preparation of the ESMP study and EGAS Team listed in [Annex-1](#) of this report.

Table 1-3: Shortlist of Main Contributors

Shortlist of Petrosafe main Team Members				
Project Manager	Project Manager	Social consultant	Team leader	Quality Control
Chem. Mohamed Saad Abdel Moein	Chem. Mohamed Abdel Moniem Aly	Economist/ Osama Kamal	Geo. Mohamed El-Ghazaly	Dr. Zeinab Farghaly

2. Project Description

2.1 Background

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

The city distribution network comprises the following components:

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

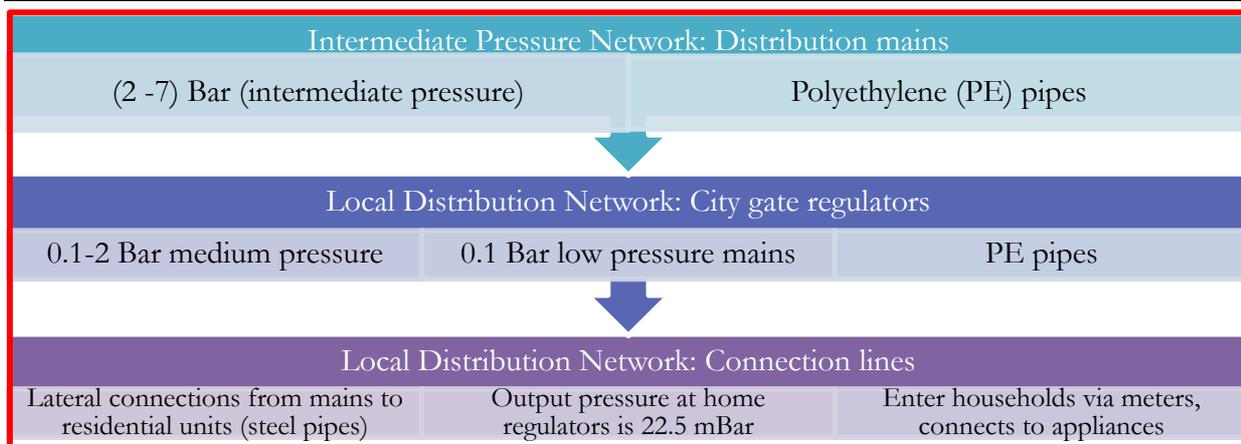


Figure 2-1: General components of the Twenty districts distribution network (Surrounded by red frame)

2.2 Project Work Packages

According to the agreement between Town Gas Company and the Egyptian Natural Gas Holding Company “EGAS” signed for supplying natural gas to more than 92,017 residential customers in the project districts.

Town Gas Company will start the necessary installations needed from the existing PRSs or regulator (Table 2-1) to feed natural gas for the customers in these districts.

Table 2-1: Existing PRSs and regulator feeding the project districts

no	PRS / regulator	Capacity (m3/H)	supplying
1.	Helwan PRS	100000	Helwan, Ain Helwan, Hekr El Tebeen, 15 May, Hadaak Helwan
2.	El Mokattam PRS	60000	Darb Saada, El Darb El Ahmar, Ard Sherif, El Magharplyn, El Sayda Zeineb, Misr El Qidima, Tora, Ezbat El Nasr (El Bassateen), El Bassateen, Magra El Ayon.
3.	North Heliopolis PRS	60000	Bab El Sharia, El Hikestep.
4.	Maadi PRS	60000	Ather El Nabi
5.	Zahraa El Maadi regulator	10000	Zahraa El Maadi, Mantket Al Estsmar (El Katamia)

The project scope within Cairo Governorate’s said districts will be as follows: -

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

2.2.1.1 El Hikestep district:

El Hikestep district will be connected by polyethylene intermediate pressure feeding pipeline from the current network feeding El Nozha El Gedida District, which connected to the existing North Heliopolis PRS.

2.2.1.1.1 Route

The proposed pipeline route will start from the intake point from the underground valve on the existing NG intermediate pipelines network feeding El Nozha El Gedida district, which located in Taha Hussain road about 100 m south west the entrance gate of Saudi Germany Hospital (Lat.: 30° 07 '53.64 "N, Long.: 31° 23' 1.94" E).

The proposed Pipeline route will extend to the north east along with Taha Hussain street for about 225 m then continue extending to the north east and east directions along with Joseph Tito Street for about 3.8 km to reach the entrance of Markaz Shabab El Hikestep street (El Forn street). The proposed pipeline route will then be extended to the north direction along this street for about 320 m to reach the end point at the front of El Tawheed Mosque (Lat.: 30° 08 '32.28 "N, Long.: 31° 25' 23.49" E). The total length of the intermediate pipeline route for El Hikestep district will be about 4.4 km. (Figures: 2-2 and 2-3).

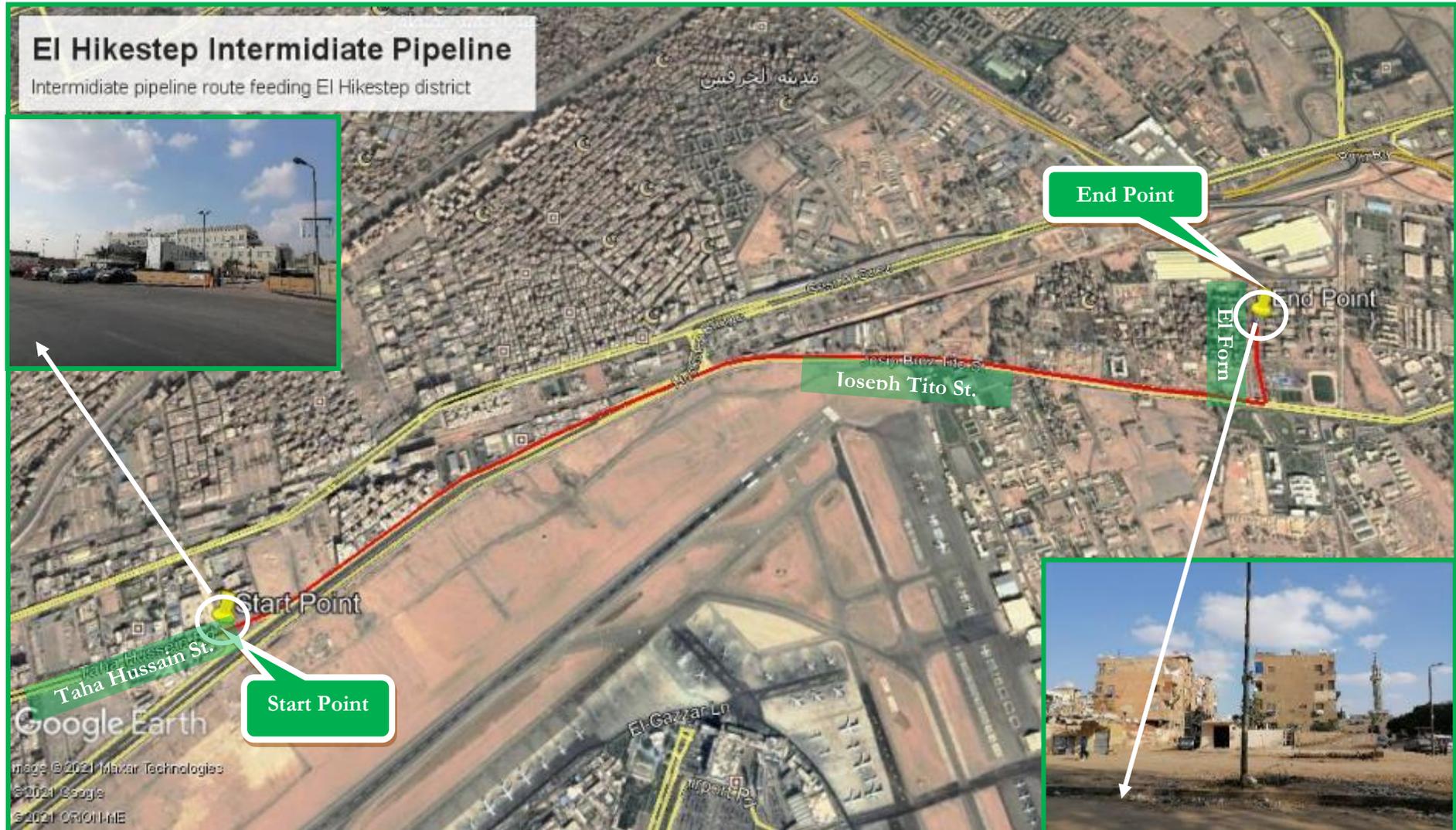


Figure 2-2: The proposed El Hikestep Intermediate Pressure pipeline route.

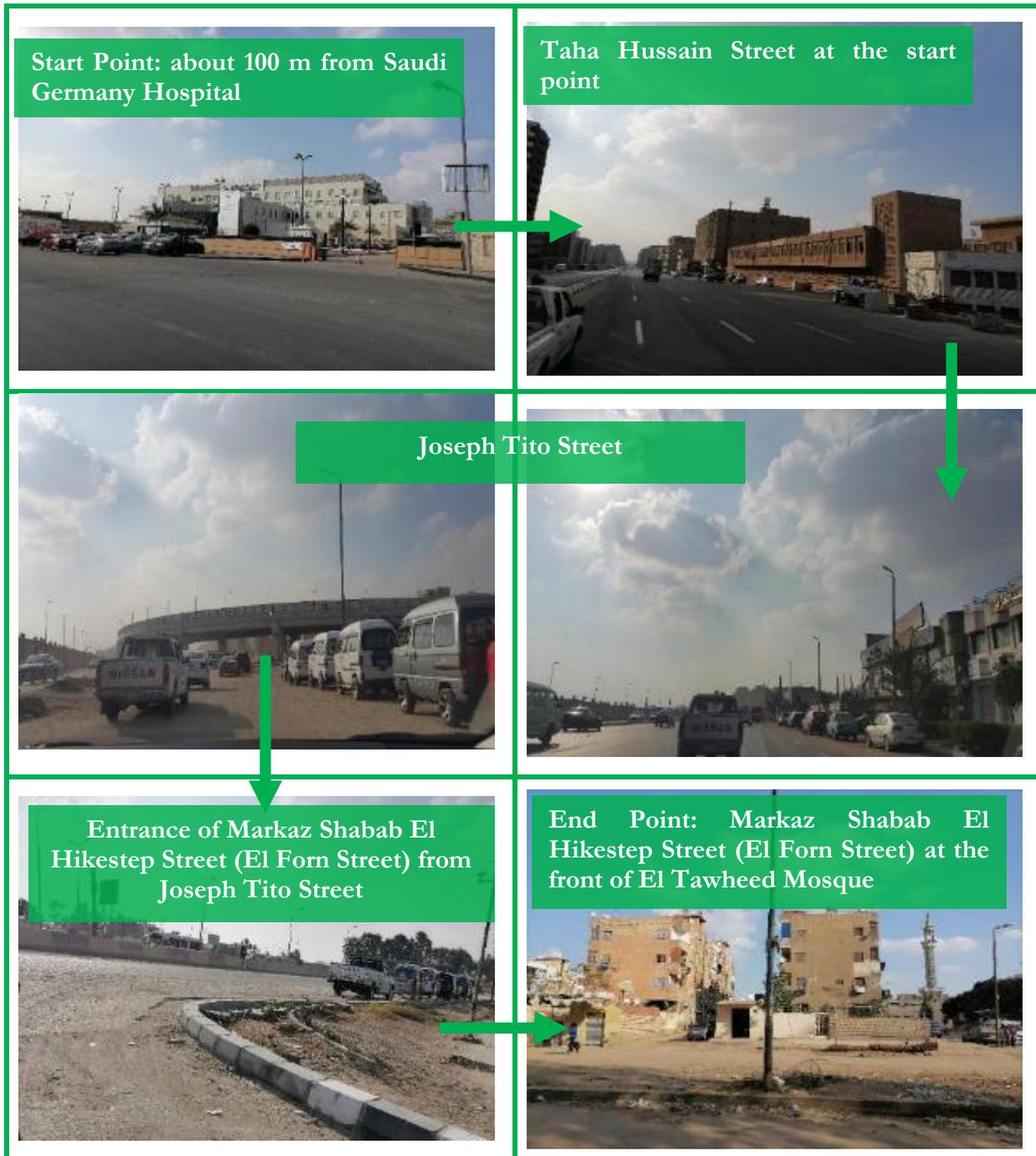


Figure 2-3: Pictures showing El Hikestep intermediate pressure pipeline route.



2.2.1.2 **Bab El Sharia district:**

Bab El Sharia district will be connected by polyethylene intermediate pressure feeding pipeline from the current network connected to the existing North Heliopolis PRS.

2.2.1.2.1 **Route**

The proposed pipeline route will start from the intake point from the underground valve on the existing NG intermediate pipelines network, which located in at the entrance of Koshtomor Street from El Gaish Street. (Lat.: 30° 03 '38.27 "N, Long.: 31° 15' 50.35" E).

The proposed Pipeline route will extend to the south west direction along with El Gaish Street for about 500 m then changing direction to the south east along with El Banhawy Street for about 406 m to reach the end point beside El Hosayneya Street. (Lat.: 30° 03 '19.47 "N, Long.: 31° 15' 50.66" E).

The total length of the intermediate pipeline route for Bab El Sharia district will be about 1 km. (Figures: 2-4 and 2-5).

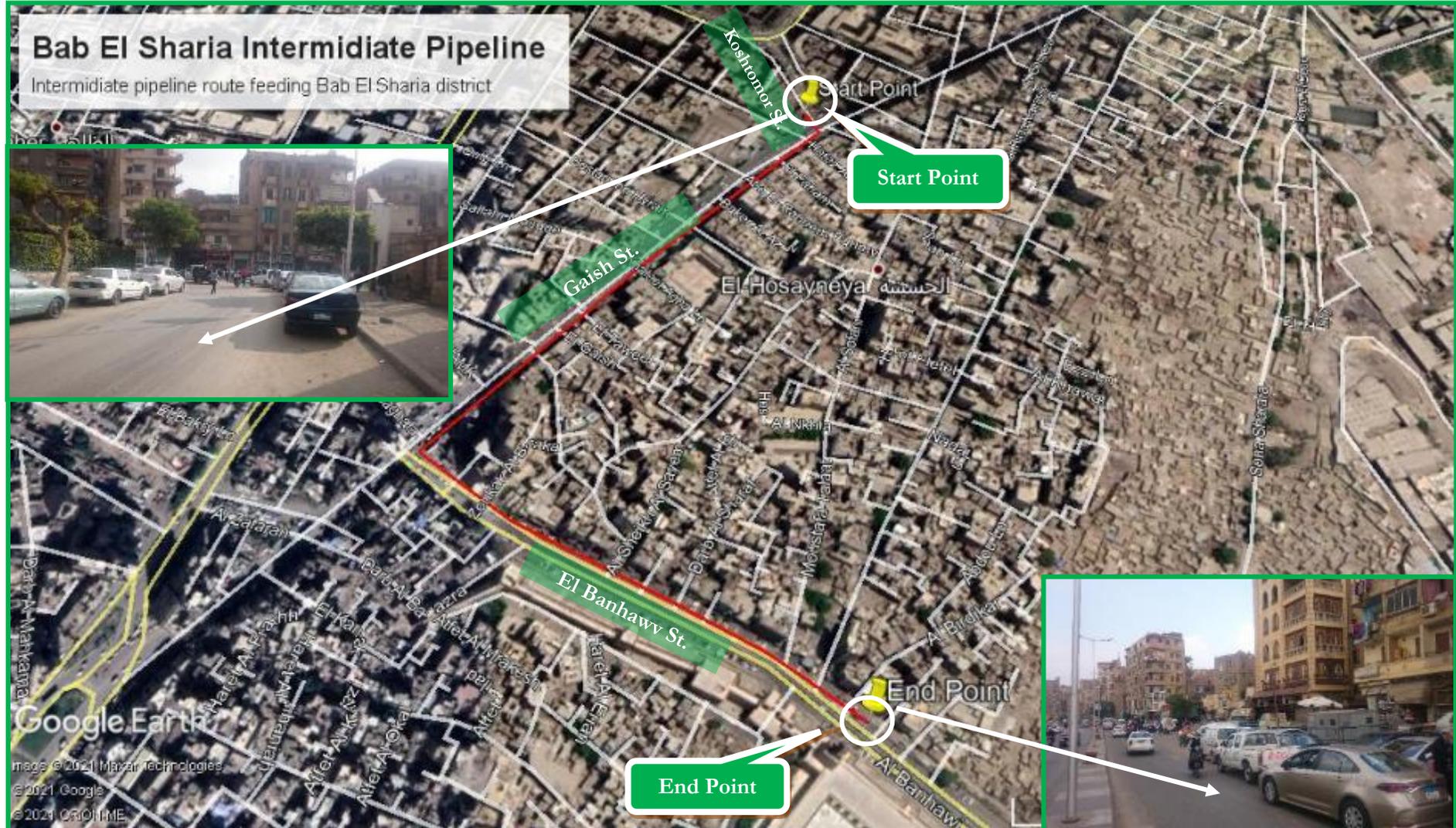


Figure 2-4: The proposed Bab El Sharia Intermediate Pressure pipeline route.

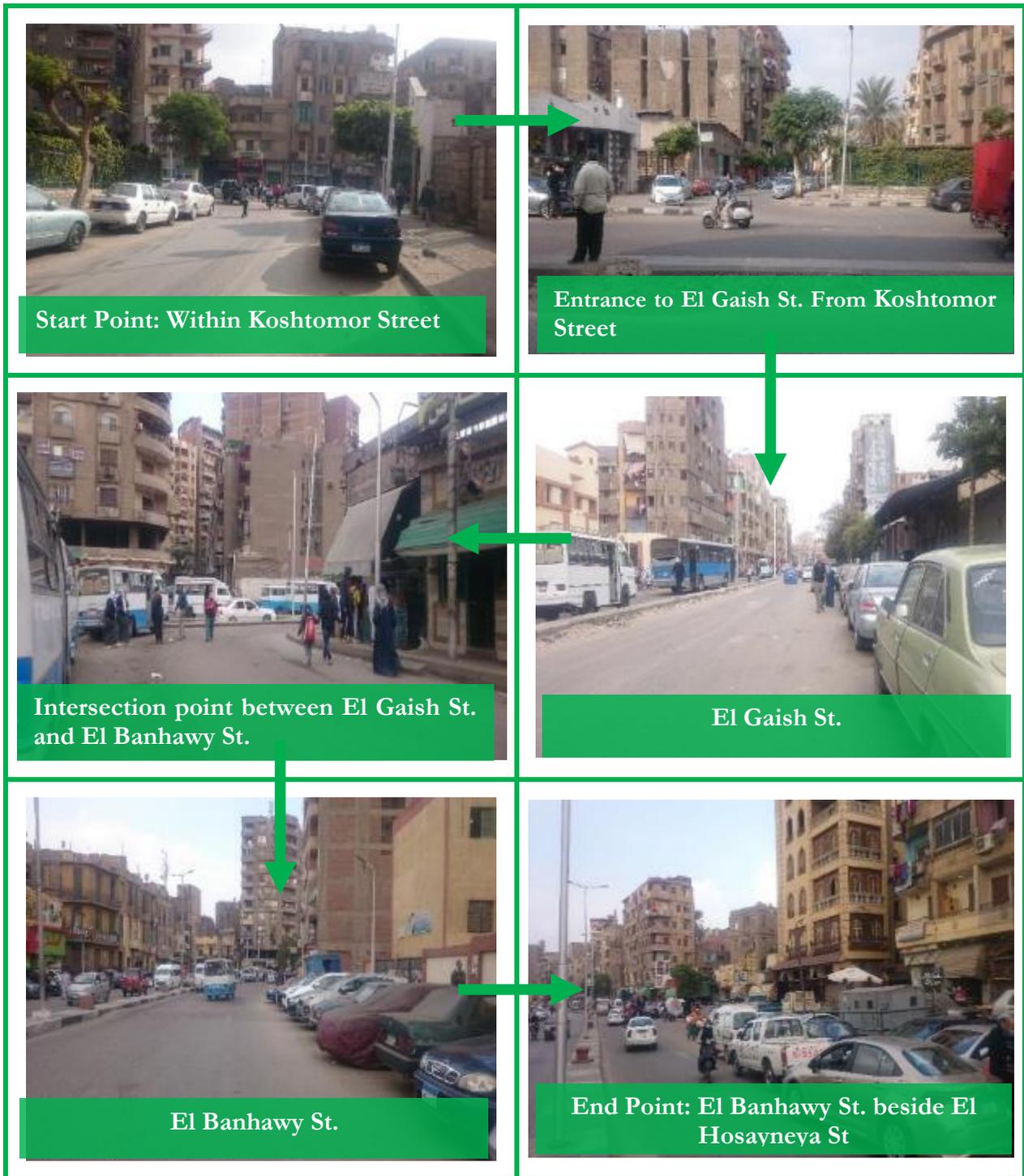


Figure 2-5: Pictures showing Bab El Sharia intermediate pressure pipeline route.

**2.2.1.3 15 May district:**

15 May district will be connected by polyethylene intermediate pressure feeding pipeline from the current network connected to the existing Helwan PRS.

2.2.1.3.1 Route

The proposed pipeline route will start from the intake point from the underground valve on the existing NG intermediate pipelines network, which located in 15 may road at the front of 15 may Amusement area. (Lat.: 29° 50 '25.07 "N, Long.: 31° 21' 53.51" E).

The proposed Pipeline route will extend to the north direction toward Omar Ibn El Khattab square and along with the street leading to Mogawra-2 and Mogawra-3 for about 1.4. The proposed Pipeline route will then be changing direction to the north west along with the street leading to Mogawra-8 for about 350 m. The proposed route then will be changing direction to the north east along with Masjed Al Sahaba Street toward Mogawra-9 for about 570 m.

The proposed route then will be changing direction to the north along with Mohamed Rafaat Street for about 400 m, then follow internal unpaved roads for about 250 m reach the end point in the front of Mogawra-7. (Lat.: 29° 51 '40.10" N, Long.: 31° 22' 04.40" E). The total length of the intermediate pipeline route for 15 May district will be about 2.96 km. (Figures: 2-6 and 2-7).

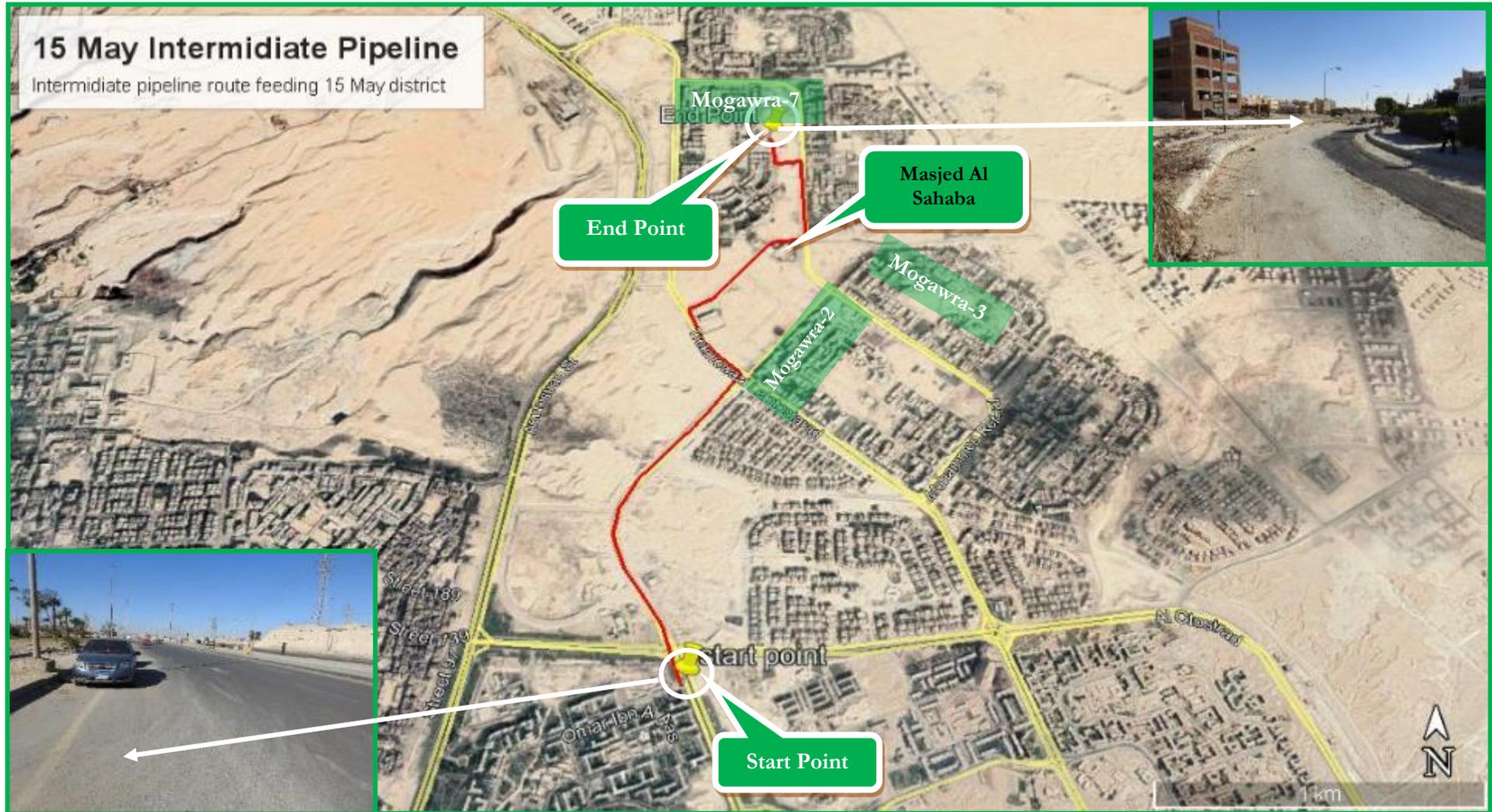


Figure 2-6: The proposed 15 May Intermediate Pressure pipeline route.

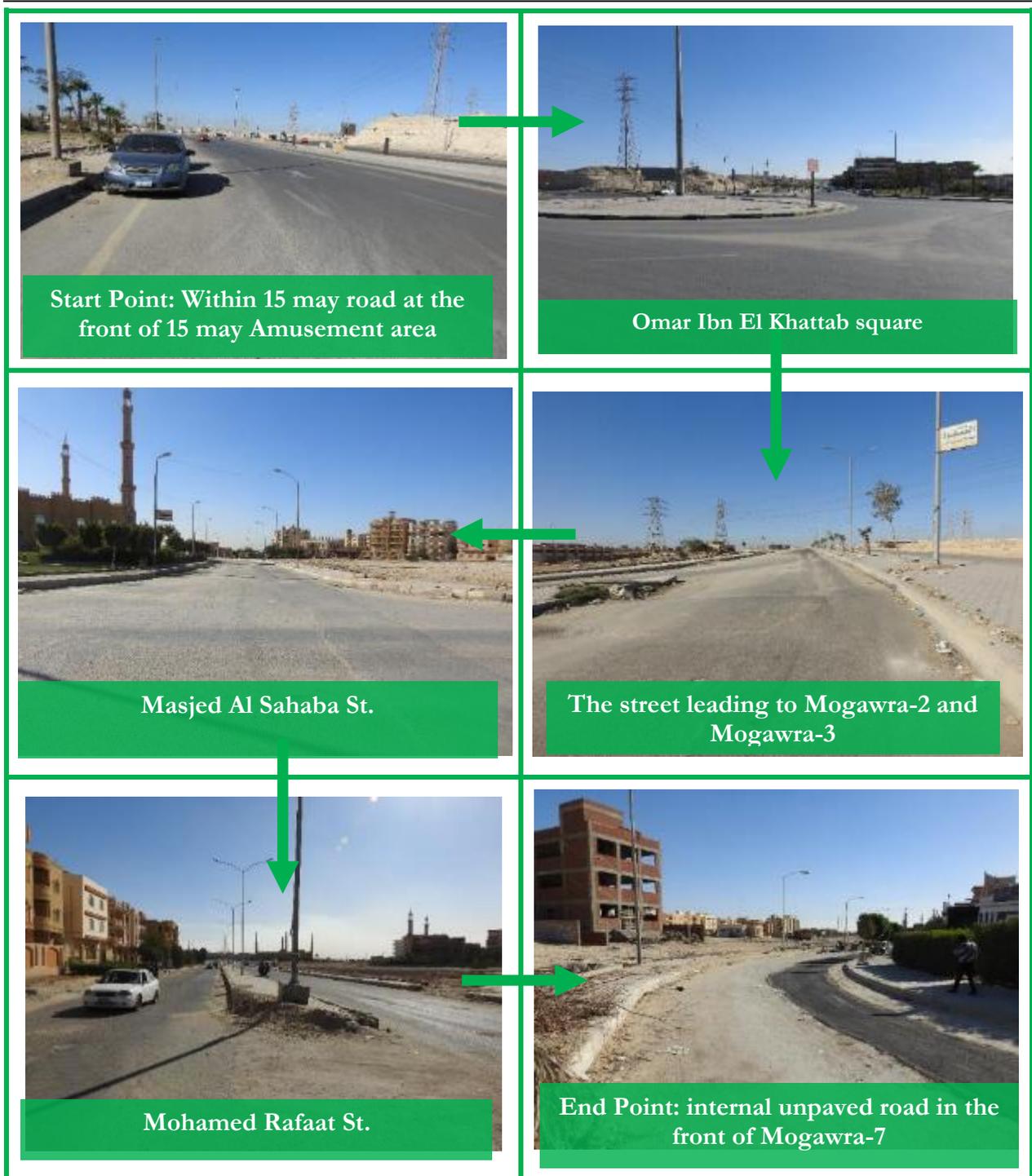


Figure 2-7: Pictures showing 15 May intermediate pressure pipeline route.

2.2.1.4 Helwan district:

Helwan district will be connected by polyethylene intermediate pressure feeding pipeline from the current network connected to the existing Helwan PRS.

2.2.1.4.1 Route

The proposed pipeline route will start from the intake point from the existing above ground regulator room, which located at the end of El Seka El Hadid El Gharbeya Street. (Lat.: 29° 51 '34.58 "N, Long.: 31° 19' 04.04" E).

The proposed Pipeline route will extend to the south direction along with El Seka El Hadid Street for about 2.36 km until reaching Omar ibn Abdel Aziz Street. The proposed route changing direction to the west along with Omar ibn Abdel Aziz Street for about 830 m to reach the entrance of El Hariry Street. The proposed route then changing direction to the south along with El Hariry Street for about 2.73 km to reach El Shohada Street at which the end point located about 90 m from the entrance of this Street. (Lat.: 29° 49 '0.57" N, Long.: 31° 18' 18.40" E). The total length of the intermediate pipeline route for Helwan district will be about 6 km. (Figures: 2-8 and 2-9).

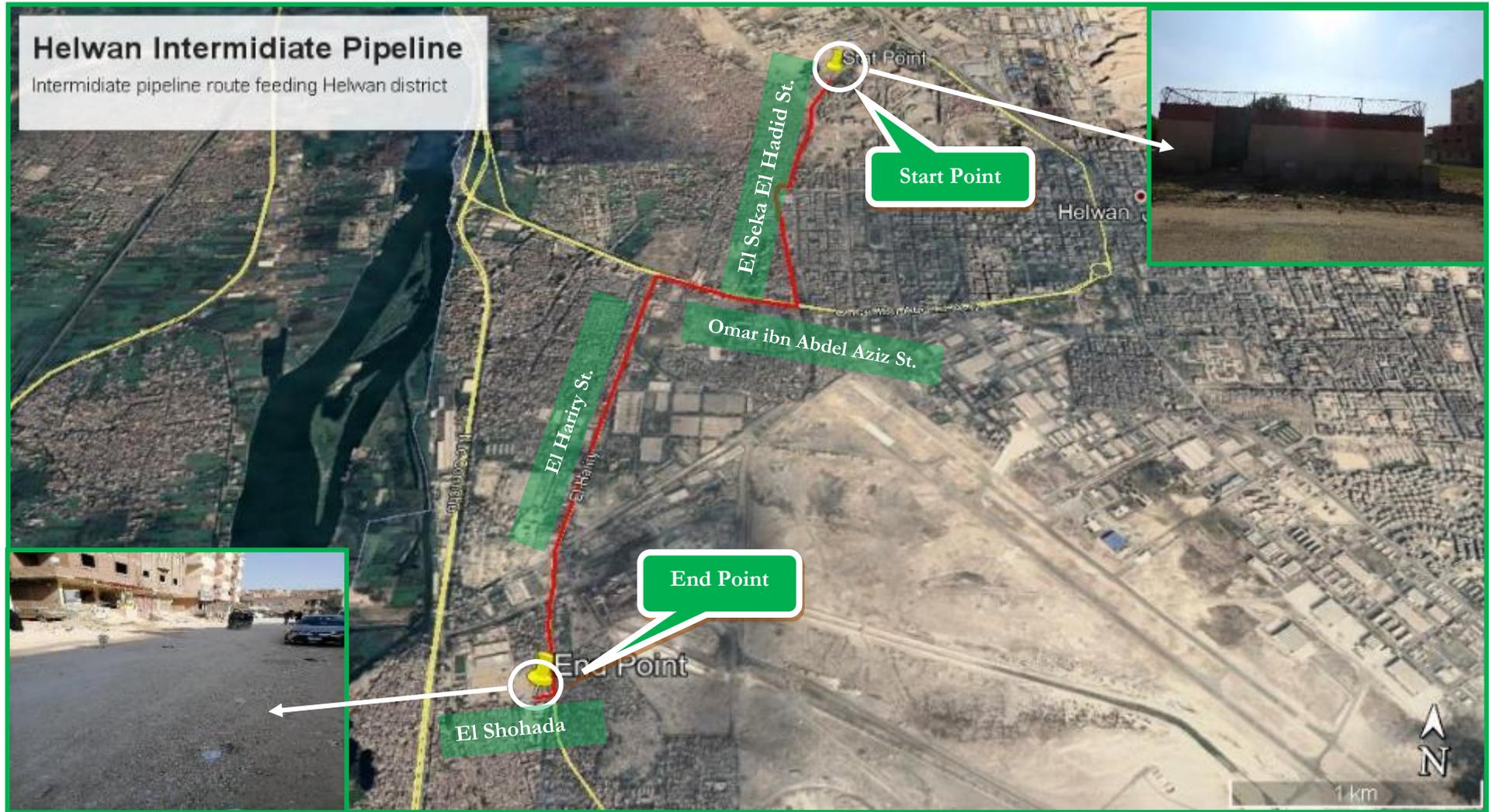


Figure 2-8: The proposed Helwan Intermediate Pressure pipeline route.

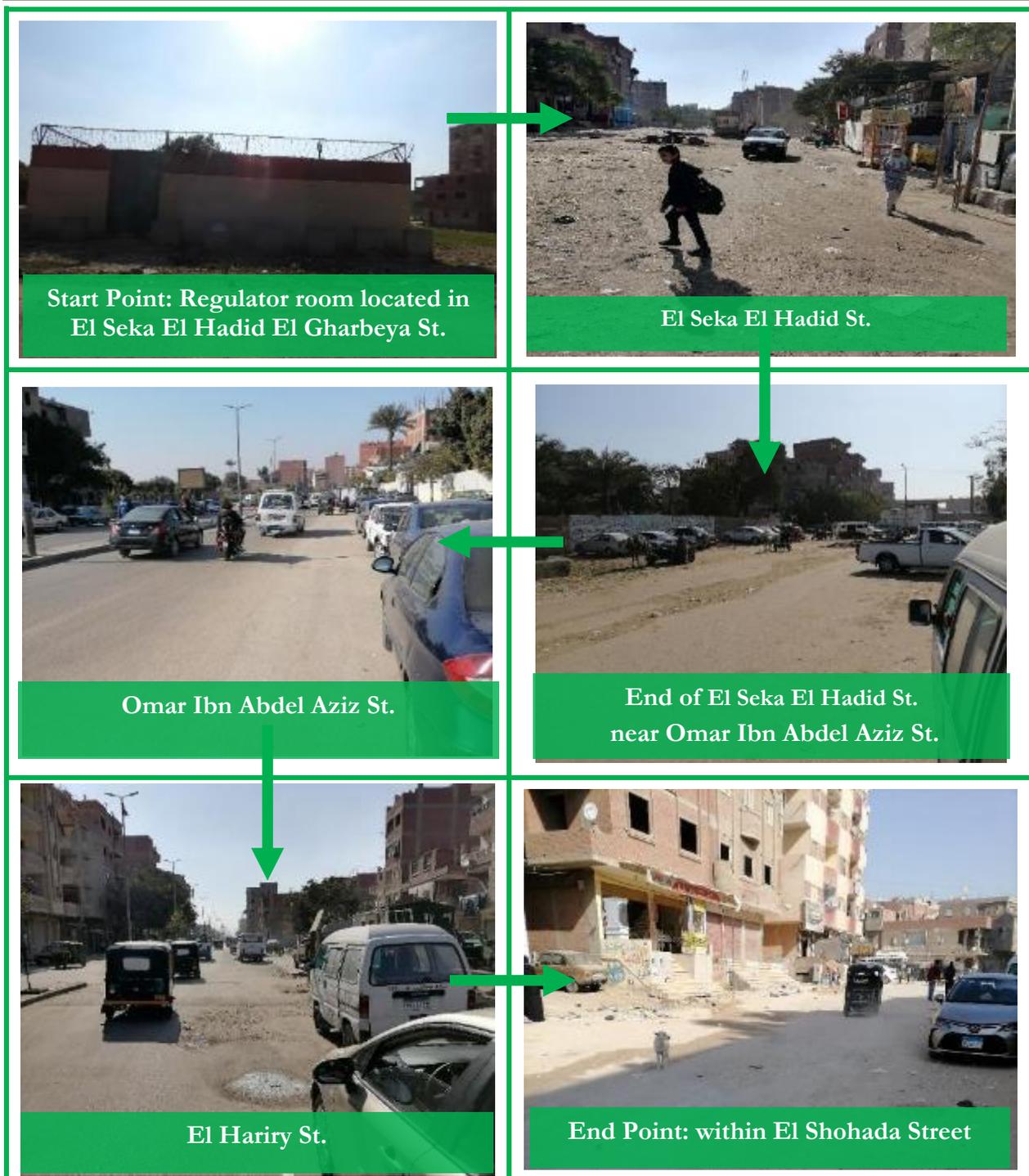


Figure 2-9: Pictures showing Helwan intermediate pressure pipeline route.



2.2.1.5 Zahraa El Maadi district:

Zahraa El Maadi district will be connected by polyethylene intermediate pressure feeding pipeline from the current network connected to the existing Zahraa El Maadi regulator.

2.2.1.5.1 Route

The proposed pipeline route will start from the intake point from the existed above underground valve on the existing NG intermediate pipelines network, which located within El Khamsin St. (Lat.: 29° 57' 53.87" N, Long.: 31° 18' 26.87" E).

The proposed Pipeline route will extend to the North West direction along with El Khamsin Street for about 0.71 km, then changing direction to the north along with El Mirage Street. The proposed route will follow El Mirage Street for about 1.27 km, then changing direction to the East along with El Shatr El Asher Street. The proposed route will follow this street for about 0.6 km, then change direction to the north along with El Shatr El Tasea Street and follow it for about 0.36 km to reach El Saada Street. The proposed Pipeline route will change direction to the south west and then to the west along with El Saada Street for about 1 km to reach the end point located in the front of Stars Language school. (Lat.: 29° 58' 23.98" N, Long.: 31° 19' 46.55" E). The total length of the intermediate pipeline route for Zahraa El Maadi district will be about 4 km. (Figures: 2-10 and 2-11).

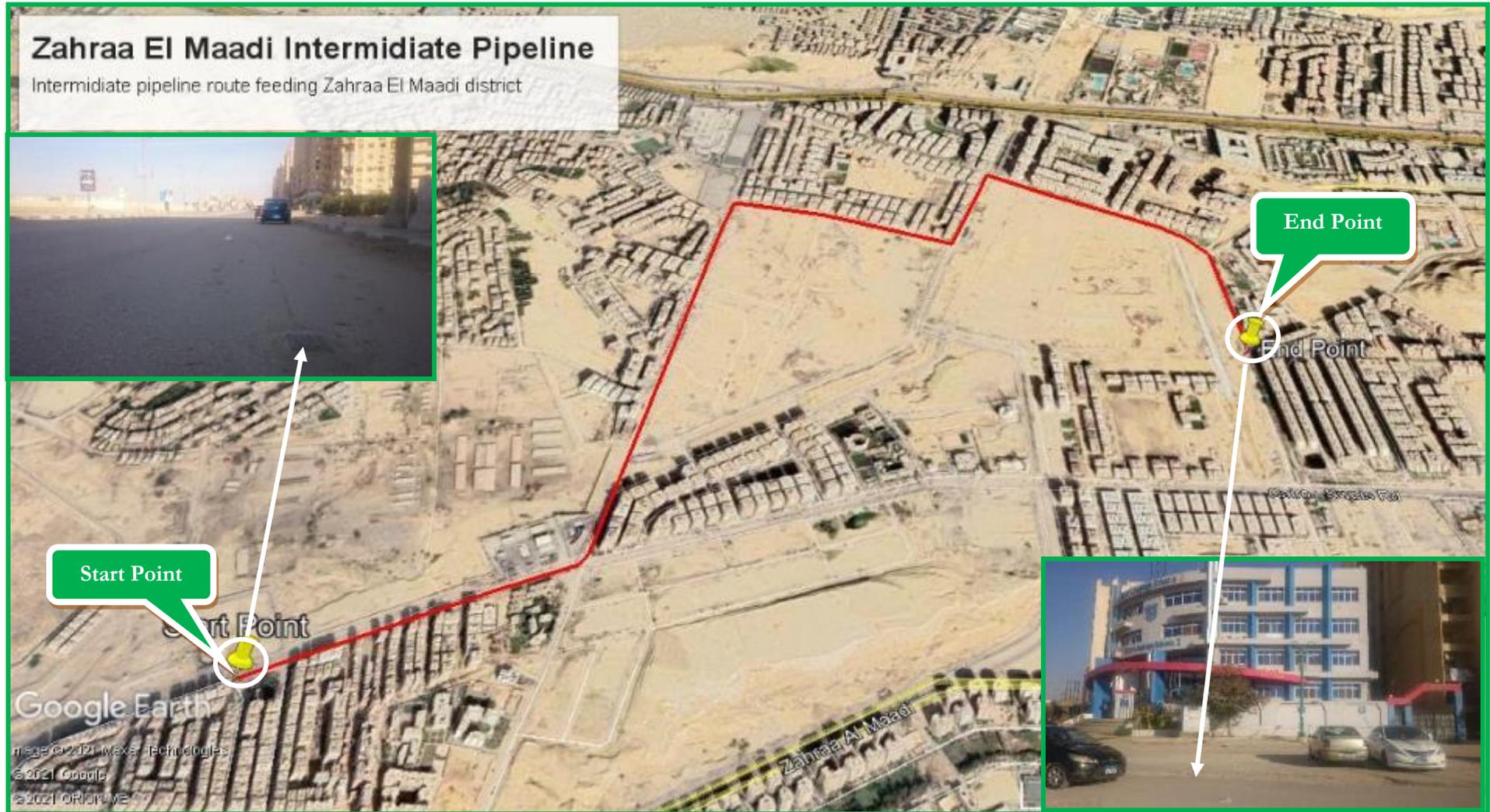


Figure 2-10: The proposed Zahraa El Maadi Intermediate Pressure pipeline route.



Figure 2-11: Pictures showing Zahraa El Maadi intermediate pressure pipeline route.

2.2.2 Low-pressure Distribution-Network for Project Districts:

Low-pressure gas distribution piping system consisting of low-pressure service lines. The pressure of gas in service lines is 100 mbar. In such a system, a service regulator is not required on the individual service lines. Low pressure service lines are mainly constructed from medium density polyethylene pipes (MDPE) having a maximum operating pressure (MOP) below 100 mbar. PE80 network will be installed horizontally underground for Project Districts within Cairo governorate as shown in Figures from 2-2 to 2-11.

2.3 Project Execution Methodology

2.3.1 Project district selection criteria

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

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

The technical criteria can be summarized as follow:

- EGAS prepared a list of technical specification required to have the NG installed in the district:
 1. Districts that have access to all necessary public utilities especially land networks (electricity, water, sewage, telephone lines and overhead utilities)
 2. Adobe and wooden houses are not eligible for NG connections
 3. Districts that comply with the British standards and/or the applied standards for NG connections that can be used for determining districts eligibility for NG connections.
 4. Districts adjacent to NG National Grid

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

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

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

Design of the transmission and distribution pipelines is utilized to estimate the materials needed to implement the project. Procurement of the materials includes local and international components. Local purchases typically include PE piping for the distribution networks. International purchases include critical components, regulators, and metering stations.

2.3.3 Construction works of main feeding line/network “7 bar system – PE100”

The distribution system shall consist of 7-Bar mains extending through city gate regulators, which in turn feeds low-pressure networks via district regulators. Distribution mains are typically Polyethylene (PE) pipes connected to regulators. Regulators are fed by 7-Bar piping which is orange in color (referred to as PE 100) with diameters between 16 mm to 35 mm according to GIS PL2-8 and the information provided by Town Gas.

2.3.3.1 Clearing and grading activities and pipe transportation and storage

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

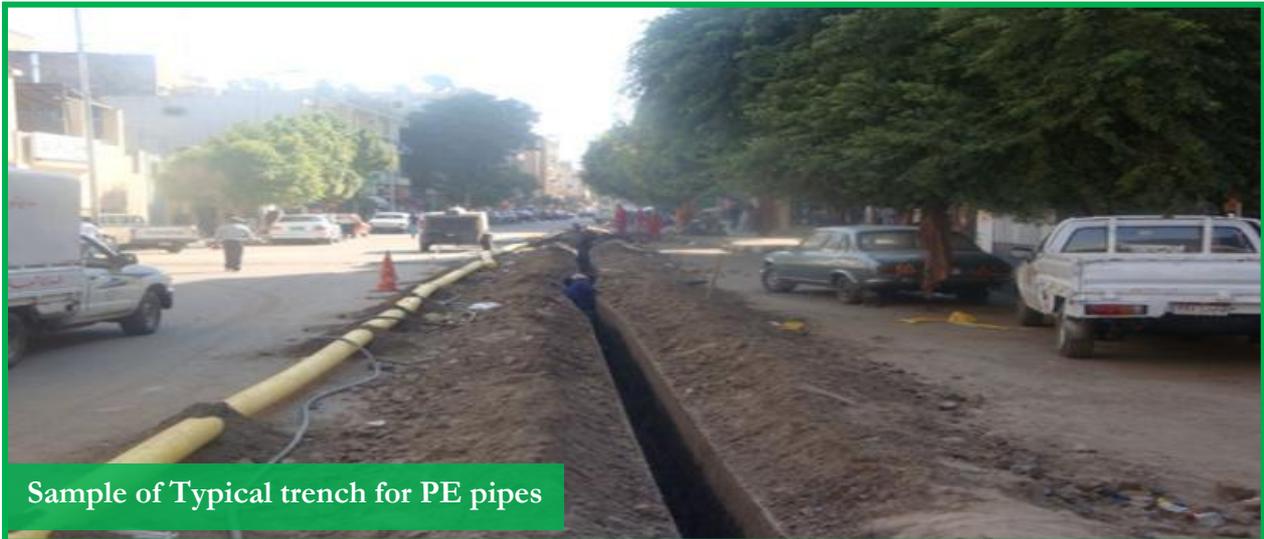
2.3.3.2 Site preparation

Before any excavation activities, Town Gas shall coordinate with the different authorities to determine the existing infrastructure in the project’s district (e.g. water lines, sewage lines, electrical cables, telecommunication lines and overhead utilities) so as to avoid any undue damage. In case of lacking sufficient information on the available infrastructure, they will carefully excavate a trial pit.

2.3.3.3 Excavation

The most commonly used excavation technique is the Open cut technique which start by removing the asphalt layer and the base stone layer using either a mechanical excavator (used in urban roads) or an air compressor jack hammer for dusty roads (used in local roads). In case the jack hammer is used, road layers are removed by excavator. The trench is excavated to a depth that provides sufficient cover over the pipeline after backfilling (1.2 m in depth and 0.6 m in wide). The road base soil, underneath asphalt and stones, is then excavated either by a backhoe excavator or by manual excavation. The advantage of manual excavation is that it reduces the risks of breaking water, sewerage, electric or

telecommunication lines which are unmapped. At locations with irregular ground elevations, additional excavation may be applied to avoid undue bending of the pipe. In addition, and in case of having crossing with other underground infrastructure lines/cables, the trench shall be deepened so that the pipeline be installed below or above the existing lines/cables. as shown in **Figure 2-12**. The followed safety procedures are presented in **Annex-2**



Sample of Typical trench for PE pipes

Figure 2-12: Picture showing sample of typical trench for PE pipes

A Horizontal Direct Drilling (HDD) method will be used Two times for Cairo intermediate Pressure pipeline routes (the 1st HDD Crossing will be about 60 m of Gohar Al Kaed street in El Magharplyn district and the 2nd HDD Crossing will be about 100 m of the Subway (first line) in Tora district) as shown in **Figure 2-13**.



Figure 2-13: Pictures showing the proposed location HDD crossing in Cairo districts

HDD is a trenchless methodology that use high excavation depths (about 30-40 meters) and can be used for high pipeline length. HDD causes very little disruption to traffic as road narrowing or diverting are not required, in addition to the smaller work area requirements and it takes 2 working days, a reinforced concrete sleeve will be installed to further protect the piping from fatigue. as shown in

Figure 2-14:

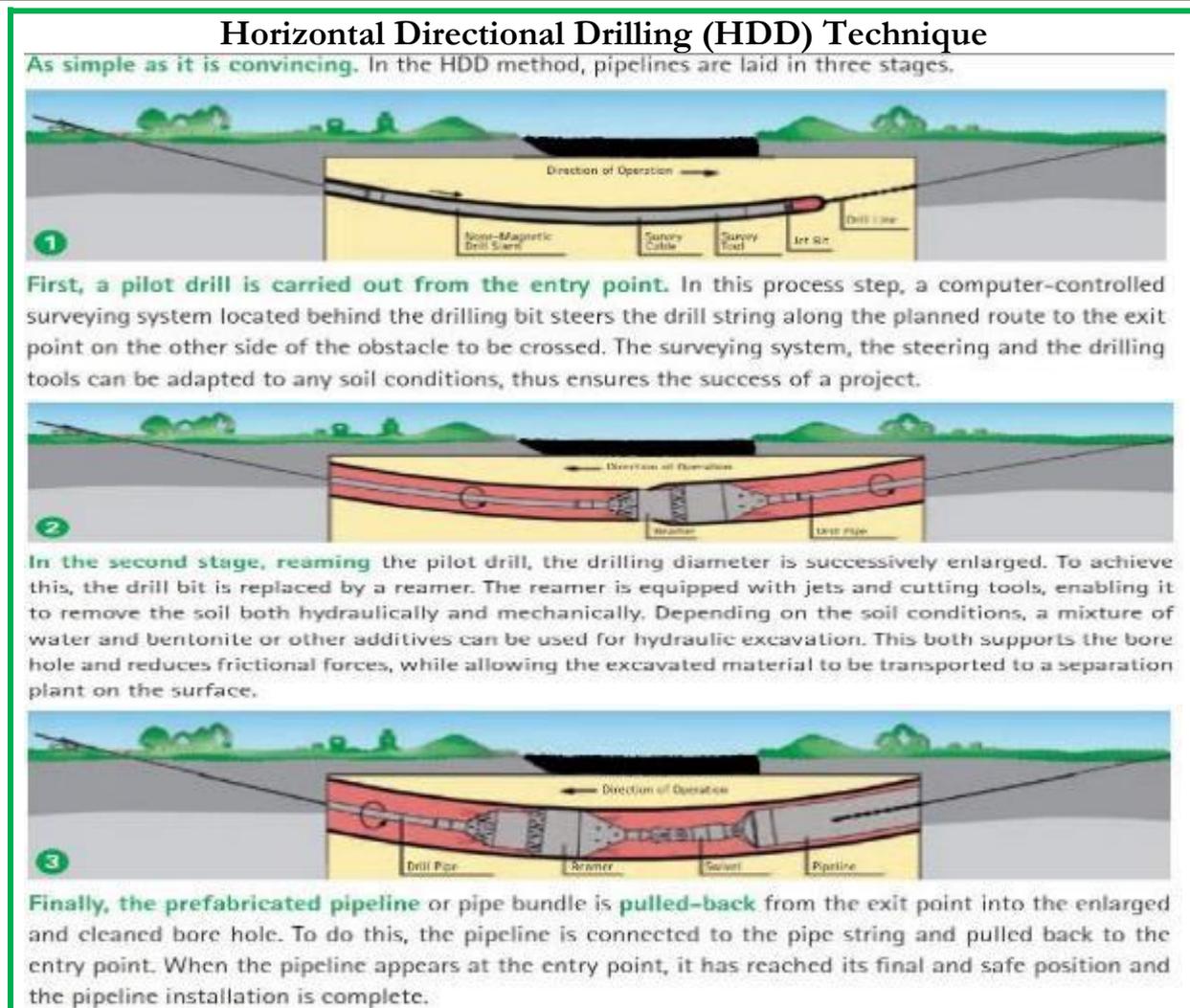


Figure 2-14: Pictures showing Horizontal Directional Drilling (HDD) Technique.

2.3.3.4 Pipe laying

Before pipe laying, the bottom of the trench is cleaned of any rocks or solid objects, which may damage the pipes. In cases, where ground water table is shallow, the trench should be dewatered (Portable trash pumps are commonly used in construction projects) and discharge the water into a drain or sewer manhole, according to the arrangements with local authorities.

2.3.3.5 Pipe welding

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



2.3.3.6 Backfill and road repair

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

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

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

2.3.3.7 Leakage testing

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

2.3.3.7.1 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; and
- Reliability of operation.

It is recommended only for low-pressure applications. Pressure relief devices are a must during the test to ensure no over pressurization, and in order to prevent deformation, dislocation, and rupture of the pipes.

Leakage testing through pressurization must be performed after backfilling the excavation under (10 cm), around (10 cm), and above the pipes (20 cm, at least).

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

2.3.4 Construction works of distribution network “regulators, PE80 networks”

The distribution system shall consist of 100 mbar mains extending from the city gate regulators through distribution networks are typically Polyethylene (MDPE) pipes connected to regulators. Regulators are fed by 100 mbar piping which is yellow in color (referred to as PE80) with diameters between 16 mm to 250 mm according to the information given from Town Gas.

2.3.5 Construction works of household installation

Connection's 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:

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

The underground portion of the riser is sleeve-protected, while above-ground pipes are painted. Risers and laterals are fixed on walls by steel clips. This will involve drilling the walls to attach the necessary bolts and rivets. The laterals enter the household through the wall. Connections are tested for leakage by increasing pressure to 2 bar and monitoring pressure drop.

2.3.6 Conversion of home appliances

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

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

2.3.7 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.

2.3.8 Types of Equipment Used

The proposed equipment which will be uses are shown in [Table 2-1](#).

Table 2-2: Types of Equipment used

Equipment	
<ul style="list-style-type: none"> • Heavy Truck • Medium Truck • Light Truck • Pickup Truck • Mini Van • Air Compressors with jack hammer • Pump 	<ul style="list-style-type: none"> • 110 V Generator • 220 V Generator • Welding machine • Cold cut machine • Hilti drill machine • Excavators • Horizontal Directional Drilling machine

The following are the expected impacts from the above-mentioned equipment:

1. Exhaust from excavation equipment and heavy machinery mainly from air compressor with jackhammer, generators, Excavators, containing SO_x, NO_x, CO, VOCs, etc.
2. Noise and vibration mainly from air compressor with jackhammer, generator, Horizontal Directional Drilling machine, Excavators, and the excavation tools.
3. Heat stress mainly from the welding machine

More detailed impacts and their mitigation measures are addressed in details in sections 5 and 7.

(For more information, please see [Annex-3](#))

2.3.9 Laborers Requirement

According to the previous experience at similar project districts, 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. The expected daily average number of workers per sector during the peak time will be:

- About 14 excavation workers (unskilled workers).
- About 17 technicians (semiskilled workers).
- About 2 site engineers (skilled workers).
- About 1 HSE supervisor

It worth to mention that the skilled and experienced personnel are usually LDC' staff who live at the project districts, while the unskilled laborers are hired by the contractor (or the subcontractors) come from the surrounding districts. So, no accommodation will be needed during the construction activities onsite. However, workers (if needed) from outside Cairo governorate receive accommodation allowance added to their salaries to lease apartments in the nearest residential districts to construction sites. Laborers usually rely on the surrounding community facility. They obtain potable water from shops located in the project sites. Regarding, sanitation and toilet facilities, they use available toilets in the mosques or close coffee shops. Workers generate limited domestic waste that is put in the public waste bins located in the streets.

2.3.10 On-site workshops, warehouses and types of activities.

The contractor will rent an empty shop (3*4 meter) to be used as workshop/warehouse during the construction and installation activities; where the workers/ laborers will carry out the welding and painting of the pipelines, in addition to the storage of the chemicals used such as paints and solvents. This shop must be facing the main street. In case of no availability for such shop, the contractor occupies an open street area that is affiliated to local Governmental authority.

2.3.11 Use of chemicals or other hazardous materials

The expected chemicals that will be consumed per district during this phase of the Subproject are about 75 paint containers of capacity 20 liters and 20 solvents jerry cans of capacity 20 liters.

2.3.12 Activities of the operation phase

2.3.12.1 Operation of the network

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

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

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

2.3.12.2 Repairs in households

Repairs include appliance adjustments or piping/metering replacement.

3. Legislative and Regulatory Framework

3.1 Applicable Environmental and Social Legislation in Egypt

- _ Law 217/1980 for Natural Gas.
- _ Law 4 for Year 1994 for the environmental protection, amended by Law 9/2009 and law 105 for the year 2015 and its Executive Regulation (ER) No 338 for Year 1995 and the amended regulation No 1741 for Year 2005, amended with Prime Ministerial Decree No 1095/2011, prime ministerial decree No 710/2012, Prime Ministerial Decree No 964/2015, Prime Ministerial Decree No 26/2016 and Prime Ministerial Decree No 618 & 1963/2017.
 - o EEAA guidelines
 - o Updated EGAS HSE guidelines, LDCs will comply with Updated EGAS HSE Guidelines (provided in [Annex-2](#) from the report)
- _ Law 38/1967 for General Cleanliness
- _ Law 93/1962 for Wastewater
- _ Law 117/1983 for Protection of Antiquities
- _ Traffic planning and diversions
 - o Traffic Law 66/1973, amended by Law 121/2008 and Law 142/2014.
 - o Law 140/1956 on the utilization and blockage of public roads.
 - o Law 84/1968 concerning public roads.
- _ Work environment and operational health and safety
 - o Articles 43 – 45 of Law 4/1994, air quality, noise, heat stress, and worker protection
 - o Law 12/2003 on Labor and Workforce Safety including Decree 211/2003

The following tables present the Egyptian limits for ambient air quality, noise levels, and allowable emissions from vehicles and power generation units:

Table 3-1: Maximum limits of outdoor air pollutants

Annex 5 of the ER amended by Decree No. 710/2012					
Pollutant	Location Area	Maximum Limit [$\mu\text{g}/\text{m}^3$ unless otherwise noted]			
		1 hour	8 hours	24 hours	1 Year
Sulphur Dioxide	Urban	300	---	125	50
	Industrial	350	---	150	60
Carbon Monoxide, mg/m^3	Urban	30	10	---	---
	Industrial	---	---	---	---
Nitrogen Dioxide	Urban	300	-	150	60
	Industrial	300	-	150	80
Ozone	Urban	180	120	---	---
	Industrial	180	120	---	---
Total Suspended Particles (TSP)	Urban	---	---	230	125
	Industrial	---	---	230	125
Particulate Matter less than $10\ \mu\text{m}$ (PM_{10})	Urban	---	---	150	70
	Industrial	---	---	150	70
Particulate Matter less than $25\ \mu\text{m}$ ($\text{PM}_{2.5}$)	Urban	---	---	80	50
	Industrial	---	---	80	50
Suspended Particles Measured as Black Smokes	Urban	---	---	150	60
	Industrial	---	---	150	60
Lead	Urban	---	---	---	0.5
	Industrial	---	---	---	1.0
Ammonia (NH_3)	Urban	---	---	120	---
	Industrial	---	---	120	---

Table 3-2: Power generation by diesel engines

Table 2 of Annex 6 of the ER amended by Decree No. 710/2012				
Fuel Type	Maximum Emission Limits (mg/m ³)			
	TSP	CO	SO ₂	NO _x
Natural Gas	50	150	100	600
Diesel	100	250	400	600

Reference conditions: O₂ is 15% & Temperature 273 K & Pressure 1 atm.

Table 3-3: Maximum allowable emissions from vehicles that operate using gasoline fuel

Table 23 of Annex 6 of the ER amended by Decree No. 710/2012						
Pollutants	Before the year 2003		From 2003 to 2009		Year 2010 and later	
	Hydrocarbons HC (ppm)	CO%	HC (ppm)	CO%	HC (ppm)	CO%
Maximum allowable Limit	600	4	300	1.5	200	1.2

Measurements should be done at the idle speed from 600 to 900 rpm

Table 3-4: Maximum allowable emissions from vehicles that operate using diesel fuel

Table 24 of Annex 6 of the ER amended by Decree No. 710/2012		
Manufacturing Year (model)	Before the year 2003	From 2003 and later
Smoke density factor K (m ⁻¹)	2.8	2.65
Opacity %	30	25

- Measurements are done in accordance with the ISO-11614 international standard.
- Opacity measured at light flow device 127 mm.

Table 3-5: Maximum permissible noise level limits

Table 3 of Annex 7 of the ER amended by Decree No. 710/2012		
Area Type	Maximum Permissible Equivalent Noise Level [dB(A _{eq})]	
	Day (7am – 10pm)	Night (10pm – 7am)
Sensitive areas to noise	50	40
Residential suburb with low traffic and limited activities service	55	45
Residential areas in the city and have commercial activities	60	50
Residential areas are located on roads less than 12 m and have some workshops or commercial activities or administrative activities or recreational activities ... etc.	65	55

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). It is not envisaged that the Subproject will result in any physical or economic dislocation of people in the project districts.

Environmental Assessment OP/BP 4.01 will apply to the Subproject. Physical Cultural Resources OP/BP4.11 will be applicable since Cairo governorate is known of archeological and cultural sites). Chance find procedures will be part of the contracts of the contractors. Involuntary Resettlement OP/BP 4.12 will not be applicable to the low-pressure pipelines network of the project districts 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 Subproject will result in any physical or economic dislocation of people for the construction of low-pressure pipelines in the project districts.

“Gap analysis for key environmental and social issues concerns: Egyptian laws and WBG Policies was conducted in the ESIAF of the project and disclosed on EGAS website¹”

3.2.1 World Bank Group General Environmental, Health, and Safety Guidelines², WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems³

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues in specific industry sectors (please see [Annex-4](#)).

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

The following tables present the IFC limits for ambient air quality, noise levels, and allowable emissions from vehicles and power generation units.

Table 3-6: WHO Ambient Air Quality Guidelines⁴⁵

Pollutants	Averaging Period	Guideline value in mg/m ³
Sulphur Dioxide	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minutes	500 (guideline)
Nitrogen Dioxide	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter less than 10 µm (PM ₁₀)	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
		150 (Interim target-1) 100 (Interim target-2)
		24-hour

¹ <http://www.egas.com.eg/docs/RPF%20for%20NG%20connections%20project%20for%2011%20Governorates.pdf>

² <https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

³ <https://www.ifc.org/wps/wcm/connect/9c6e3d0048855ade8754d76a6515bb18/Final%2B-%2BGas%2BDistribution%2BSystems.pdf?MOD=AJPERES&id=1323162128496>

⁴ World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

⁵ Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

Pollutants	Averaging Period	Guideline value in mg/m ³
Particulate Matter less than 25 µm (PM _{2.5})	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Table 3-7: Small Combustion Facilities Emissions Guidelines (3MWth – 50MWth) – (in mg/Nm³ or as indicated)

Combustion Technology / Fuel	Particulate Matter (PM)	Sulfur Dioxide (SO ₂)	Nitrogen (NO _x)	Oxides	Dry Gas, Excess O ₂ Content (%)
Engine					
Gas	NA	NA	200 (Spark Ignition) 400 (Dual Fuel) 1,600 (Compression Ignition)		15
Liquid	50 or up to 100 if justified by project specific considerations (e.g. Economic feasibility of using lower ash content fuel, or adding secondary treatment to meet 50, and available environmental capacity of the site)	1.5 percent Sulfur or up to 3.0 percent Sulfur if justified by project specific considerations (e.g. Economic feasibility of using lower S content fuel, or adding secondary treatment to meet levels of using 1.5 percent Sulfur, and available environmental capacity of the site)	If bore size diameter [mm] < 400: 1460 (or up to 1,600 if justified to maintain high-energy efficiency.) If bore size diameter [mm] > or = 400: 1,850		15
Notes: N/A/ - no emissions guideline; Higher performance levels than these in the Table should be applicable to facilities located in urban / industrial areas with degraded airsheds or close to ecologically sensitive areas where more stringent emissions controls may be needed.; MWth is heat input on HHV basis; Solid fuels include biomass; Nm ³ is at one atmosphere pressure, 0°C.; MWth category is to apply to the entire facility consisting of multiple units that are reasonably considered to be emitted from a common stack except for NO _x and PM limits for turbines and boilers. Guidelines values apply to facilities operating more than 500 hours per year with an annual capacity utilization factor of more than 30 percent.					

Table 3-8: Noise Level Guidelines⁶

Area Type	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational ⁷	55	45
Industrial; commercial	70	70

⁶ Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999. 55 For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999).

⁷ Noise monitoring should be carried out using a Type 1 or 2 sound level meter meeting all appropriate IEC standards.



3.3 Permits Required

- _ Constructions permit to be obtained from the Local Governmental authority.
- _ Road and Bridges Directorate permission for digging of main roads in accordance to Law number 84 of year 1968 pertaining to the public roads.
- _ Environmental permit: according to Egyptian Law for the Environment, Law 4/1994 amended by Law 9/2009. EEAA approval on ESIA is considered the environmental permit.

4. Environmental and Social Baseline

4.1 Description of the Environment

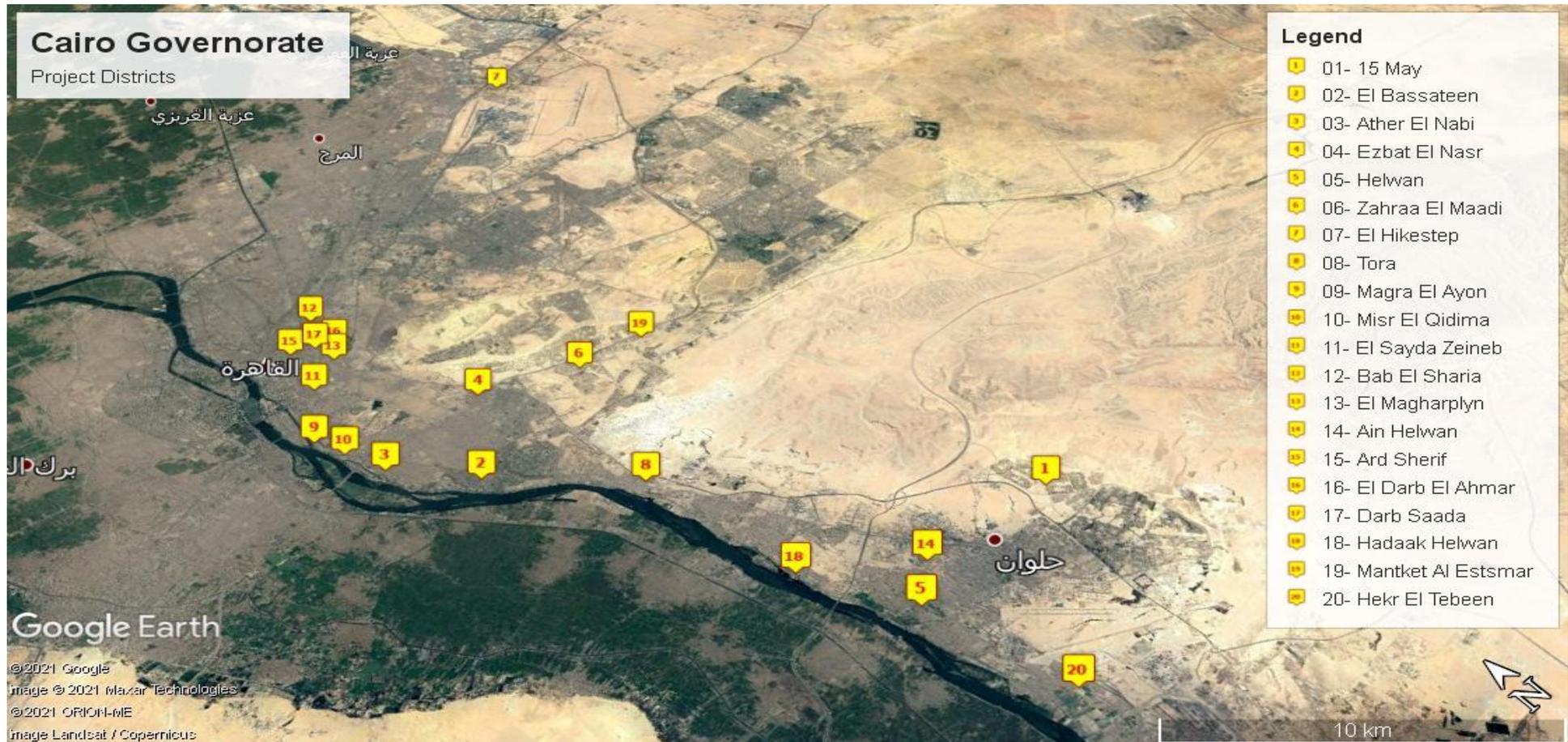


Figure 4-1: Distribution of project districts in Cairo governorate

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

- **El Hikestep:**

El Hikestep district is located the northern part of Cairo, bordered from north by El Salam City, from south and east by Cairo Airport, and from West by the ring road. (Figure 4-2)

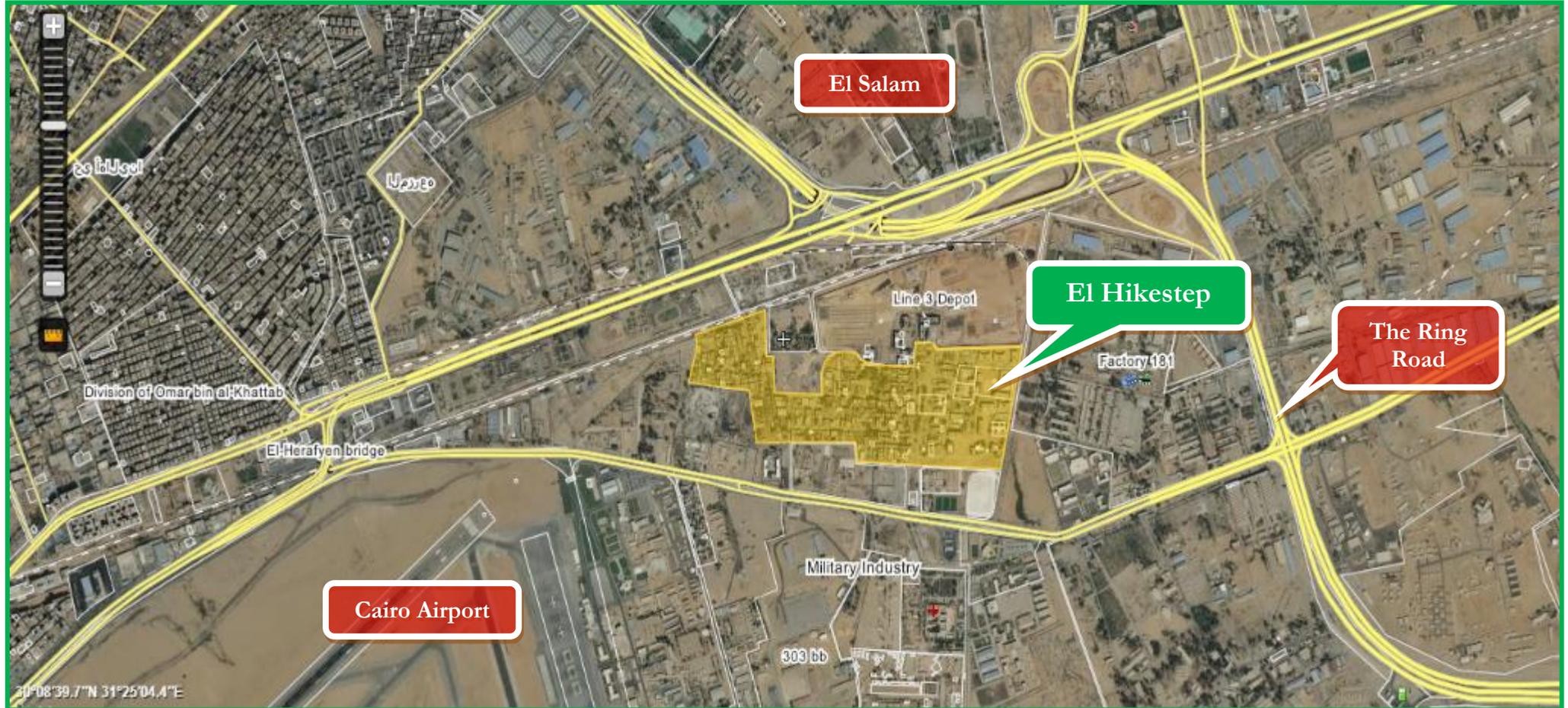


Figure 4-2: Satellite map showing El Hikestep district and surrounding communities

▪ **Bab El Sharia:**

Bab El Sharia district is located the Middle Eastern part of Cairo, bordered from north by El Abassia, from south by El Gammalia, from East by El Faggala and from South West by El Darrassa. (Figure 4-3)

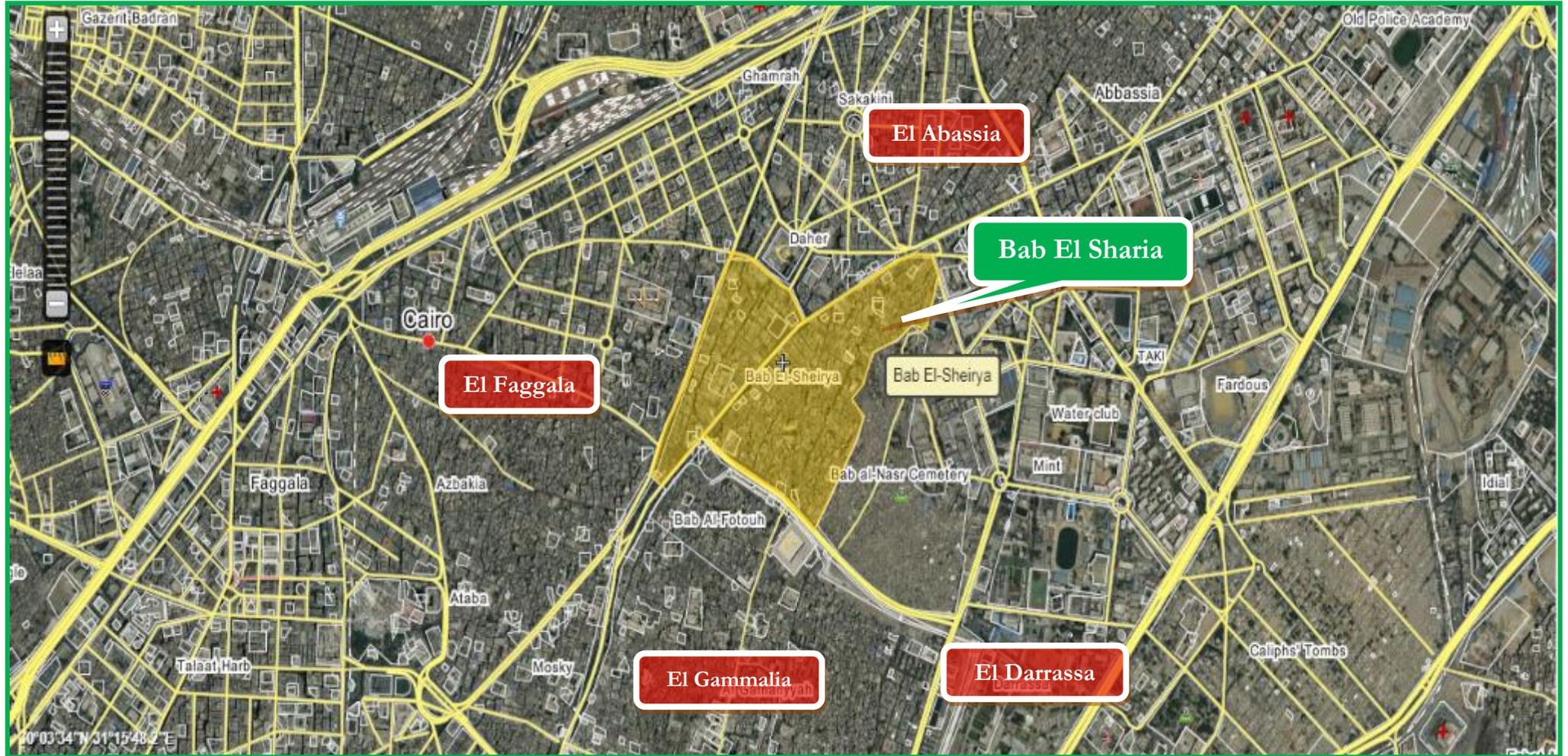


Figure 4-3: Satellite map showing Bab El Sharia district and surrounding communities

15 May:

15 May district is located southern part of Cairo, bordered from north, south and East by Desert background, and bordered from the east by Helwan district.

(Figure 4-4)

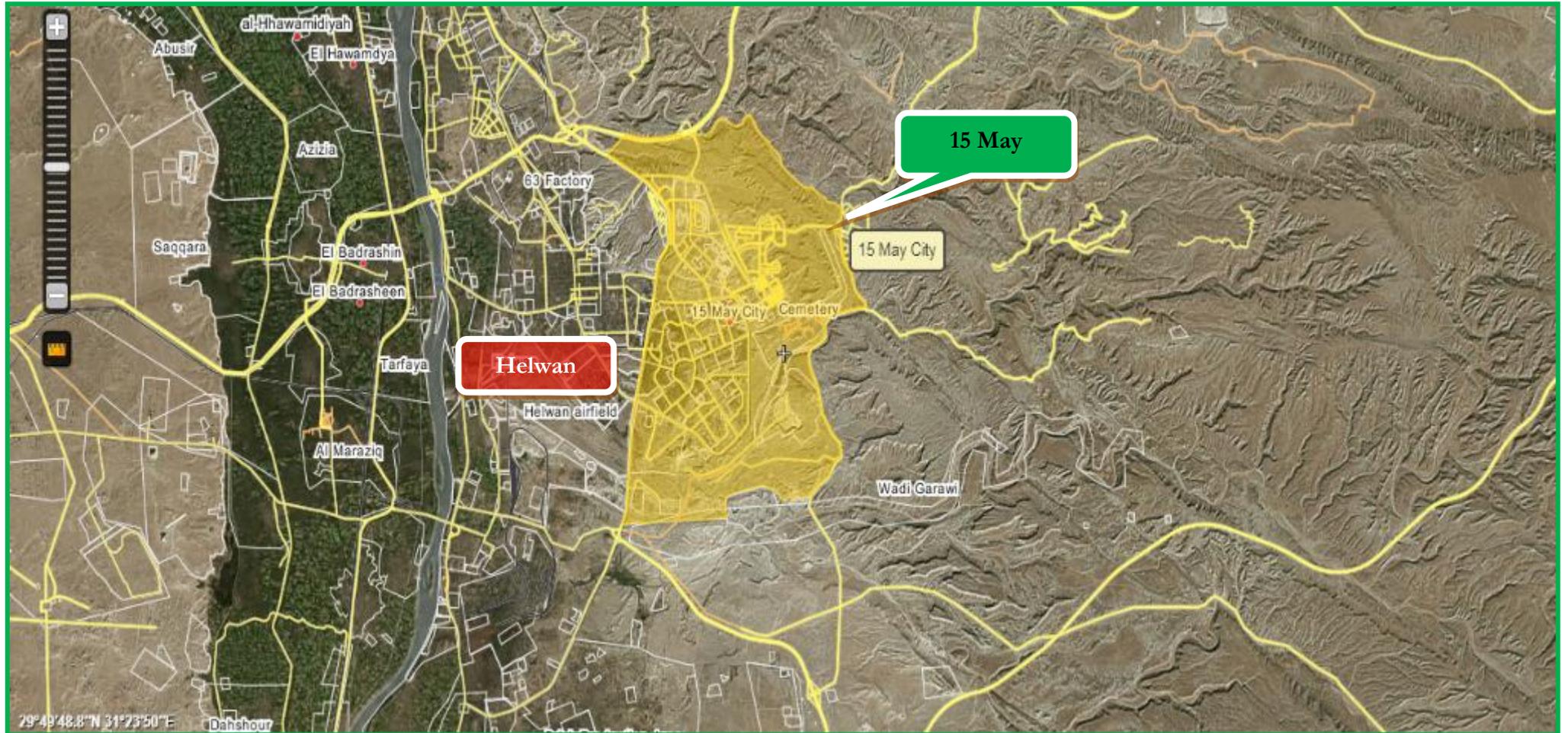


Figure 4-4: Satellite map showing 15 May district and surrounding communities

▪ Helwan:

Helwan district is located the southern part of Cairo, bordered from north by El Massarra, from the East and the south by Giza governorate, from West by 15 May district. (Figure 4-5)

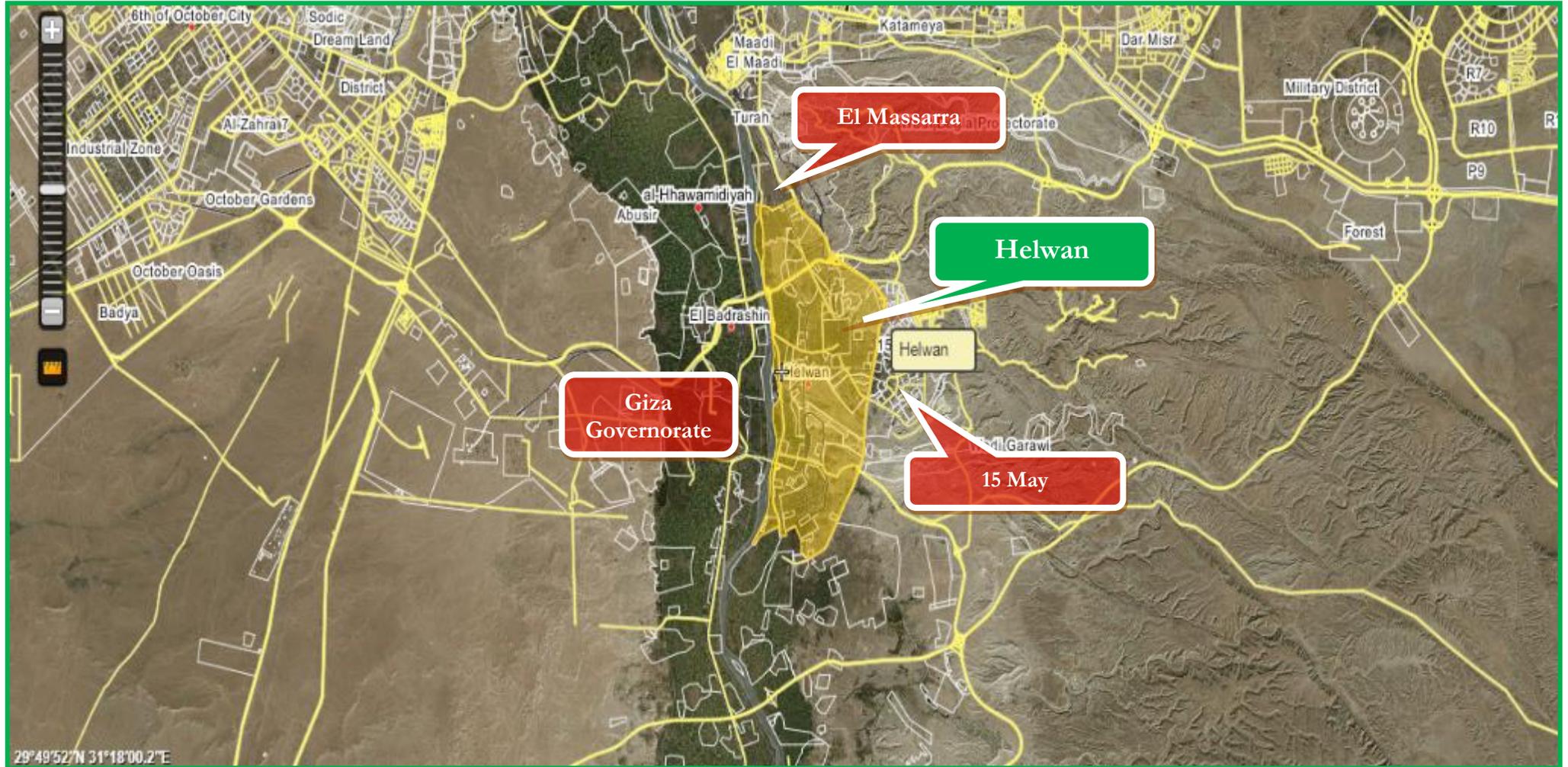


Figure 4-5: Satellite map showing Helwan district and surrounding communities

▪ **Zahraa El Maadi:**

Zahraa El Maadi district is located the southern part of Cairo, bordered from north by El Mokattam, from the South by Shaq El Teban area, from the East by Miraj City and from the West by El Kattameya. (Figure 4-6)

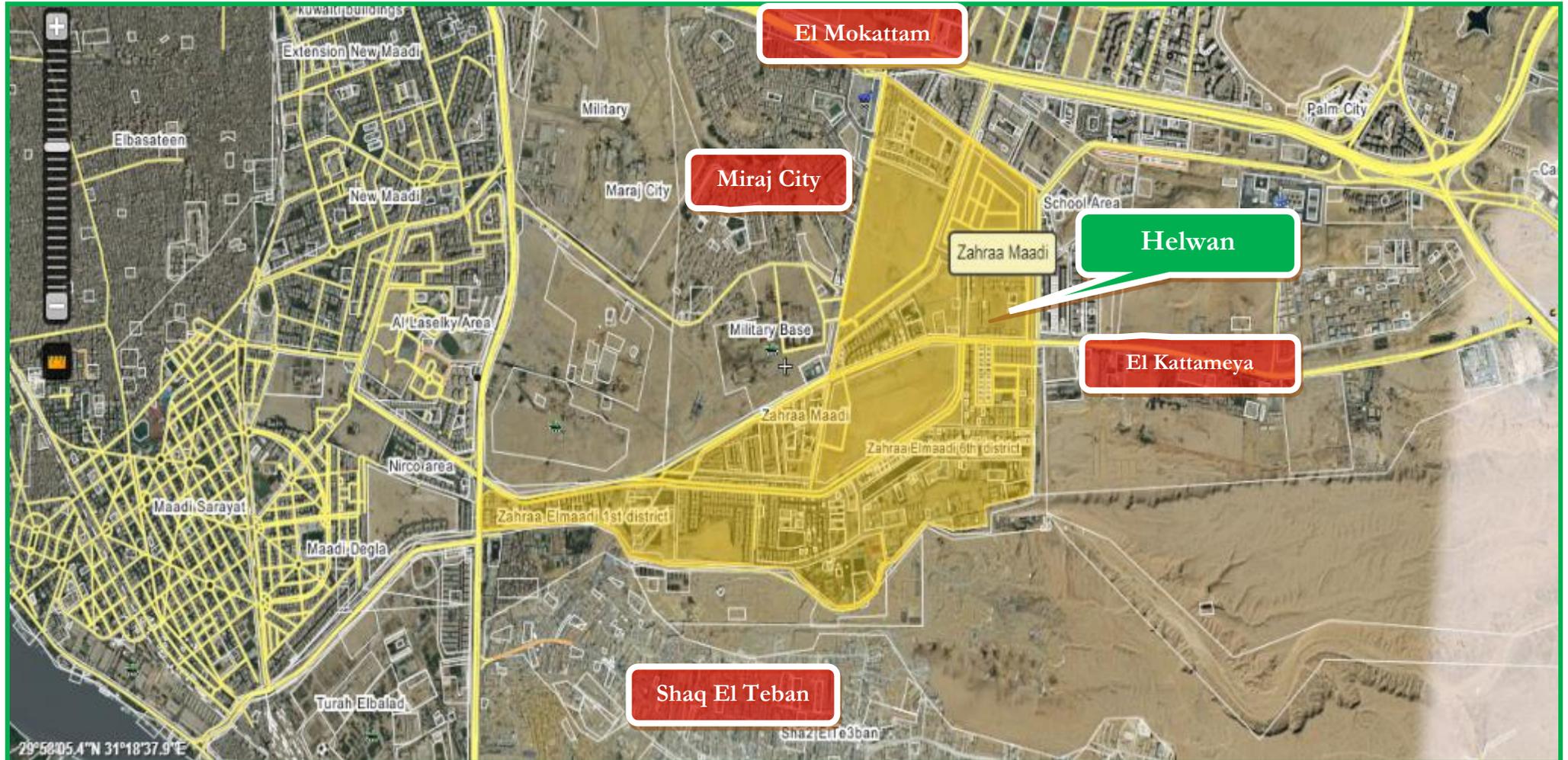


Figure 4-6: Satellite map showing Zahraa El Maadi district and surrounding communities

4.1.1 Air Quality

4.1.1.1 Site Specific Ambient Air Quality:

The selection of the active air measurement locations is based on the nature of the surrounding activities, the locations 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.

According to the study methodology the measurement locations was chosen on the basis that it is beside sensitive receptors close to the intermediate pipelines' routes. The GPS coordinates of the selected Ambient Air monitoring locations are shown in the table below.

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

Table 4-1: Location of Air measurements

Area	Latitude	Longitude
El Hikestep: Saudi German Hospital (Mixed residential commercial area)	30° 07' 55.78" N	31° 23' 07.21" E
Bab El Sharia: Mohamed Nasr School (Mixed residential commercial area)	30° 03' 25.41" N	31° 15' 39.93" E
15 May: Al Sahaba Mosque (Mixed residential commercial area)	29° 51' 22.26" N	31° 22' 03.98" E
Helwan: Gamal Abdel Naser School (Mixed residential commercial area)	29° 50' 19.50" N	31° 18' 26.90" E
Zahraa El Maadi: Stars School (Mixed residential commercial area)	29° 58' 36.63" N	31° 19' 48.10" E

Methodology, instrumentation, and results of Air Quality measurements are detailed in [Annex-5](#).

Results of ambient air quality measurements:

The concentrations of measured air pollutants in the represented studied districts as shown in (Table 4.2) are below national and WBG guidelines. Construction engines are certified, i.e., exhaust is below permissible levels. Ambient concentrations of gaseous pollutants, NO_x, SO_x and CO are unlikely to surpass permissible levels due to operation of construction equipment. Management and mitigation plans for ambient air pollution are further addressed in chapters 6 and 7. During the construction phase, excavation and construction activities will likely cause dust levels to surpass permissible levels at the construction areas. The duration of permissible levels being surpassed will be intermittent for the duration of the workday i.e., 8-10 hours. Management and mitigation plans for dust concentration beyond permissible levels are further addressed in chapter 7.



Table 4-2: El Hikestep air Quality Measurements

Time	NO ₂ (µg /m ³)	SO ₂ (µg /m ³)	CO (mg/m ³)	PM10 (µg /m ³)	T.S.P (µg /m ³)	
10:00 AM	23.5	19.8	2.2	98.12	141.66	
11:00 AM	17.3	18.8	2.5			
12:00 PM	21.4	17.2	2.7			
1:00 PM	20.3	15.5	2.7			
2:00 PM	21.9	19.9	2.6			
3:00 PM	11.1	19.9	2.6			
4:00 PM	10.6	19.5	2.6			
5:00 PM	12.2	18.3	2.6			
Limits	National	300/h	300/h	30/h	150/24h	230/24h
	WBG	200/h	500/10min	-	150 /24h ⁸	-

Table 4-3: Bab El Sharia air Quality Measurements

Time	NO ₂ (µg /m ³)	SO ₂ (µg /m ³)	CO (mg/m ³)	PM10 (µg /m ³)	T.S.P (µg /m ³)	
10:00 AM	26.2	15.4	4.5	93	137	
11:00 AM	19.3	14.1	6			
12:00 PM	15.6	14.4	6.1			
1:00 PM	18.4	14.9	6.2			
2:00 PM	24.8	18.2	6.3			
3:00 PM	33.2	16.6	5.9			
4:00 PM	29.1	17.3	5.1			
5:00 PM	18.6	15.8	5.5			
Limits	National	300/h	300/h	30/h	150/24h	230/24h
	WBG	200/h	500/10min	-	150 /24h ⁸	-

Table 4-4: 15 May air Quality Measurements

Time	NO ₂ (µg /m ³)	SO ₂ (µg /m ³)	CO (mg/m ³)	PM10 (µg /m ³)	T.S.P (µg /m ³)	
10:00 AM	26.7	21.1	2.1	101.82	127.42	
11:00 AM	27.3	23.2	2.2			
12:00 PM	24.4	16.7	2.4			
1:00 PM	25.7	24.4	2.8			
2:00 PM	21.9	19.3	2.7			
3:00 PM	23.8	11.2	2.3			
4:00 PM	19.8	13.4	3.1			
5:00 PM	20.4	14.8	2.8			
Limits	National	300/h	300/h	30/h	150/24h	230/24h
	WBG	200/h	500/10min	-	150 /24h ⁸	-

⁸ Interim target-1



Table 4-5: Helwan air Quality Measurements

Time	NO ₂ (µg /m ³)	SO ₂ (µg /m ³)	CO (mg/m ³)	PM10 (µg /m ³)	T.S.P (µg /m ³)
10:00 AM	27.8	13.2	3.4	79	109
11:00 AM	18.7	11.3	4		
12:00 PM	26.1	12.6	4.1		
1:00 PM	29.1	13.8	4.3		
2:00 PM	36.8	13.9	3.9		
3:00 PM	41.8	14.2	3.3		
4:00 PM	17.2	15.3	3.1		
5:00 PM	17.5	15.6	2.9		
Limits	National	300/h	300/h	150/24h	230/24h
	WBG	200/h	500/10min	-	150 /24h ⁸

Table 4-6: Zahraa El Maadi air Quality Measurements

Time	NO ₂ (µg /m ³)	SO ₂ (µg /m ³)	CO (mg/m ³)	PM10 (µg /m ³)	T.S.P (µg /m ³)
10:00 AM	24.9	18.2	2.5	94.87	101.20
11:00 AM	24.9	12.8	3.2		
12:00 PM	18.1	16.3	2.8		
1:00 PM	10.6	14.4	2.9		
2:00 PM	24.9	11.2	2.8		
3:00 PM	18.1	11.3	3.1		
4:00 PM	11.6	14.1	2.8		
5:00 PM	16.2	15.8	2.3		
Limits	National	300/h	300/h	150/24h	230/24h
	WBG	200/h	500/10min	-	150 /24h ⁸

4.1.2 Noise

4.1.2.1 Site specific noise measurements

One-hour average results for 8 hours continuous measurements were conducted for noise level measurements in the same location of the ambient air quality measurements (Table 4-1).

Table 4-7: El Hikestep, Bab El Sharia, 15 May, Helwan and Zahraa El Maadi Noise Measurements

Time	Sound Level Equivalent (LAeq) in dBA for 8 Hours (averages)					Permissible Limits	
	El Hikestep	Bab El Sharia	15 May	Helwan	Zahraa El Maadi	LAeq (dBA)	
						National	International
10:00 AM	53.82	59.3	57.5	59.7	53.82	60	70
11:00 AM	57.96	57.2	52.3	50.3	54.96		
12:00 PM	53.12	54.9	54.9	53.7	53.12		
1:00 PM	54.5	56.3	55.2	50.6	56.52		
2:00 PM	57.9	52.4	59.4	58.9	57.91		
3:00 PM	51.12	51.5	55.2	59.1	51.12		
4:00 PM	57.89	49.9	53.5	57.8	57.89		
5:00 PM	54.5	45.2	56.2	57.4	54.5		

Methodology, instrumentation, and results of Noise measurements were shown in Table (4-3) and are detailed in Annex-5.



Results of noise measurements

The noise measurements in the studied districts are below national and WBG guidelines.

The excavation and construction activities may cause noise levels to further surpass permissible levels at the site. As the excavation and construction are done on the same workday, therefore, the duration of permissible levels being surpassed will be intermittent for the duration of the workday i.e., 8-10 hours. Management and mitigation plans for noise levels beyond permissible levels are further addressed in section 7.

4.1.3 Climate

Cairo climate is dominated in all months by the subtropical anticyclon, or subtropical high, with its descending air, elevated inversions, and clear skies. Such an atmospheric environment inhibits precipitation. Most of Earth's tropical, true desert climates occur between 15° and 30° latitude.

The Köppen Climate Classification subtype for this climate is "Bwh". (Tropical and Subtropical Desert Climate).

The average temperature for the year in Cairo is 21.7°C. The warmest month, on average, is July with an average temperature of 28.3°C. The coolest month on average is January, with an average temperature of 13.9°C.

The highest recorded temperature in Cairo is 45°C, which was recorded in June. The lowest recorded temperature in Cairo is 0°C, which was recorded in January.

The average amount of precipitation for the year in Cairo is 25.4 mm. The month with the most precipitation on average is January with 5.1 mm of precipitation. The month with the least precipitation on average is May with an average of 0 mm. There is an average of 17.0 days of precipitation, with the most precipitation occurring in January with 5.0 days and the least precipitation occurring in June with 0.0 days.

The monthly average of relative humidity in the study area is ranging between 50.0% in May and 65.0% in December. The monthly average of wind speed varies in time and location with monthly average ranging between 9 km/h in November and 16 km/h in February.

4.1.4 Water resources

4.1.4.1 Surface water

The River Nile passes through Cairo, before it reaches the Nile Barrage north of Cairo, where it starts branching to Damietta Branch and Rosetta Branch forming the Nile Delta. Besides the River Nile, the Ismaileya Canal, is a major freshwater canal that supplies Suez Canal cities and passes through Greater Cairo. The Canal starts in Greater Cairo at Shobra district (north of Cairo) and passes through Shobra, El Matareya, and Mostorod districts before it continues to the east.

The projected work planned along existing roads; no pipelines will be passing through the Nile River within the studied districts.



4.1.4.2 Groundwater

In Greater Cairo, the coarse massive sand and gravel Unit, belonging to the late Pleistocene is considered the main aquifer system with a maximum thickness of about 70 m and occupies almost all the area of the flood plain and parts of the adjacent elevated plains. The groundwater exists under semi-confined conditions as well as phreatic conditions.

Groundwater flow is being observed by the Research Institute of Ground Water (RIGW)⁹ since 1950. It was observed that the piezometric levels decrease gradually from more than 15 m+msl in the southern portion to 11 m+msl in the north. The average piezometric gradient is about 11 cm/km. Groundwater flow direction is by definition perpendicular to the piezometric contour lines and therefore the flow direction is from south to north.

The hydraulic parameters of the groundwater aquifer are as follows:

- Vertical Permeability of the top clay layer varies from 0.03 to 0.05 m/day;
- Aquifer Hydraulic conductivity varies from 20 to 70 m/day;
- Transmissivity varies from 1000 to 11000 m²/day; and,
- Aquifer Storativity varies from 0.0005 to 0.01.

Recharge sources are:

- Seepage from the river and main canals;
- Deep percolation from irrigation of cultivated lands;
- Seepage from drinking water supply networks; and
- Infiltration/seepage from the sewage trenches.

Discharge occurs as:

- Groundwater return flow to the River Nile;
- Interception by the sewage system; and
- Groundwater extraction (Data of 1991, RIGW, 1992).
 - 0.7 million m³/year for irrigation from 16 wells.
 - 126.8 million m³/year for drinking from 111 wells.

Many authors, institutes and researchers studied the groundwater quality of Greater Cairo water for the purpose of different projects and/or studies, however, the groundwater quality could be summarized in the following main points:

Groundwater type is bicarbonates, indicating that the source of recharge is surface water; Sodium Chloride and Sodium Sulphate are also present in the deep aquifer which may indicate fossil water and/or recharge from domestic sources and TDS generally range between 1000 and 5000 ppm.

The groundwater table in most of Greater Cairo regions ranges between 1 and 5 meters in most areas. Many places in Greater Cairo suffer from the problem of groundwater rising especially along

⁹ RIGW is one of the research institutes of the National Water Research Center.



the eastern bank of the River Nile. In the Old Cairo district, the increase of groundwater varied between 1 and 3 m during the last 20 years due to absence of groundwater extraction. In the north western part of Greater Cairo, a decrease in groundwater heads occurred in the range of 1.75 to 2 m due to due to the expansion in building area. In the south western portion of Greater Cairo, a decrease in groundwater of about 0.7 m was due to the excess of groundwater extraction for drinking purposes.

During the project construction activities, the excavation depth does not exceed 1.5 meter.

4.1.5 Terrestrial Biological Environment:

The projected work is planned along existing roads; no pipelines will be passing through any of natural habitats. The pipelines routes are planned to be implemented in existing urban roads in urban residential areas.

The proposed routes and the connections of pipelines to households are planned in districts where flora and fauna of significance do not exist.

4.1.6 Waste Management:

Solid Waste:

The responsibility of service planning, delivery and monitoring in Al Cairo Governorate is delegated to Cleansing and Beautification Agency managed by Presidency of the City Council.

In Helwan, 15 May and Zahraa El Maadi districts waste transferred to waste recycle factory (EKAM) located in 15 May district by trucks then the rejected wastes transferred to 15 May dump site, while in Bab El Sharia wastes transferred by trucks to Manshaat Naser dumpsite and finally El Hikestep wastes transferred by trucks to El-Obour dumpsite.



Figure 4-7: Shows 15 May dumpsite and Helwan waste trucks

Liquid Waste:

The project districts are well covered by public sanitation network which take all the municipal sewage to be treated in existing sewage treatment plants.

People in the streets can use available public sanitary facilities which can be located within the existing mosques, restaurants or any public coffee shops.



Figure 4-8: Shows some of sewage treatment plants in project districts

Hazardous Waste:

There are no hazardous wastes site within Cairo Governorate, any hazardous Waste generated within the project will be Temporarily stored in isolated area (in the generated site) and will be transported- by licensed hazardous waste handling vehicles and personnel for final disposal at a licensed hazardous waste facility (Nassreya or UNICO in Alexandria).

4.1.7 Roads and traffic:

The traffic in project districts roads is relatively of moderate density (after the recent road projects implemented by the government of Egypt in the past years). The rush hours are usually between 8:00 to 9:00 AM, and 4:00 to 6:00 PM and it may slightly vary between project districts as there is some difference between the socioeconomic main activities. Almost all main type of vehicles is existing in Cairo roads starting from Tuk Tuk, Private cars, Buses, Trucks, Microbuses, Tricycles to Motorcycles. Figure 4-9 and Figure 4-10 illustrates the traffic density and main streets within the project districts:

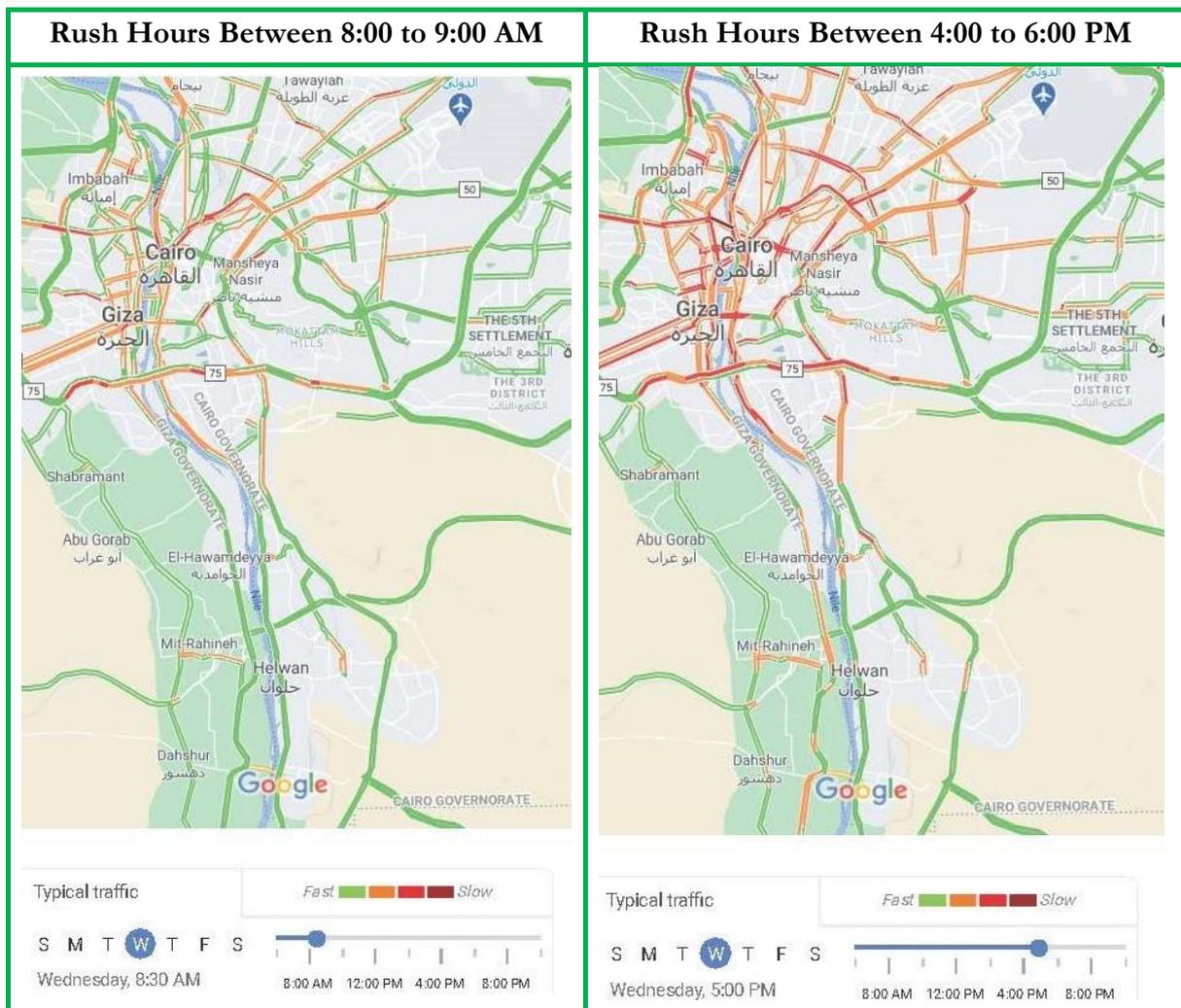


Figure 4-9: Shows Typical Traffic in Project Districts within the Cairo Two Rush Hours

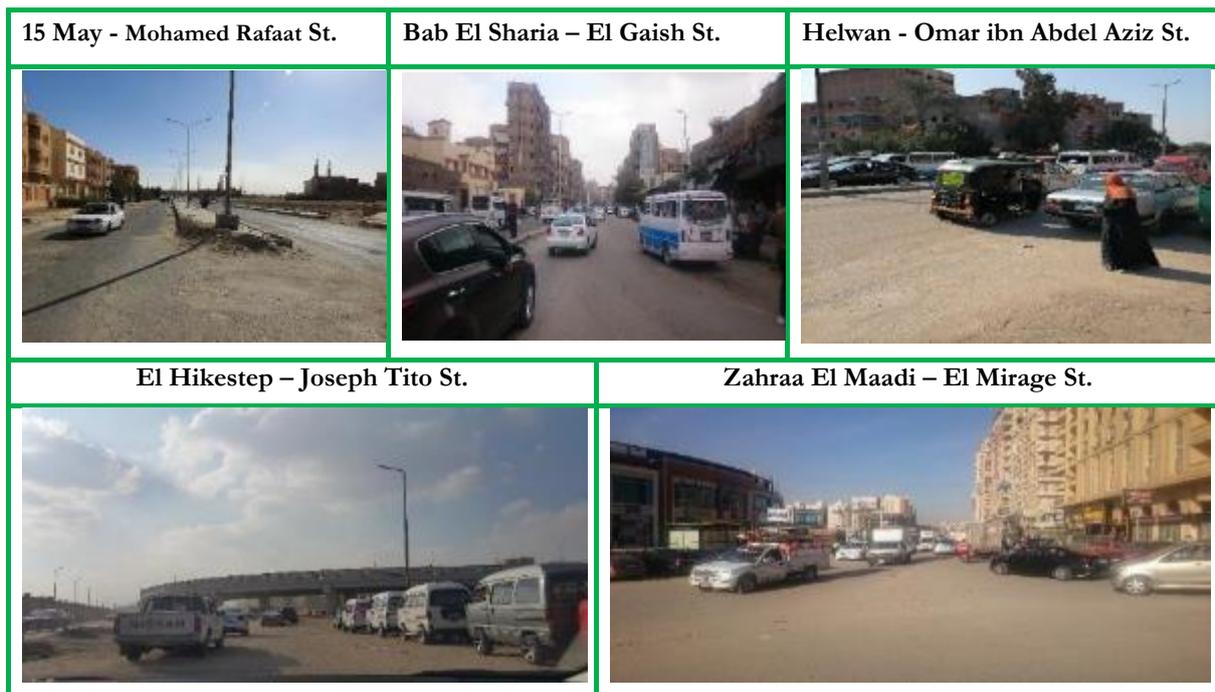


Figure 4-10: Shows Type of vehicles, Traffic density and main streets in some of project districts



4.2 Socioeconomic Baseline

Cairo Governorate is the capital of Egypt, and one of the largest cities in Africa. Cairo has stood for more than 1,000 years on the same site on the eastern bank of the Nile. It is located in the northeastern part of the country. Cairo is the gateway to the Nile delta, where the lower Nile separates into the Rosetta and Damietta branches

Depending on a combination of both primary data collected from the field and secondary resources reviewed including statistical data, this section will highlight the following:

Administrative division, urbanization trend, demographic characteristics, access to basic services, human development profile, roads and transport, fuel currently used in households, problems faced with the current household fuel, perception towards the project, and gender dimension of the current type of fuel. It is worth mentioning that the new NG connection project in Cairo Governorate is supplementary to the current existing natural gas connection network in Cairo. Currently Cairo Governorate has more than 2.6 million households connected to the natural gas services. Additionally, the World Bank has supported the expansion of the NG grid since 2008 by financing the Egypt Natural Gas Connection project in Greater Cairo. The project has successfully connected more than 350 thousand households in 28 districts.

According to the site visits and data provided by the LDC, the project will be implemented at 20 Districts within Cairo Governorate. All current project districts are urban areas and homogeneous in geographical, environmental and social features.

4.2.1 Administrative division¹⁰

Cairo is the most populated of the governorates of Egypt, with a total population of about 9.5 million. Its total area is 3084.7 km²; the total inhabited area represents only 6% (185 km²) of its total area. Cairo Governorate consists of 4 main zones with a total of 38 districts and 41 police stations. Five main districts (15 May, Helwan, Bab El Sharia, Zahraa El Maadi (El Bassateen) and El Hikestep) have been selected to represent the other project districts according to selected criteria adopted by the study team (length of the network, number of the households connection and the nature of the districts). The number of the households in the selected 5 districts represents about 73% of the proposed total NG connections in the 20 districts.

4.2.2 Urbanization Trends

Cairo Governorate is completely urbanized. Most of its buildings are constructed of concrete and red bricks and in compliance with the bases and preconditions for connecting NG. The majority of buildings are between 5 to 10 stories high.

¹⁰ Sources: Cairo Governorate web site, CAPMAS 2017

With regard to the legal status of buildings; most of buildings and neighborhoods are legal as reported by the head of Cairo districts due to the good control system applied by the governorate. Some buildings are exceeded the highest permitted as noticed by the team work at some districts.

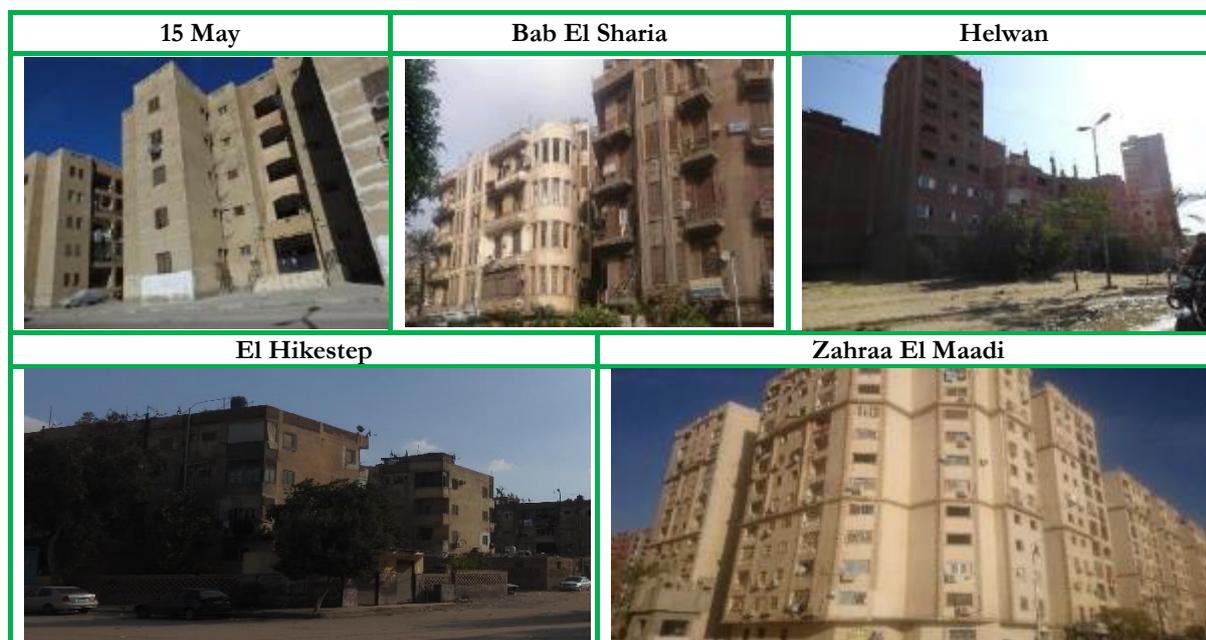


Figure 4-11: Shows Building Condition in some of project districts

Regarding the condition of the streets in Cairo districts, most of them are in good condition, the average width of main streets range between (3 to 5) lanes wide, and side streets range between (2 to 3) lanes wide. Despite the good conditions and maintenance of the asphalt, they are mostly paved out and convenient for NG installations. According to the head of Cairo districts, the Governorate is giving high priority to Cairo as the capital of Egypt, on infrastructure upgrade and maintenance which included roads and streets, sanitary and sewage systems, and renewing the main squares. (Figure 4-10)

4.2.3 Demographic Characteristics

4.2.3.1 Total population:

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

Table 4-8 Distribution of population in the project districts¹¹

District	Population					No. of Clients at the project districts
	Male	Female	Total	No. of Households	Average Family size	
El Hikestep	23,140	22,584	45,724	12,032	3.8	1,691
Bab El Sharia	24,261	22,412	46,673	15,424	3.0	750

¹¹ Source: CAPMAS, 2017 and LDC



District	Population					No. of Clients at the project districts
	Male	Female	Total	No. of Households	Average Family size	
15 th of May City	49,437	44,137	93,574	28,417	3.3	5,500
Helwan	265,347	255,892	521,239	133,342	3.9	39,765
Zahraa El Maadi (El Bassateen)	260,756	234,687	495,443	137,537	3.6	19,875
Total selected Districts	622,941	579,712	1,202,653	326,752	3.68	67,581
Total Cairo Governorate	4,960,625	4,579,048	9,539,673	2,595,977	3.6	92,017

4.2.3.2 Rate of natural increase and Household size:

The birth rate in Cairo Governorate is about 25.4 births per 1000 persons. The adult mortality rate is 9 per 1000 people. That gives a natural growth rate of 16.4 per 1000 persons. The average household size is about 3.6 persons in Cairo Governorate, which is similar to the average at the project districts, which range between 3 – 3.8 persons. As shown in the above table.

4.2.4 Access to Basic Services¹²

Access to basic services, water supply, electricity and sanitation is one of the main pillars that determine the economic well-being of the community. Cairo districts are enjoying the access to basic services. Nearly 100% of individuals using electricity, having public water network. In addition, having sanitation network. Thus, it will be possible to install the NG to all the project districts.

4.2.5 Human development profile

Educational, health facilities, poverty index, income and expenditure, and human activities and work status should be highlighted in order to determine the current socioeconomic conditions of the target districts in Cairo Governorate.

4.2.5.1 Education:

Education is perceived as the first shell that can help population to withstand poverty. The review of the CAPMAS data for 2017, and the focus group discussions showed that the intermediate education is common in Cairo governorate, which it represents about 33% on the governorate level and ranges between (20% - 48%) at all project districts. The percentage of the illiterate rate is about

¹² Source: CAPMAS data 2017



16% in Cairo Governorate, this percentage ranges between 3% and 20% in the project districts and it is similar between males and females, which means that the females are given the same opportunity at the field of education. In addition, the percentage of university education is high in Cairo governorate (23.2%). The level of education is very important to choose the suitable channels to share the project information with the community. The following table shows Distribution of the project districts population by educational status.

Table 4-9 Distribution of the project districts' population by educational status¹³

District	Percent Illiterate	Percent with University Education	Percent Intermediate Education
Cairo Governorate	16.2%	23.2%	33%
El Hikestep	4.1	51.5%	20.3%
Bab El Sharia	17%	17.1%	40.6%
15th of May City	3%	27%	48%
Helwan	18%	14%	36%
Zahraa El Maadi (El Bassateen)	20%	16%	33.4%

4.2.5.2 Health Facilities

Cairo governorate and its districts are enjoying a high level of health facilities both governmental and private, where most of the hospitals and health care units are concentrating in Cairo Governorate. There are 39 hospitals affiliated to the Ministry of Health and 7 hospitals affiliated to Health Insurance, in addition to so many hospitals affiliated to other entities such as educational hospitals, University hospitals, public sector hospitals, etc. The health facilities are very close to the project districts and easy to reach where they lie near the project sites within two to three kilometers distance (as Sayed Galal, Saudi German and 15th May hospitals). Providing health facilities is very important to save workers during in case of accidents and emergency cases. So, a special clause is written in all agreements between LDC and all contractors to guarantee providing the necessary medical services to the workers. The LDC (Town Gas) is giving a high priority for protecting their workers. Also, Town Gas in the emergency cases provides the worker with all the required medical services.

4.2.5.3 Poverty index, Income and Expenditure

Gaining information about the income of the potential beneficiaries shed light on the potential affordability to pay for the NG connections fees, either in cash or by installment. According to the latest CAPMAS Income, Expenditure and Consumption Survey in 2017-2018 which covers Cairo Governorate, the average monthly income in per household is 6258.7 EGP and the average

¹³ Source: CAPMAS data 2017



expenditure is 4782.69 EGP. The survey has included 3187 households and 11893 individuals to guarantee that the selected sample is representing all the society. In addition, the results of the survey showed that, the percentage of poor people in Cairo Governorate is about 31%. However, based on the site visits and the focus group discussions and individual interviews, the majority of households in the project districts expressed their willingness to be connected to the NG and they prefer to pay NG installation costs either in cash or in installments to avoid the different problems they are facing with the LPG bottles.

4.2.5.4 Human activities in the project districts

Since Cairo is the country's administrative capital, many of its jobs are related to the public sector. It includes more than 20 thousand governmental institutions such as the People's Assembly, government ministries and the department's governorates. They all include labor force that participates in supporting the country economic activity. Additionally, Cairo governorate embraces different economic activities. The governorate hosts several industrial zones which makes it a destination for capital polarization and investment to develop the national industry and enhance its competitiveness on the local and international levels. The governorate offers multiple potential investment opportunities including establishment of hotels, tourist facilities, malls and exhibitions, in addition to investments in real estate and industrial fields. Special attention is also given to small handicraft projects that contribute to the creation of job opportunities for youth. Moreover, Cairo embraces monuments from several civilizations including the pharaonic, romans, Christian, and Islamic as well as modern eras. Natural gas can play a vital role -as one of main energy sources to overcome the problems of its alternatives (LPG and electricity).

4.2.5.5 Unemployment and work status

According to the data published by CAPMAS regarding labor force and unemployment for the year 2017, the total work force (15 years and above) in Cairo governorate is about 3.3 million people of which the females represent about 25%. The total estimated of employed persons is about 2.8 million. The unemployment rate in Cairo governorate is about 15%, this ratio is quite high between females (26%) comparing to only 11.4% between male, as shown in the following table.

Table 4-10 Unemployment Rate in Cairo Governorate ¹⁴

Labor Force (15 years and above) Number in (hundred)			Estimated Employed Persons Number in (hundred)			Unemployment Rate		
Male	Female	Total	Male	Female	Total	Male	Female	Total
24383	8230	32613	21597	6078	27675	11.4%	26%	15%

¹⁴ Source: CAPMAS, Annual Bulletin of Labor Force 2107



In addition, the formal Statistics obtained from the CAPMAS, regarding work force reflected that the age of starting work is 15 years old. Both the Child Law and the Labor Law state that children shall not be employed before they complete 14 years old, nor shall they be provided with training before they reach 12 years old; however, children between 12 and 14 years old are permitted to work as trainees. Furthermore, the governor concerned in each governorate, in agreement with the Minister of Education may permit the employment of minors aged 12-14 years in seasonal work which is not harmful to their health and growth, and which does not conflict with regular school attendance. Consequently, there is always a risk to detect child labor in most of the projects implemented in Egypt. In the project districts where different work activities are in place, there is a big number of underage laborers were noticed. As a conclusion, there is a risk that this common practice is used in the project and contractors / subcontractors might employ young people below 18 years old. In the meantime, due to the technicality of the work in NG project, LDCs always seeks for technical workers that are highly trained and experienced, so the risk of contracting children under 18 years is medium to minor.

Therefore, rigid restrictions to employ this category must be added to the contractor obligations.

4.2.6 Fuel currently used in households

The majority of the samples surveyed in the project districts reported that, the main type of fuel used for cooking are the LPG cylinders. The source of aforementioned type is mainly the LPG vendors, the second source is the LPG outlets. The formal price of LPG cylinder is 65 EGP in addition to 10-20 EGP transportation and services cost. The average consumption of LPG cylinders per household is ranges between 1 to 2 cylinders monthly. While during winter, LPG consumption increases to be between 1 to 3 cylinders monthly for each household due to water heating. LPG for water heating is preferred than electricity due to its cheap price, compared to electricity price.



Figure 4-12: Shows some of LPG vendors and LPG outlet in project districts



4.2.7 Problems faced with the current household fuel

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

- High cost of LPG compared to NG, and price fluctuations especially during winter.
- The tedious process to obtain LPG cylinders.
- LPG cylinders are not available all the time.
- The LPG is not completely full. It is half filled.
- Sometimes it might leak.
- It is difficult to bring the LPG bottle upstairs.

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

4.2.8 Gender dimension of the current type of fuel

Females are the main player when it comes to handling LPG within the boundaries of the household. According to the interviews and the focus group discussions, women are responsible for carrying the LPG cylinders from the outlets and installing them to their stoves or water heaters, which adds more pressure on women in terms of time, effort and money.



Figure 4-13: Shows woman carrying the LPG cylinder from Bab El Sharia outlet

4.2.9 Perception towards the project

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

- It is obvious that the majority of the samples surveyed in the project districts have positive perceptions about NG connections project. They reported that NG has many benefits:
- NG will save community people effort and money



- It is reliable, safe, and available
- It will put limitation to the quarrels and fights occurring from obtaining an LPG
- It also will put limitation to the crisis of the LPG shortage
- It will save electricity that is used in electricity heater and reduce the cost of electricity bill.

4.2.10 Willingness and affordability to pay

Based on the latest formal price of LPG and analysis of the data obtained, each household consumes between (1 – 3) LPG cylinders monthly, indicating that each household will pay about 225 - 240 EGP as a maximum per month according to the average price of LPG cylinder 75 - 80 EGP (the formal price is 65 EGP plus transportation and services cost 10-15 EGP).

During the consultation activities, the participants were asked about their opinion of the NG installation fee. They stated that the installation fee, which goes around (2300 to 2650 EGP), is too high to be paid in one installment. All participants demanded a system of monthly installments to settle the installation fee within a period between one to five years. Participants stated that they could pay around (50 to 150 EGP) per month to settle the installation fee. The community socioeconomic characteristics and the willingness of people to convert from LPG cylinders to household NG are remarkable. Community members are much in favor of the project. The majority of people in Cairo have a good idea about the bank installment system to cover and pay the NG connection cost but a lot of them have no ideas about the others available options. Therefore, there is a need to provide clear information about the other available options, which are currently applicable to settle the installation cost, such as:

- The Ministry of Petroleum initiative to encourage more people to connect natural gas to their homes by paying the installation cost in installment for 6 years with a zero-interest rate (about 30 EGP per month). This initiative is currently the most popular option and helps so much of increasing the numbers of the household's contracts of natural gas connections.
- AFD Grant in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG. The grant (1500 EGP) will cover more than 50% of the NG installation cost according to eligibility criteria. This eligibility criteria depends on selecting the beneficiary households based on their electricity consumption rate. The average monthly consumption for eligibility shall range from 50 kWh to 300 kWh on average, calculated over a period of 12 months. The average monthly electricity consumption is highly correlated to the poverty level of households. Consumers have to submit their application to the relevant LDC, which will liaise with the involved entities to check the eligibility of the households. Subsequently, eligible consumers will receive the subsidy in the form of a deduction applied to



the connection fees. The implementation of the Targeted Financial Support based on this eligibility criterion involves a number of entities; namely EGAS and LDCs under the Ministry of Petroleum, Ministry of Social Solidarity as well as Ministry of Electricity and Renewable Energy. Additionally, other criteria have been added up, by selecting the poor areas according to CAPMAS and the Ministry of Social Solidarity to determine the poor areas, which can benefit from the grant). Based on approved eligibility criteria mentioned above, it is expected that the grant would support in covering the expenses to connect to natural gas to a targeted 500,000 deprived households. Town Gas has disclosed all information about the grant in its contract offices.

4.2.11 Physical cultural resources

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

In case of any unanticipated archeological discoveries within the project districts; the [Annex-6](#), entitled 'Chance Find Procedure,' details the set of measures and procedures to be followed in such case.



5. Environmental and Social Impacts

The environmental and social impact assessment is a process used to identify and evaluate the significance of potential impacts on various environmental and social receptors as a result of planned activities during (construction and operation) phases of the Project.

5.1 Impact Assessment Methodology

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

The table below presents the classification of impact ratings and respective importance of impact values.

Table 5-1 Impact Assessment Methodology

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

Detailed impact assessments results are presented in two tables in [Annex-7](#).

5.2 Impacts during Construction

5.2.1 Positive impacts

5.2.1.1 Impacts related to employment

The project will result in positive impacts through the provision of job opportunities both directly and indirectly.

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

Based on similar projects implemented recently by EGAS and Town Gas, the daily average number of workers during the peak time will be about 100 - 150 excavation workers, 10 engineers and 50 technicians. The workers can also include drivers, digging staff, technicians and welders. About half of them can be recruited from the local community.

- **Indirect benefits**

As part of the construction stage, many indirect benefits expected to be sensed in the targeted areas due to the need for more supporting services to the workers and contractors who will be working



in the various locations. This could include, but will not be limited to accommodation, food supply, transport, trade, security, manufacturing... etc. For example, the transportation of workers to project districts will work for the benefit of car lease offices.

5.2.2 Negative Impacts

The process of environmental impact assessment during construction phase indicate that some receptors have irrelevant impacts. Those receptors include ground water and Ecological (fauna or flora).

A Summary of Impact Assessment during construction and operation the is illustrated in [Table -5.2](#)

5.3 Impacts during Operation

5.3.1 Positive impacts

- On a national level, reduced expenditure on imported LPG cylinders
- Women are key players in the current residential 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. The use of a reliable source of energy will allow households, especially women to accomplish the residential activities in less time and this will potentially open a space for better utilization for the saved time.
- The NG connection will help the household achieve a higher level of privacy by eliminating the need for informal LPG distributors from entering private homes.
- Significantly lower gas leakage and fire risk compared to LPG.
- Eliminate the hardships that special groups like the physically challenged, women, and the elderly had to face in handling LPG.
- Limiting possible child labor in LPG cylinder distribution.
- Constantly available and reliable fuel for home use
- Improved safety due to low pressure (20 mBar) compared to cylinders

5.3.2 Negative impacts

The process of environmental impact assessment during the operation phase indicate that some receptors have irrelevant impacts. Those receptors include waste management, air quality, soil and Ecological (Fauna and flora).

A Summary of Impact Assessment during construction and operation the is illustrated in [table 5.2](#)

Table 5-2 Impact Assessment

 Detailed impact assessments results presented in two tables in [Annex-7](#).

Impact	Description	Type	Significance
During Construction			
Deterioration of soil quality	Degradation of soil quality, Excavation and movement of heavy machinery on unpaved surface soils during site preparation and pipeline laying could cause a physical breakdown of soil particles potentially causing destabilization of the soil structure.	Negative	Medium
Air emissions	WBG requirements and Law 4/1994 (modified by laws 9/2009 & 105/2015) stipulates strict air quality standards. Air emissions (gases and particulates) during construction (from transportation and machine operation) shall arise from: <ul style="list-style-type: none"> - Particulate matter and suspended solids from excavation/backfilling operations - Possible dispersion from stockpiles of waste or sand used for filling trenches. - Exhaust from excavation equipment and heavy machinery (excavators, trenchers, loaders, trucks) containing SO_x, NO_x, CO, VOCs, etc. - Traffic congestions resulting from road closure or slowing down of traffic due to excavation works. - Dust: Excavation on dusty or rocky roads such as local roads and some urban roads are likely to generate more dust compared to asphalted streets due to the dusty status of those roads the impact of dust generation (particulate matter) can lead to temporary reduction of air quality, however is unlikely to cause major air emissions impacts as it will be limited to the working hours as excavation and backfilling are carried out within the same day. 	Negative	Medium
	<u>Gaseous pollutants emissions</u> Provided machinery used during construction is certified and maintained as per guidelines, the increase in emissions stemming from the exhaust of machinery is unlikely to increase ambient levels beyond national and WBG permissible levels.	Negative	Minor
Vibration	The potential for vibration at neighboring sensitive locations during construction is typically limited to drilling and excavation works. However, due to the distance between sensitive locations to the construction works, there is little likelihood of any structural or cosmetic damage to nearby dwellings. For Gohar Al Kaed street HDD crossing, the nearest historical building from the said crossing is Bab Al Berika (Islamic), which lay about 100 m (328.084 ft.) from the HDD. The PPV "Transit Noise and Vibration Impact Assessment" for the said distance is (0.010173 PPV, in/sec) which is far less than the maximum acceptable values for older homes and buried utilities (0.12 PPV, in/sec) according to (FTA, 2016).	Negative	Minor
Noise	Construction activities of the gas distribution network will likely increase noise levels due to excavation and heavy machinery. Typical construction noise includes noise intensity due to engine operation, and intermittent impacts that may take place during demolition of asphalt by jackhammers.	Negative	Medium

Impact	Description	Type	Significance
Risks on Occupational health and safety	- Inhalation of air pollutants, high noise levels, potential injuries or death as a result of slips, falls, operating heavy equipment and handling hazardous materials, working at height, excavation and electrical hazards. - Electrocutation in sites with intersection points of overhead power lines.	Negative	Medium
Impacts due to Covid-19 pandemic	- During the project activities, Movement of staff can increase the risk of transmission of COVID-19 to the workers and Community members.	Negative	Medium
Impacts related to Labor Influx	If not properly managed, there is a risk that labor inappropriate behaviors or misconduct might pose negative impacts on the community groups, particularly on women, children and other vulnerable groups (including inconvenience and impacts on work sites)	Negative	Medium
Child Labor	As mentioned in the baseline, child labor is a common practice in the project districts communities. Children below 18 years-old work almost in all projects as they receive low salaries and they are less demanding. Due to the technicality of the work in NG project, LDCs always seeks for technical workers that are highly trained and experienced, so the risk of contracting children under 18 years is medium to minor. This risk should be carefully handled in the ESMP	Negative	Medium - 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. The legal standards of Law 4/1994-9/2009-105/2015 for the Environment and Law 38/1967 stipulate that these wastes should be disposed of in licensed sites by the local authority, which minimizes any aesthetic effects of such waste. Liquid waste including sewage and wastewater resulting from dewatering activities (if encountered during excavation of trenches) will be collected in tanks, analyzed and transported via a certified contractor to the nearest wastewater treatment station. Hazardous and non-hazardous materials available onsite during construction activities are likely to include fuel, engine oil, paints, Poor handling of those materials and their inappropriate storage may result in poor containment of induced leaks.	Negative	Medium

Impact	Description	Type	Significance
Reduction of Traffic Flow	<ul style="list-style-type: none"> - Traffic congestion and loss of access due to establishing temporary workshops and storage areas, excavation and installation works will be varying from district to another according to the population, rush hours (Figure 4-10) and the services within each district. - 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. 	Negative	Medium
Risk on Community health and safety	<p>The excavation works and establishing temporary workshops and storages areas within the project districts will affect the community health and safety by the following means:</p> <ul style="list-style-type: none"> - Emissions of gaseous pollutants and dust from equipment and machinery used - Increased background noise levels resulting from the operation of jackhammers, which surpasses permissible limits for residential districts in the vicinity of commercial areas during the day - Waste accumulation in illegal dumping and potential burning of construction waste, which will consist mainly of excavated soil and leftover PE and carbon steel pipes - Excavation works will result in the presence of open trenches in areas accessible to local community (e.g., in front of building and shops.) The presence of open trenches can pose risks of accidental falls and injuries. Trenches expected to be open during the workday, with no trenches being left open after working hours. - Installation of household connections may involve working at height, which can result in falling objects causing health and safety hazards to local community. - Construction works will involve the use of equipment such as jackhammers and welding machines, which can cause injuries to local community as a consequence of contact. - Congestion and traffic disturbance for pedestrians, cars as well as the livelihoods of taxi, TukTuk and microbus drivers. - Access to buildings (including houses, shops and schools) entrances may be limited or constricted in cases where excavations form obstacles for persons and cargo. - Negative effects on the business of neighboring shopkeeper's due to excavation close to such shops. The excavation activities affect having access to the shops. - Children in schools might get affected in case of excavating in the proximity of their schools. - Walking People in the streets or living in narrow or blocked streets might get affected in case of excavating or establishing temporary workshops in their streets - installing temporary working platforms (scaffolds) in front of houses may result in accidents to residents 	Negative	Medium

Impact	Description	Type	Significance
Risk on Infrastructure and underground/ utilities	<ul style="list-style-type: none"> - Underground utilities and infrastructure pipelines (such as water, sewerage and telecommunication) have installed years ago without accurate documentation and maps for its routes and depths. Therefore, the risk of damage to such utilities during excavations for natural gas pipeline installation is possible. - The most significant potential environmental impact will arise in case a sewerage pipe is broken and wastewater potentially accumulating in the trench. There is also the possibility of overflowing to the streets causing nuisance to the surrounding environment. - Breaking a water supply pipe may result in cutting the supply to a number of residential units, which may lead residents to use other sources of water that may be either expensive or unsafe. - Damaging sanitary pipelines, electricity and water supply result in severe disturbance to community people. 	Negative	Minor
Street Condition Deterioration	Streets rehabilitation or restoration following pipeline network installation: is referred to by an Egyptian legal/institutional expression (رد الشيء لأصله) that signifies the responsibility to “restore to original condition”. In the context of the project, it applies to the responsibility of the implementing company to provide the necessary resources to re-pave roads and streets to the original state after natural gas excavation and installation works. The current arrangement is that the implementing entity performs the backfilling of the excavated trenches and agrees a restoration fee with the local government authority to cover the balance of the restoration and pavement cost. The local authority uses the fee to include the restoration and re-pavement of the streets in its “pavements plan”.	Negative	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.	Negative	Minor
Impacts Related to Land	The project will need plots of lands for the workshops and temporary storage areas. Town Gas will establish the workshops and temporary storage areas in the side roads near to installation site. The lands are state owned lands that require a kind of arrangement with the Local Governmental authority in to use the lands for storage purpose and establish a temporary workshop. Using the side road will never entail any land acquisition. No socio-economic impacts on lands have been identified.	None	None

Impact	Description	Type	Significance
Effect on Visual resources and landscaping	Project activities will entail piling of sands and moving of vehicles in various construction sites. Moreover, the temporary storage areas will be used to store pipes, painting materials and safety equipment. That may have impact on visual resources and landscaping.	Negative	Minor
Operation			
Risk on Community health and safety	<ul style="list-style-type: none"> - In addition to a full array of safety and emergency precautions taken by EGAS and Town Gas, user safety is prioritized by stating emergency precautions on the household gas meter and by setting up emergency response centers. Impacts on user health and safety may occur through improper handling of piping and valves by the user, which can result from lack of awareness, illiteracy, or failures in piping or sealants. - Low-probability events may impact the integrity and safety of the NG network and components during the years of the operation phase - Geological and geotechnical events: earthquakes may result in geotechnical instabilities that lead to network breakage or leakage in multiple locations simultaneously. - Sabotage: pipelines and other components may be targeted for sabotage. Adverse impact is expected in raising the fear of disruption of Gas supply 	Negative	Minor
Risk of Economic disturbance	- For those who will pay in installments, this may be an added financial burden on the poor families. Also, 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	Minor
Impacts due to Covid-19 pandemic	- During the project maintenance or check NG meter activities, Movement of staff inside houses may increase the risk of transmission of COVID-19 to Community members.	Negative	Minor



6. Analysis of Alternatives

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

In **March 2014** an Environmental and Social Impact Assessment Framework (ESIAF) was developed for 11 of the project's Governorates followed by update of the ESIAF in **January 2017** to cover the expansion of the project in a new 9 Governorates including Cairo Governorate.

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

6.1 Pipeline Installation Technology Alternatives

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

6.1.1 Trenchless Technologies

HDD anticipated three times for Cairo intermediate Pressure pipelines routes (the 1st HDD Crossing will be about 60 m of Gohar Al Kaed street in El Magharplyn district and the 2nd HDD Crossing will be about 100 m of the Subway (first line) in Tora district)¹⁵. HDD¹⁶ 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 used for larger distances and wider range of pipeline diameters.

¹⁵ See figure number 2-13

¹⁶ See figure number 2-14



- 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.

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 is the recommended solution in the four studied project districts since the pipeline route passes through urban and local roads.

6.2 Routing, regulators, working time and payment

Description and details of the preferred routing selected, types of regulators, preferred working hours to avoid the rush hours, as well as the alternative of payment for installations costs are discussed in details in the ESIAF developed for the whole project; 2.3 million Natural Gas Connections Project in 20 Governorates.¹⁷

¹⁷ <https://www.egas.com.eg/sites/default/files/2019-06/updated%20environmental%20and%20social%20impact%20assessment%20framework%20for%2020%20governorates.pdf>



7. Environmental and Social Management & Monitoring Plan

7.1 Objectives of the ESM&MP

The Environmental and Social Management and Monitoring Plan (ESMMP) consists of a set of mitigation, management and monitoring measures to be taken during implementation of the project to avoid, reduce, mitigate, or compensate or offset any adverse social and environmental impacts analyzed in the previous chapter. The ESMMP distinguishes between mitigation measures and monitoring plans that should be implemented during the construction and operation of the project.

The ESMMP identifies certain roles and responsibilities for different stakeholders for implementing, supervising and monitoring the environmental and social performance of the project as well as some of their estimate costs during its life cycle. Roles and responsibilities for implementing the ESMMP during the construction and operation phases have been proposed. During construction EGAS/LDC will assign supervision staff who will undertake supervision over the contractor to make sure that the mitigation measures specified in the design/tender document are implemented in the field.

Overall, the following Environmental and Social measures are complementary to and do not substitute compliance to the detailed updated HSE guidelines, procedures, and actions adopted by EGAS and its subsidiary LDCs. Annex-2 attached to this study.

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

7.2 Environmental and Social Management Matrix during CONSTRUCTION

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

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Physical receptor	Degradation of soil quality	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - LDC HSE Contractor 	<ul style="list-style-type: none"> - LDC HSE 	Field supervision (audits)	<ul style="list-style-type: none"> - Contractor costs - LDC management costs
Physical receptor	Air emission	<ul style="list-style-type: none"> - Controlled wetting and compaction of excavation/backfilling surrounding area - Excavated soil stockpiles and stored sand (if any) should be located in sheltered areas. Stored fine sand should be covered with appropriate covering material, 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. - Disposal of excavation/construction waste should be in locations licensed by the local authority. - Compliance to legal limits of air emissions from all relevant equipment - Availability of 24-7 hotline service (129) to all beneficiaries and the public for reporting possible leaks, damages or emergencies - Quick response to gas leaks by evacuation of the affected area - Repair or replacement of failed component 	Minor-negligible	<ul style="list-style-type: none"> - Excavation Contractor LDC HSE 	<ul style="list-style-type: none"> - LDC HSE 	<ul style="list-style-type: none"> - Contractual clauses - Field supervision - Measure & document emissions of machinery by regular audits request emission measurements 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
	Vibration	<ul style="list-style-type: none"> - Before any excavation Activities near any historical or old building, LDC will get all the required permissions from the Egyptian Ministry of Antiquities which in turn will fully supervise all processes. - Operate earth-moving equipment on the construction lot as faraway from vibration-sensitive sites as possible. - Earth-moving, ground-impacting and HDD machines shall not be operated in the same time period (unlike noise, the total vibration level produced could be substantially less when each vibration source operates separately). 	negligible	Excavation Contractor LDC HSE	<ul style="list-style-type: none"> - LDC HSE - Egyptian Ministry of Antiquities 	<ul style="list-style-type: none"> - Contractual clauses - Field supervision 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs
Physical receptor	Noise	<ul style="list-style-type: none"> - Restrictions on lorry movements to prevent noise nuisance in the early morning/late evening - All machine and vehicles should be shut-off when not used. - choosing vehicles, equipment of a good technical specifications and status - good maintenance of these equipment to reduce the resulted noise - effective scheduling of construction activities to avoid the overlap of noise sources - All machinery to be fitted with effective exhaust silencers. - Air compressors should be of the type, which is sound reduced with properly, lined and sealed acoustic cover and to be operated with the covers closed - All machine and vehicles should be shut-off when not used. - Avoid noisy works at night whenever possible - Avoid construction activities during peak hours of heavy traffic whenever possible; especially when project site is in proximity of a sensitive receptor. - Ear muffs, ear plugs, certified noise PPE for workers - Noise exposure periods should be minimized for workers so as not to exceed the safe limits mentioned in the 	Minor	<ul style="list-style-type: none"> - LDC HSE - Excavation Contractor 	<ul style="list-style-type: none"> - LDC HSE 	<ul style="list-style-type: none"> - Contractual clauses - Field supervision (audits) - Complaints receipt from local administration 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		environmental laws in addition to the occupational health and safety standards. <ul style="list-style-type: none"> Workers operating in areas or activities of high noise level intensities should be supplied with earmuffs Contractors should train all the workers before the commencement of construction activities about this hazard and how to avoid it. 					
Physical receptor	waste generation	<u>Non-hazardous waste accumulation:</u> <ul style="list-style-type: none"> Allocating certain areas, in each Sector, for stockpiling waste soil and construction waste, in coordination with the local authority. No soil stockpiling is allowed on banks of waterways. Segregate waste streams to the extent possible to facilitate re-use/recycling, if applicable Maximize re-use of excavation waste as backfill for natural gas pipeline trenches. Reuse non-hazardous waste to the extent possible Estimate size of fleet required to transport wastes. Normally asphalt waste could be disposed of with other excavation waste/aggregates in the local non-hazardous waste site. Solid waste from unlikely scenarios such as domestic site activities (such as temporary offices or rest areas) should be addressed in specific waste management plans, as appropriate 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 	Minor	<ul style="list-style-type: none"> LDC Excavation Contractor 	<ul style="list-style-type: none"> LDC HSE 	<ul style="list-style-type: none"> Contractual clauses Monitoring of waste management plan Field supervision 	<ul style="list-style-type: none"> Contractor costs LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Physical receptor	waste generation	<p><u>Hazardous waste accumulation:</u></p> <ul style="list-style-type: none"> – 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 LDC depots for temporary storage until disposal at a hazardous waste facility (Nassreya /Unico). – Transfer to LDC depots for temporary storage – Disposal at licensed Alexandria hazardous waste facilities (Nassreya) by licensed contractors. – If hazardous waste quantities generated are too small for isolated transport to the Nassreya /Unico landfill, a temporary storage site can be created. Coordination with waste authority will be imperative to secure a location and implement adequate procedures for storage depending on quantities and type of wastes until collection and shipping to Nassreya /Unico landfill. – Hand-over selected oils and lubricants and their containers to Petrotrade for recycling – 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. – Adequate management of asbestos and any possible hazardous waste – Minimize fueling, lubricating and any activity onsite that would entail production of hazardous materials empty containers – Pre-Plan the anticipated amounts of hazardous liquid materials (such as paint, oils, lubricants, fuel) to be used in the various activities in order to minimize leftovers and residuals. 	Minor	<ul style="list-style-type: none"> – LDC – Excavation – Contractor – Water Authority + contractor – LDC – Excavation – Contractor 	– LDC HSE	<ul style="list-style-type: none"> – Field supervision and review of certified waste handling, transportation, and disposal chain of custody – Field supervision + review of Water Authority manifests 	<ul style="list-style-type: none"> – 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): 8000 EGP - 10000 EGP per ton – Contractor costs – LDC management costs



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		<ul style="list-style-type: none"> - Preplanning drainage of dewatering water (subsurface water) and taking necessary permits from the Water and Wastewater Company, or irrigation authority. No land disposal should be accepted for the water - If dewatering is taking place from a contaminated trench, or contains hydrocarbons that could be observed or smelled, contaminated water should be collected in barrels and transported to a wastewater treatment facility. - Testing the subsurface water sample before selecting the appropriate disposal option - Asphalt waste may contain hazardous components, such as tar, lubricating oils, heavy metals, etc. However, its solid nature minimizes the transport risk of such components to the environment. Disposal of asphalt waste to the municipal waste disposal site is common practice in Egypt as this is normally not associated with significant environmental risks because of the dry weather nature of the country. - 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: <ul style="list-style-type: none"> - 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 					

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Social receptor (health and safety)	Impacts on occupational health and safety	<ul style="list-style-type: none"> - The project will hire a qualified contractor/sub-contractor with the high health and safety standards. In addition, the ToR for the contractor and the ESMP will provide the provision of the health, safety and precaution of the environmental impacts and its mitigation measures to be followed during construction - Standard protection by placing clear project signs. - Time management for vehicles movement; especially avoiding the peak hours - Standard protection for the workers especially working at elevated heights or trench. - Regular inspection to compelling worker to use their PPE - Specialized trainings for technicians and supervisors - 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 - The new contracts with contactors/subcontractors will include an annex for the mitigation of the labor management procedures. The annex will include all the social requirements in the worker ' contract such as: <ul style="list-style-type: none"> - The right of the worker to know all the terms and conditions of his contract. (Salary, business hours, insurance, etc.. - Ensuring that there are adequate facilities for workers (cafeteria, health care facilities, toilet) - Worker GRM, that allows the worker to submit his complaint. 	Minor	<ul style="list-style-type: none"> - LDC - Excavation Contractor 	<ul style="list-style-type: none"> - LDC - HSE Department 	<ul style="list-style-type: none"> - Field supervision inspection and review of HSE report+ Field supervision (audits) 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		<ul style="list-style-type: none"> - Medical report should be submitted for all workers prior to join the work site and Drug Test should be conducted every 3-6 months. - The contractor also will be obliged to maintain daily attendance sheets in order to verify the age of workers and maintain evidence for their attendance to ensure 6 working days and 1 day off per week for all workers and to be able in case of accidents to provide the injured persons with proper benefits of the health insurance. - Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals adopted by EGAS - All workers should be trained on using their right to stop the work in case they identified unsafe action/ condition. - Segregate/ barricade work areas. - The safety work Permits in general will be issued before each activity on site by the LDC safety team according to the Updated EGAS HSE guidelines (Annex-2) - Ensure the provision of the appropriate personal protective Equipment and other equipment needed to ensure compliance to HSE manuals 					
Social receptor (health and safety)	Impacts due to COVID-19 pandemic	<p>Assessing Workforce Characteristics</p> <ul style="list-style-type: none"> - minimize contact and keep mask of face and a distance not less than 1 meter with community people <p>Entry/Exit to the Work Site and Checks on Commencement of Work</p> <ul style="list-style-type: none"> - Confirm that workers are fit for work - Check and record temperatures of workers - Update daily personnel count log(in/out) in each area/ working site 	Minor	LDC	<ul style="list-style-type: none"> - LDC Patrolling committees - EGAS HSE department 	<ul style="list-style-type: none"> - Field supervision inspection and review of HSE report+ Field supervision (audits) 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		<ul style="list-style-type: none"> - Provide briefings to workers prior to commencing work, focusing on COVID-19 specific considerations, and reminding workers to self-monitor for possible symptoms and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell - Prevent a worker from an affected area or who has been in contact with an infected person from returning to the site for 14 days or isolating such worker for 14 days. - Prevent sick workers from entering the site, referring them to local health <p>General Hygiene</p> <ul style="list-style-type: none"> - Train workers and staff on site on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular hand washing and social distancing) and what to do if they or other people have symptoms - Place informative, illustrative posters and signs around the site, - Ensure hand washing facilities supplied with soap, disposable paper towels and closed waste bins exist at key places throughout the site, if such facilities aren't available then Alcohol based sanitizers should be supplied <p>Cleaning and Waste Disposal</p> <ul style="list-style-type: none"> - Provide adequate cleaning equipment, materials, and appropriate PPE (face masks, gloves,...) as necessary - Train on appropriate cleaning procedures and appropriate frequency in high use or high-risk areas - Train on proper hygiene, how to use PPE and waste control <p>Adjusting Work Practices</p> <ul style="list-style-type: none"> - Adapting work processes to enable social distancing and training workers on these processes - Continuing with usual safety trainings include use of PPE, adding COVID-19 specific considerations 					

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		<ul style="list-style-type: none"> - Review overall work schedule and assess whether adjustments are needed, considering Government advice and instructions <p>Project Medical Services</p> <p>Local Medical and Other Services</p> <ul style="list-style-type: none"> - Any suspected case should leave site immediately and referred to the nearest hospital / local medical facility for medical examination - any suspected cases should self-quarantine for 14 days <p>Instances or Spread of the Virus</p> <ul style="list-style-type: none"> - If a worker has symptoms of COVID-19, the worker should be removed immediately from work activities - The worker should be referred to the local health facilities to be tested. - Implement sanitization practices in affected sites - Inform fellow workers of possible exposure to the virus if a worker is confirmed to have Covid-19 infection but maintain confidentiality <p>Training and Communication with Workers</p> <ul style="list-style-type: none"> - Workers are made aware of the procedures that have been put in place by the project, and their own responsibilities in implementing them - Training is conducted regularly, providing workers with a clear understanding of how they are expected to behave and carry out their work duties <p>In addition to EMOP and WBG Guidelines related to COVID-19 infection (Annex-8).</p>					
Social receptor	Child Labor	<ul style="list-style-type: none"> - The project will hire a qualified contractor/sub-contractor with the high health and safety standards. In addition, the ToR for the contractor and the ESMP will provide the provision of the health, safety and precaution of the environmental impacts and its mitigation measures to be followed during construction. 	Minor - Negligible	<ul style="list-style-type: none"> - LDC - Excavation Contractor /subcontractor 	<ul style="list-style-type: none"> - LDC HSE department 	<ul style="list-style-type: none"> - Field supervision and review of HSE report+ Field supervision (audits) 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		<ul style="list-style-type: none"> – Rigid obligations and penalties will be added to the contractor ToR in order to warrantee no child Labor is occurred in the project – The ToR also will oblige the contractor to keep a copy of IDs of Laborers in order to monitor the hired staff below 18 years old – The contractor also will be obliged to maintain daily attendance sheets in order to verify the attendance of workers to ensure first, that workers below 18 years old are not included on site. 					
Social receptor (health and safety)	Disturbance to Community due to Labor Influx	<p>In order to minimize impacts pertaining to labor influx the following should be thoroughly implemented:</p> <ul style="list-style-type: none"> – Preparation of appropriate code of conduct that stipulates the different commitment of labor towards community groups and the different behavior that should be avoided (please see Annex-9 of this report). – All workers should be trained on the Code of Conduct. – All workers should sign their attendance to the code of conduct training. – All workers should be trained on the Code of Conduct and using their right to alert any worker violating the code of conduct and to report in case they identified unethical action/ condition. – Code of conduct to be signed by sub-contractor. – Code of conduct induction to be done every 2 weeks for the recurrent workers and the new comers before starting work. – According to availability, try to rent all apartments in the same building. – Apply the full requirements related to operating the grievance mechanism, including anonymous channels – Raising awareness of the local populations about the project commitment towards communities’ and the measures taken 	Minor	<ul style="list-style-type: none"> – Contractors and subcontractors 	<ul style="list-style-type: none"> – LDC HSE for guidance supervision 	<ul style="list-style-type: none"> – Field supervision by LDC and EGAS. – Received grievances 	<ul style="list-style-type: none"> – Contractor costs – LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		for that through public consultation and focus group discussions _ Apply Penalties to workers violating the code of conduct.					
Community	Traffic congestion	_ Excavation during off-peak periods as example to avoid governmental employees and schools' entry and exist times. _ Time limited excavation permits granted by local authority& traffic department _ Safety precautions taken during night driving will be according to Updated EGAS HSE guidelines (Annex-2) _ Coordination with traffic department (ministry of interior) for vehicles route and movement	Minor	_ LDC _ Excavation contractors	_ LDC HSE+ _ 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, for example: _ Coordination with commercials shops and schools. _ Coordination with surrounding factories. _ Flag man will be considered whenever needed	Minor	_ LDC _ Excavation contractors	_ LDC HSE _ Local Unit _ Traffic Dept.	_ Ensure inclusion in contract + Field supervision	
		_ Establishing temporary workshops and storage areas in a wide, low residence and low traffic streets. _ The workshops and storage areas will be established with a kind of arrangement with LCU to avoid any disturbance to people and traffic. _ Safety signs (warning/ mandatory/ prohibition/ allowance) will be provided and posted on sites	Minor	_ LDC _ Excavation contractors	_ LDC HSE _ Local Unit _ Traffic Dept.	_ Field supervision _ Conditional permit _ Fluidity of traffic flow	
		_ Apply Horizontal Directional Drilling under critical intersections whenever possible to avoid heavy traffic delays	Minor	_ Contractor	_ LDC HSE	_ Field supervision	



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community		<ul style="list-style-type: none"> Traffic detours and diversion 	Minor	<ul style="list-style-type: none"> Traffic Department Contractor 	<ul style="list-style-type: none"> Traffic Department LDC HSE 	<ul style="list-style-type: none"> Field supervision for detouring efficiency Complaints received from traffic department 	<ul style="list-style-type: none"> Additional budget not required
		Road restructuring and closing of lanes	Minor			<ul style="list-style-type: none"> Fluidity of traffic flow 	
		<ul style="list-style-type: none"> Arrange Restoration and re-pavement 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. 	Negligible	<ul style="list-style-type: none"> LDC HSE Subcontractor 	<ul style="list-style-type: none"> LDC HSE EGAS 	<ul style="list-style-type: none"> Field supervision Coordination with LGA as needed 	<ul style="list-style-type: none"> Included in re-pavement budget agreed by LDC with local units or Roads and Bridges Directorate

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community	Affecting children in the proximity of their schools	<ul style="list-style-type: none"> - As an avoidance measure, constructions in the proximity of schools should be avoided during the entrance and exit times. - The contractor is obliged to use yellow warning caution tape. - The contractor is obliged to use safety warning signs onsite in Arabic and English - Arrangement with school administration to avoid dismissing children without informing site engineer in order to be ready for supporting children. - The contractor should secure safe access roads to children. In case of excavating close to the entrance gate, the site workers should be sure that a proper access is installed. - The contractor should ask school administration's support to share information with the school children in terms of safety aspects - Workers should oversee children exit/ entrance roads to avoid any accidents - The detailed grievance mechanism (GRM) is presented in Annex-11 attached to this report is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues 	Minor	<ul style="list-style-type: none"> - LDC (HSE+SDO) - Excavation Contractor 	<ul style="list-style-type: none"> - LDC HSE - LGA 	<ul style="list-style-type: none"> - Field supervision - Coordination with LGA as needed 	<ul style="list-style-type: none"> - Contractor costs - LDC management costs



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community	Affecting Walking People in the streets or living in narrow or blocked streets might by establishing temporary workshops in their streets.	<p>As an avoidance measure:</p> <ul style="list-style-type: none"> Working in the workshops should be avoided at night. Establishing temporary workshops and storage areas in a wide, low residence and low traffic streets The contractor is obliged to use yellow warning caution tapes and signs. The contractor should secure safe access roads to people. In case of excavating across the street entrance, the site workers should be sure that a proper access is installed. The contractor should work only within his workshop boundaries. Ensure transparent information sharing about excavation (time and duration) The detailed grievance mechanism (GRM) is presented in Annex-11 attached to this report is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues 	Minor	<ul style="list-style-type: none"> LDC Excavation Contractor 	LDC HSE	<ul style="list-style-type: none"> Field supervision Coordination with LGA as needed 	<ul style="list-style-type: none"> Contractor costs LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community	Lack of accessibility to businesses due to delay in street rehabilitation	<ul style="list-style-type: none"> – Access to business due to digging out the streets will be mitigated through enabling alternative entrances to the business. Also, special wooden bars will be used to enable the shoppers to get into the markets. Additionally, the duration of work will not exceed one working day. In case of digging main streets in the commercial areas, this can be only done during night after business closing. – Notify business owners about that work plan before construction giving them time to adapt – Follow up the procedure of Grievance Redress Mechanism – Ensure transparent information sharing – The telephone numbers of the social development officer responsible for grievances should be shared with the community people. – Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues 	Minor	<ul style="list-style-type: none"> – LDC – HSE+ – SDO – Excavation Contractor 	<ul style="list-style-type: none"> – EGAS (SDO) – LDC – HSE+SDO 	<ul style="list-style-type: none"> – Ensure the implementation of GRM – Supervision on Contractors performance 	No cost



Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community	Threat to Safety of users and houses (due to limited level of awareness and misconceptions)	<p>Awareness raising campaigns should be tailored in cooperation with the community-based organizations. The following are some mitigation procedures to be adopted:</p> <ul style="list-style-type: none"> _ Using caution tapes that help to keep people away of the site, _ Informing residents and shopkeepers about the timeline of the project (street by street) as well as the working hours in order for the residents to know when to avoid certain streets _ The detailed grievance mechanism (GRM) is presented in Annex-11 attached to this report is to be shared with the community beneficiaries. Informing residents through posters about the project details, location signing up to the network and receiving the system, project-level GRM Additionally, they will be availed in the customer services office. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues _ Install wooden bars or decks over trenches to allow safe crossing _ A worker should support old people to cross the digging areas, especially, on the wooden bars 	Minor	<ul style="list-style-type: none"> - During the construction - LDC - HSE+ - SDO 	<ul style="list-style-type: none"> - EGAS (SDO) - LDC - HSE+SDO 	<ul style="list-style-type: none"> - List of awareness activities applied - Lists of participants - Documentation with photos - Awareness reports 	<ul style="list-style-type: none"> - 40838 EGP per awareness raising campaign - 40838 EGP for brochure and leaflets to be distributed (material available by EGAS)

Community	Damage to underground utilities resulting in water/wastewater leaks, telecommunication and electricity interruptions	<p>_ Coordination with departments of potable water, wastewater, electricity, and telecom authorities to obtain maps/ data on underground utilities, whenever available</p> <p>_ Mitigation measures for avoiding breaking underground utilities and infrastructure pipes:</p> <p>_ Collecting most accurate maps for underground utilities and infrastructure routes from Information Centers in the various Governorates and asking them for site markings, whenever available, and making such data available to the contractor prior to commencing the works.</p> <p>_ If maps/data are unavailable, perform limited trial pits or boreholes to explore and identify underground utility lines using non-intrusive equipment</p> <p>_ Once underground utilities are mapped or uncovered, horizontal and vertical clearances between natural gas lines and electricity lines must be respected for safety considerations.</p> <p>_ LDCs follow established procedures to deal with emergency situations related to breaking underground utility and infrastructure lines. The company supervisor stops work in the affected area, calls the Police Department and emergency department in the relevant utilities company for immediate repair of the damage, which the contractor is invoiced for. The mitigation measures below focus on preventive measures and documentation</p> <p>_ In case an underground utility and infrastructure pipe has been damaged, standard procedures should be followed, as described before, in addition to preparing a documentation report for the accident. <u>The documentation report should include:</u></p> <ul style="list-style-type: none"> • Time and place of accident; • Name of contractor; • Type of underground utilities, infrastructure line; • Description of accident circumstances & causes; • Actions taken and responses of different parties, such as infrastructure company; • Duration of fixing the damage; and • Damage caused (description shall be according to observation, expertise judgment, reports of infrastructure company). <p>_ Repair and rehabilitation of damaged components</p>	Negligible	- LDC HSE Excavation Contractor	LDC HSE	<ul style="list-style-type: none"> - Official coordination proceedings signed by representatives of utility authorities - Examination of site-specific reports and records - Field supervision 	<ul style="list-style-type: none"> - Contractor management costs - LDC management costs

7.3 Environmental and Social Management Matrix during OPERATION

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

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Community	risk on Community health and safety	<p>Possibility of Gas leakage:</p> <ul style="list-style-type: none"> 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 ERP should be activated and posted in different places inside the PRS. (Annex-10) <p>Drills will be conducted quarterly/ bi- annually with records.</p>	Negligible	<ul style="list-style-type: none"> LDC HSE+SDO 	<ul style="list-style-type: none"> EGAS (HSE+SDO) 	<ul style="list-style-type: none"> Complaints raised due to Gas leakage 	<ul style="list-style-type: none"> LDC management costs
Community	Risk on Community health and safety	<p>Network integrity:</p> <ul style="list-style-type: none"> Detailed review of the geotechnical history of the project district Development of a full emergency response plan 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 & the public for reporting possible leaks, damages or emergencies Quick response to gas leaks by evacuation of the affected area Repair or replacement of failed component Scheduled inspection and preventive maintenance activities Inspection will include any activities that could potentially lead to damage in the pipeline In case of emergency, the source of the leak will be isolated until the maintenance team performs the required maintenance Signs will be posted over the pipeline path showing the numbers to be called in case of emergency 	Negligible	<ul style="list-style-type: none"> LDC 	<ul style="list-style-type: none"> LDC HSE. 	<ul style="list-style-type: none"> Map and local geotechnical report review Site inspections Awareness actions Periodical drills 	<ul style="list-style-type: none"> LDC management costs

Community	Risk of economic disturbance Financial burden on economically disadvantaged due to the installments: _ Information should be provided to people in order to be fully aware about the different available options to cover and paying the installation cost. _ Also, posters and leaflets could be published and distributed in the contracting offices. LPG distributors: _ LPG distributors should be informed about the NG potential areas in order to enable them to find alternative areas They should be informed about the GRM in order to enable them to voice any hardship.	Negligible	_ LDC (SDO) _ LGA	_ LDC (SDO) in coordination with LGA	_ Complaints raised by LPG distributors to the LGA due to loss of jobs	_ No cost
	Impacts due to COVID-19 pandemic Assessing Workforce Characteristics _ Minimize contact and keep mask of face and a distance not less than 1 meter with community people Entry/Exit to the Houses for NG check meters and maintenance activities _ Confirm that workers are fit for work _ Provide briefings to workers prior to commencing work, focusing on COVID-19 specific considerations, and reminding workers to self-monitor for possible symptoms and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell _ Prevent a worker from an affected area or who has been in contact with an infected person from returning to work for 14 days or isolating such worker for 14 days. _ Prevent sick workers from entering the houses, referring them to local health General Hygiene _ Train workers and staff on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular hand washing and social distancing) and what to do if they or other people have symptoms Adjusting Work Practices _ Adapting work processes to enable social distancing and training workers on these processes	Negligible	_ LDC	_ LDC Patrolling committees _ EGAS HSE department	_ Field supervision inspection and review of HSE report+ Field supervision (audits)	_ Contractor costs _ LDC management costs

- Continuing with usual safety trainings include use of PPE, adding COVID-19 specific considerations
- Review overall work schedule and assess whether adjustments are needed, considering Government advice and instructions

Project Medical Services

Local Medical and Other Services

- Any suspected case should leave work immediately and referred to the nearest hospital / local medical facility for medical examination
- any suspected cases should self-quarantine for 14 days

Instances or Spread of the Virus

- If a worker has symptoms of COVID-19, the worker should be removed immediately from work activities
- The worker should be referred to the local health facilities to be tested.
- Implement sanitization practices for workers
- Inform fellow workers of possible exposure to the virus if a worker is confirmed to have Covid-19 infection but maintain confidentiality

Training and Communication with Workers

- Workers are made aware of the procedures that have been put in place by the project, and their own responsibilities in implementing them
- Training is conducted regularly, providing workers with a clear understanding of how they are expected to behave and carry out their work duties

Using alternative methods for NG meters readings

- Raising awareness of local community about different ways to report their NG meters reading through online website or phone calls or in the posters on their doors to avoid direct contact with workers.

In addition to EMOP and WBG Guidelines related to COVID-19 infection ([Annex-8](#)).



7.4 Monitoring and Review

Procedures to monitor and measure the effectiveness of the management plan, as well as compliance with any related legal and/or contractual obligations and regulatory requirements will be established. In addition to recording information to track performance and establishing relevant operational controls, dynamic mechanisms, such as internal inspections and audits, where relevant, to verify compliance and progress toward the desired outcomes will be utilized.

Monitoring will normally include recording information to track performance and comparing this against requirements in the management plan. The monitoring results shall be documented and the necessary corrective and preventive actions in the amended management plans shall be identified consequently.

7.4.1 Monitoring procedures

In order to fulfil the monitoring requirements and to ensure that any non-compliances are corrected, the following tasks should be followed:

- LDC HSE staff is responsible to carry out Monthly periodic audits to follow up on ESMP implementation.
- Any observed non-compliance is recorded and corrective actions requested.
- LDC report these non-compliances and the corrective actions taken to EGAS in their monthly reports.

EGAS has signed a new contractor with PETROSAFE company (as an independent entity) to conduct the supervision, monitoring visits on behalf of EGAS to ensure that all mitigation measures are appropriately adhered to, non-compliances are reported to the LDC and an action plan to correct the situation is requested and followed within the LDC monthly reports to EGAS.

7.5 Environmental and Social Monitoring Matrix during CONSTRUCTION

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

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Physical receptor	Degradation of soil quality	_ Observation of good housekeeping and waste management	LDC HSE	During construction. Monthly reports	Construction site	Site inspection and document inspection	LDC management costs
Physical receptor	Air emission	_ HC, CO%, opacity, TSP, PM10 and PM 2.5	LDC HSE	Once before construction + once every six months for each vehicle	Construction site	Measurements and reporting of dust and exhaust emissions of construction activities machinery Complaint's log	LDC management costs
Physical receptor	Noise	_ Noise intensity, exposure durations and noise impacts	LDC HSE	weekly during site inspections	Construction site (residential area or near sensitive receptors such as hospitals)	Measurements of noise levels Complaint's log	LDC management costs
		_ Complaints from residents	LDC HSE +SDO	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Physical receptor	waste generation	Observation of accumulated waste piles	LDC HSE	During construction.	Construction site	Documentation in HSE monthly reports	LDC management costs
		Observation of water accumulations resulting from dewatering (if encountered)	LDC HSE	During construction. Monthly reports	Around construction site	HSE monthly reports	LDC management costs
		Chain-of-custody and implementation of domestic wastewater (sewage)management	LDC HSE	During construction. Monthly reports	Construction site	Site inspection and document inspection	LDC management costs
Social receptor (health and safety)	Impacts on occupational health and safety	<ul style="list-style-type: none"> _ Total number of complaints raised by workers _ Periodic Health report _ safety inspection record _ Periodic safety report _ insurance policy and Attendees lists with workers IDs _ The insurance expiry dates. 	LDC HSE +SDO	Daily Biannual Daily Monthly Daily Daily	Construction site	Documentation in H&S monthly reports Complaints log	No cost
Social receptor (health and safety)	Impacts due to COVID-19 pandemic	<ul style="list-style-type: none"> _ Number of Suspected or confirmed Covid-19 cases, their location, condition, and all related actions taken _ Periodic Health report 	LDC Covid-19 Patrolling committee EGAS HSE	Daily	Construction site	As per the instructions of the Ministry of Petroleum (MoP), Patrolling committees have been formed across all LDCs to ensure that mitigation measures are being implemented on all construction sites, these committees report to EGAS on daily basis whereas EGAS report to MoP on weekly basis	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Social receptor	Child Labor	<ul style="list-style-type: none"> _ Attendee's lists with workers IDs are in place. _ Complaints and accidents reports. 	LDC HSE	Monthly for construction sites	Construction site	<ul style="list-style-type: none"> _ Safety supervisor observe the Laborers _ Random checkup for Laborers IDs 	LDC management costs
Social receptor (health and safety)	Disturbance to Community due to Labor Influx	<ul style="list-style-type: none"> _ Code of conduct is in place _ A list of workers who have attended the proper training on code of conduct (with dates). _ Complaints raised by the local community GRM. _ Conduct spot checks/audits on the worker's behaviors during field visits. 	LDC HSE	When reported and during field visits at least monthly	Construction sites	Supervision & reporting	Contractor Cost
Community	Traffic congestion	Comments and notifications from Traffic Department	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports Complaints log	LDC management costs
Community	Destruction of streets and pavement	<ul style="list-style-type: none"> _ Streets quality after finishing digging _ Number of complaints due to street damage 	LDC HSE+SDO, EGAS (SDO)	Three times per year, each three months	Site and Desk work	Checklists and complaints log	No cost



Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Community	Affecting children by excavating in the proximity of their schools	<ul style="list-style-type: none"> - Assuring the coordination with schools before the construction work. - Presence of yellow warning tapes in the project sites. - Presence of Secured safe access roads to children in case of excavating close to the entrance gate. 	LDC HSE, EGAS	Monthly during construction Quarterly monitoring	Construction site	<ul style="list-style-type: none"> - Reports - Photos - Lists of participants 	LDC management costs
	Affecting Walking People in the streets or living in narrow or blocked streets might by establishing temporary workshops in their streets.	<ul style="list-style-type: none"> - Presence of project signs with details about projects sites, timeline of the implementation and GRM. - Number of awareness raising implemented for children in school. - Number of participants in information dissemination - Number of complaints due to excavating work 					

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Community	Lack of accessibility to businesses due to delay in street rehabilitation	_ Presence of alternative entrances to the business. _ Presence of special wooden bars in front of businesses doors, to be used to enable the shoppers to get into the shops. _ Number of participants in information dissemination. _ Number of complaints due to excavating work	LDC HSE, EGAS	Monthly during construction Quarterly monitoring	Construction site	_ Reports _ Photos _ Lists of participants	LDC management costs
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 HSE, EGAS	Monthly during construction Quarterly monitoring	Office	_ Reports _ Photos _ Lists of participants	LDC management costs



Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Community	Damage to underground utilities resulting in water/wastewater leaks, telecommunication and electricity	<ul style="list-style-type: none"> _ Official coordination reports with relevant authorities _ Accidents documentation 	LDC HSE	Monthly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs



7.6 Environmental and Social Monitoring Matrix during OPERATION

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

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Community	Risk on Community health and safety	<p>Possibility of Gas leakage:</p> <ul style="list-style-type: none"> _ Complaints raised by the community people _ Number of leakage accidents reported/raised 	LDC HSE+SDO, EGAS	Quarterly	Site and Desk work	Complaints log LDC	No cost
		<p>Network integrity:</p> <ul style="list-style-type: none"> _ Earthquakes or geotechnical settlements _ Emergency response time and corrective actions during emergency drills _ Reports of alteration or tampering with any gas components 	LDC HSE	Bi-annual inspections and annual emergency response drills	Along the network and inside and outside households	Inspection, leakage detection, running the drills	LDC management costs



Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Community	Risk of economic disturbance	<u>Financial burden on economically disadvantaged due to the installments:</u> _ Number of economically disadvantaged people who complained _ Number of those who can't pay the installment	LDC SDO	Quarterly	Desk work	Complaints log	No cost
		<u>LPG distributors:</u> _ Grievance received from the informal LPG distributors _ Information shared with them	LDC SDO and EGAS	Quarterly	Desk work	Complaints log	No cost



7.7 Reporting of Mitigation and Monitoring Activities

During construction and operation, environmental performance against targets is reviewed by management on a monthly basis and reported to the contractor and LDC. The plan is designed to record incidents and to ensure investigation, root cause analysis, corrective action and follow up. Records are kept of all incidents, investigations and actions.

Regulatory and HSE reporting systems will be brought together on a monthly basis to be collated and input into the LDC's (Town Gas) reporting system to be submitted to EGAS' Environment Department during the construction phase.

During operation, the reporting of any occurrence and /or the result will take the following path:

- recording of the nature and scale of the occurrence;
- reporting to the necessary competent/ responsible persons; and
- Internal reporting and external regulatory notification.

7.7.1 During the Construction phase reports should include as a minimum

- Monthly report for the implementation of the ESMMP submitted by the contractor to LDC HSE staff.
- Monthly report on incident and complaint from the surrounding establishments and residents nearby the construction site.
- Unusual traffic delays or accident caused during construction or any complaints received should be reported in the monthly report prepared by the construction contractor supervisor. And /or permits and any comments or recommendations by Traffic Department
- Monthly report should include any incidents of high dust emissions or smoke during construction works including the natural dust that might be encountered.
- Monthly report should include number of near misses and number of incidents include injuries.
- There should be a form prepared by LDC's HSE department for the contractor to keep records of quantities, types of wastes received and the location where it has been received from.
- The monthly report of HSE supervisor from LDC should an evaluation of the contractor's compliance to mitigation measures and any comments noticed by the HSE site supervisor about mismanagement of construction waste during the month.
- The HSE team from LDC observer should report on the monthly basis of the accident or the worker's obedience.
- Reporting on the monthly basis, the total number and the type of heavy equipment use during the construction phase.



- Monthly report on health and safety performance. This report will include any incident and complaint regarding health and safety measures perform by the contractor.
- Monthly report on GRM. This report will include (as a minimum) number of received grievances monthly, type of grievance received, number of grievances solved and closed / unsolved (reasons for not solving them).
- Daily report to be prepared on construction work of the intermediate pipeline construction works.

7.7.2 Reporting of severe incidents

- In case of worker/community work-related severe accidents or fatalities, immediate reporting should take place by the LDC to the relevant regulatory authorities and to the Project Management at EGAS.
- EGAS will report the major accident to the World Bank within 24 hours at the latest.
- The report will be including all actions taken by LDC to investigate the root cause of the accident and the plan to prevent the occurrence of future accidents will be included in the final investigation report

7.7.3 During the operation phase reports should include as a minimum

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

7.8 Emergency Response Plan

Town Gas developed an Emergency Response Plan (ERP) which relates to its operations for the PRS and for its intermediate and low-pressure distribution network. The purpose of this document is to outline emergency responsibilities, organizational arrangements and responses and procedures to be followed by personnel based in the field in the event of an emergency. The said ERP will be inline with EGAS's Emergency Response Plan Main Elements & Notification Procedures Summary, kindly refer to [Annex-10](#) attached to this report.

Emergency Levels are classified as Levels (Level 1, Level 2 and Level 3) as following:

The first level of Emergency:

- Potential hazards to life, safety, property and the environment are limited, and do not exceed the emergency zone or the boundaries of the public site or facility.
- The personnel of the enterprise or the site possess adequate training, capacity, personal protection equipment and necessary tools to manage and control the situation, and there is no need for external assistance.
- Alarm bells are not required to warn those outside the site or facility.
- The situation does not require evacuation of the emergency zone.



- There is no possibility of losing control or escalating the situation.
- The accident management team is not used.

The Second level of Emergency:

- There is a serious risk to life, safety, property and the environment and may exceed the limits of the emergency zone, but do not exceed the limits of the public site or facility.
- There is a need to use the assistance of external parties to manage the emergency, or at least the presence of stand-by team in the presence of a potential escalation of the situation, but the situation does not extend its influence outside the facility or site.
- Members of the facility or site do not have sufficient capacity or resources to deal with the incident
- Requires evacuation and / or warnings to warn those outside the emergency zone
- Security breach or situation leading to constant threat to life and safety
- Accident management team intervenes

The Third level of Emergency:

- There is a serious risk to life, safety, property and the environment and may exceed the limits of the emergency zone and the possibility of exceeding the limits of the public site or facility.
- There is a need to use the help of external parties to fight fire, rescue, dealing with hazardous materials, large number of injuries and deaths.
- Measures must be taken to protect units, nearby areas and / or communities and the environment beyond the boundaries of the public site or facility
- There is a potential risk that the reputation of the company, its business or its revenues will be affected
- Any incident involving the exit of the operating system beyond the limits of safe operation with the possibility of escalation
- There is a danger to the public
- There is a possibility to start or run the communication system for emergency reporting
- The accident management team is used.

7.8.1 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.



7.9 Institutional Framework for ESM&MP Implementation

7.9.1 Environmental Management Structures

EGAS is the supervisory body. **Town Gas** is the implementing body. Being the implementing body of the natural gas network in project districts, **Town Gas** has a direct involvement with the environmental management and monitoring of the natural gas network. They have a wide range of experience in managing occupational health and safety aspects. Also, they have a good knowledge in environmental and social aspects. Town Gas has assigned social officers (SDOs) in all project districts. However, they are still enhancing their capacity in terms of managing environmental and social aspects. Therefore, an upgrade in their environmental and social capacity will be recommended.

One of the standard tasks of the HSE Departments of Town Gas, supervised by EGAS, is to ensure that the Environmental and Social Management Plan of the project is implemented in all the phases of the Project. There must be an immediate training to inform health and safety, social and environmental staff about the management plan.

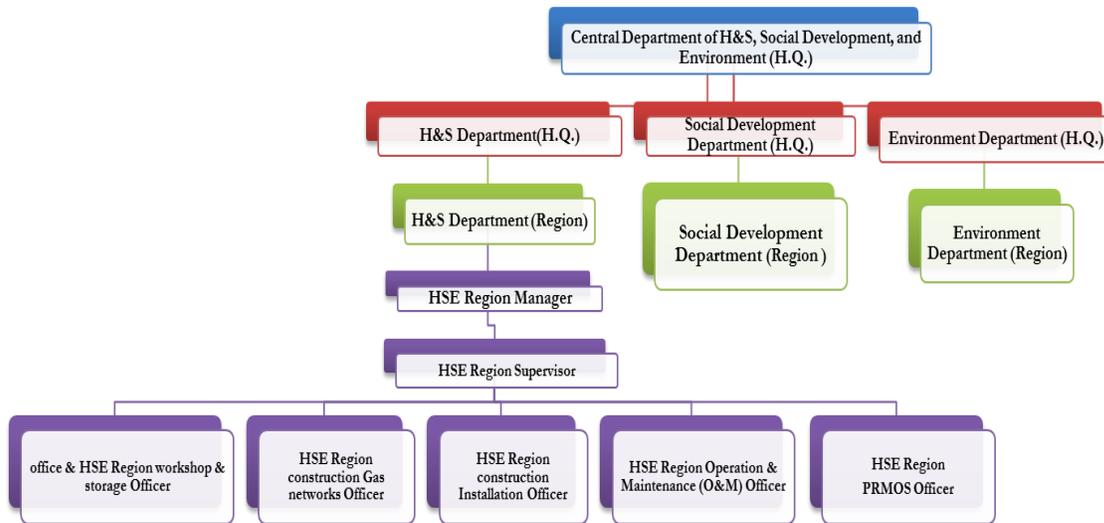


Figure 7-1: Town Gas H&S organizational structure.

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

- Worker and contractor compliance to Updated EGAS HSE Guidelines.
- Occurrence of HSE incidents and suggestions for incident avoidance
- Management of broken asphalt (if any), unused backfill, solid waste, metal scrap
- Management of paint cans, refueling & lubrication, soil contamination
- Checking that handling of hazardous waste is done according to the requirements of the Environmental Law, where a permit for handling hazardous material and Hazardous wastes is issued from EGAS Environment Department
- Other tasks as outlined in ESM & MP



Daily reports are to be compiled and sent to the regional HSE officer for preparation of monthly summary reports.

Monthly reports are sent to HSE officer at Town Gas head office for compilation into quarterly reports to EGAS.

Moreover, EGAS has signed a new contract with PETROSAFE company (as an independent entity) to conduct the supervision, monitoring visits on behalf of EGAS to ensure that all mitigation measures are appropriately adhered to, non-compliances are reported to the LDC and an action plan to correct the situation is requested and followed within the LDC monthly reports to EGAS.

7.9.2 Required Actions

- Involvement of OHS, environmental and social officers in the initial phase of the project planning.
- Following up the updated EGAS HSE Guideline
- Town Gas should keep internal training and awareness for site engineers and HSE officers with OHS, environmental and social courses focused on implementation of the ESMP

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

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

Identifying, preventing and managing unanticipated impacts are facilitated by a grievance redress mechanism (GRM).

Well-designed and implemented GRMs can help project management significantly enhance operational efficiency in a variety of ways, including generating public awareness about the project and its objectives; deterring fraud and corruption; mitigating risk; providing project staff with practical suggestions/feedback that allows them to be more accountable, transparent, and responsive to beneficiaries; assessing the effectiveness of internal organizational processes; and increasing stakeholder involvement in the project. For task teams more specifically, an effective GRM can help catch problems before they become more serious or widespread, thereby preserving the project's funds and its reputation. The LDC has an internal division responsible of receiving, record and track resolution of grievances.

Effective grievance management helps to:

- Build trust through having a dialogue with stakeholders.
- Detect weak signal and propose solution.



- Reduce risk of conflict between the affiliate and local communities.
- Reduce risk of litigation by seeking fair solutions through mediation in the event of an established impact.
- Identify and manage unanticipated impacts of operation.
- Avoid delays to operations and additional costs.
- Avoid future impacts through analysis of weak signals.

The detailed grievance mechanism (GRM) below is to be shared with the community beneficiaries. Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be available in the customer services office. It is worth mentioning that the customer’s services offices are the main channel to receive complaints of Town Gas clients all over the country, while the hotline is the main channel to receive complaints in the emergency cases. On the other hand, GRM system for the current project has been tailored to handle the complaints of the project beneficiaries in a professionally manner. Thus, sufficient and appropriate information about the GRM will be disseminated to the communities prior to the construction phase. Information dissemination about the GRM should be shared with the beneficiaries during the process of contracting and disclosed in the contracting office and other publicly accessible venues. Following are the various stages of grievances. The proposed mechanism is built on three tiers of grievances:

1. The level of site engineer of Town Gas in the project area.
2. On the level of LDC headquarter
3. On the level of EGAS

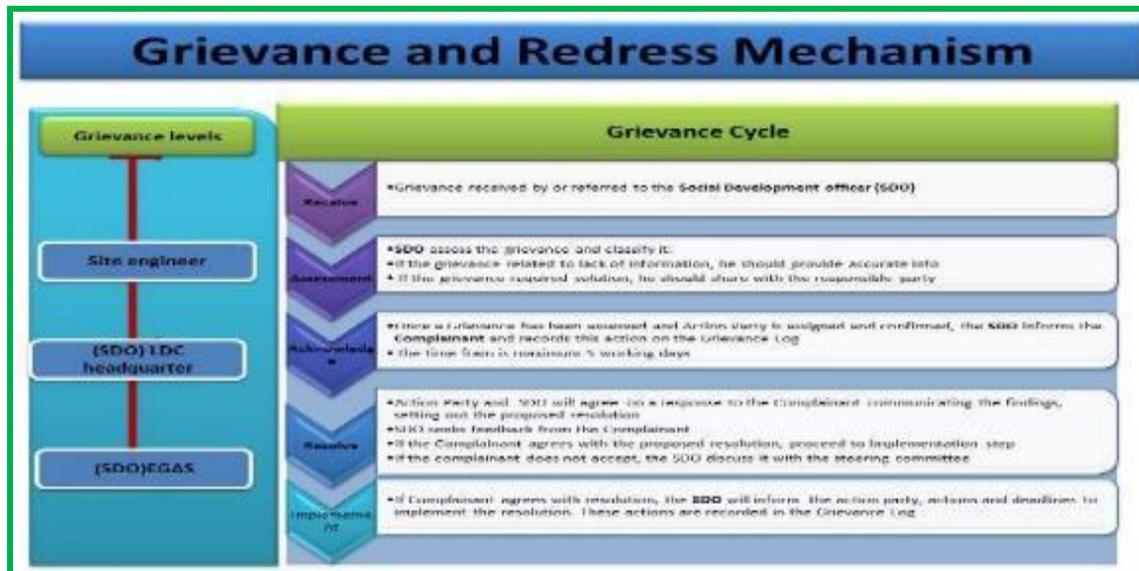


Figure 7-2 Proposed Grievance and Redress Mechanism



7.10.1.1 First tier of grievances

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

The grievances should be presented to the following:

- The foreman working on the ground in the study area,
- The project manager in the study area,

The regional department of Town Gas in Cairo Governorate, it is worth noting that most of the previous experience of EGAS is suggesting that complaints are usually handled efficiently and resolved on the local level. In case the problem is not solved, the complainant may reach out to the second level of grievance

7.10.1.2 Second tier of grievances:

If the aggrieved person is not satisfied with the decision of the first tier, they can present the case to Town Gas headquarters. SDO where they should provide resolution within 10 business days, following is the second level of grievances:

- The Social Development Officer in Town Gas headquarters will handle technical, environmental and land acquisition complaints. Town Gas headquarters SDO should receive the unsolved problems. Thereafter, the SDO gets in contact with the petitioner for more information and forwards the complaint to the implementing entities for a solution.
- The SDO should follow the complaints and document how they were solved within 10 business days.

7.10.1.3 Third tier of grievances:

If the aggrieved person is not satisfied with the decision of the SDOs of Town Gas at Stage 2, they can present the case to EGAS SDO where they should provide resolution within 10 business days. The following section presents the third level of grievances:

- The Social Development Officer in EGAS will handle technical, environmental and land acquisition complaints. He should receive the unsolved problems. Thereafter, they get in



contact with the petitioner for more information and forward the complaint to the implementing entities for a solution.

- The SDO should follow the complaints and document how they were solved within 10 business days.
- The SDO should update the complainant on the outcome of his/her complaint.

7.10.1.4 Grievance channels

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

- Foremen act as the main channel for complaints. They are always available on the construction sites. However, complaints raised to him/her are mostly verbal. Thus, s/he should document all received grievances in writing form using a fixed serial number that the complainant should be informed about to be able to follow up on the complaint.
- Phone numbers of site engineer and SDO.
- Hotline: 129 is the hotline for Town Gas.
- The SDO within the LDC and EGAS
- Egyptian Governmental portal and Ministry of Petroleum website.
- Trustworthy people, community leaders and NGOs/CDAs will be an appropriate channel to guide petitioner about the various tiers of grievances

7.10.1.5 Response to grievances

Response to grievance will be through the following channels:

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



7.10.1.6 Worker Grievances

- The Egyptian Labor Law No. 12 for the year 2003 provides for the Formal Grievance Procedure in case a worker, who has been laid-off, discharged, dismissed, removed, or otherwise terminated from employment. So, The Project Management Unit (PMU) will require the Contractor/subcontractors to develop and implement a Grievance Redress Mechanism (GRM) for their own workforce before the start of civil works. The GRM must be well circulated and written in a language understood by all. The new contracts with contactors/subcontractors will include an annex with mitigation measures to address labor management issues, through having in place of the labor management procedures. One of the main items that will be included in the annex is the Worker GRM, which allows the worker to submit his complaint.

The workers GRM will include:

- Channels to receive grievances such as comment/complaint form, suggestion boxes, email, a telephone number and hotline, including reaching out to the LDC
- Stipulated timeframes to respond to grievances;
- A register to record and track the timely resolution of grievances;
- A responsible section/committee to receive, record and track resolution of grievances.

Monitoring of grievances

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

Table 7-5 Means of verification and indicators

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



Institutional Responsibility for the Grievances

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

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

(For more information about GRM and Town Gas complaint form, please see [Annex-11](#))



8. Stakeholder Engagement and Public Consultation

The public consultation section aims to highlight the key consultation and community engagement activities that took place as part of the preparation of the ESIA and ESMPs and their outcomes. More than 2.6 million households in Cairo governorate are already connected to the natural gas network. The NG connection services have started in Cairo districts since the beginning of 1990s. In line with the strategy of the Ministry of Petroleum in promoting the utilization of Natural Gas in the household sector to reduce the LPG subsidy, the World Bank has partially financed the Greater Cairo Gas Connections project. The project was completed by the year 2012, and more than 350 thousand residential customers were connected with Natural Gas services.

The current natural gas connection project in 11 Egyptian governorates financed by WBG is as an integral part of the country energy strategy, which calls for greater use of natural gas in all sectors. The main purpose of the project is to connect natural gas services to 1.5 million households. By the year 2018, a final approval by the WBG has obtained to add up new nine governorates to join the project (with a capacity of 800 thousand households), and increase the number of the total beneficiaries from 1.5 million to 2.3 million households. Therefore, the new household's connections in Cairo governorate districts are supplementary to the current existing natural gas connection network in Cairo. A public consultation session for the new nine governorates (Cairo, Luxor, Assiut, Menia, Bani Suef, Fayum, Kafr Elshekh, El Behira and Damitta) was held in October 10th, 2016. An updated ESIAF for the whole project (20 governorates) was prepared and cleared by the WBG and disclosed on EGAS website. Further consultation activities were conducted during the year 2020-2021 for the purpose of preparing the current ESMP. Due to the current situation of Covid-19 pandemic and the required precaution, measures, limited consultation activities were held in some of Cairo selected districts.

All Consultation activities showed an overwhelming acceptance of the consulted participants to host the NG. Their willingness to be connected to the NG, some potential beneficiaries expressed their willingness to pay the installation cost in cash, while others were much in favor to pay in installment. This high level of enthusiasm from the local communities towards the project is attributed to the high level of awareness of the benefits of the natural gas and the current hardships that the households are facing to secure LPG provision and usage.



8.1 Legal framework for consultation

The consultation activities used multiple tools and mechanisms (scoping, interviews, focus group discussions, public hearings/consultations) with various stakeholders and community people in the host communities were held for the proposed 2.3 million household NG connections project in compliance with the following legislations:

- WBG policies related to disclosure and public consultation, namely,
 - o World Bank Operational Policy (OP 4.01).
 - o Directive and Procedure on Access to Information
- Law 4/1994 modified by Law 9/2009 and its amendments
- Egyptian regulations related to the public consultation

While WBG safeguards and regulations state that, a minimum of two large-scale, well- publicized public consultation sessions are a must for projects classified as category “A” projects like the one at hand, the second public consultation was cancelled due to the precaution measures to prevent the spread of Covid-19 pandemic. Additional consultation efforts (for example through focus group discussions, in-depth meetings, and interviews) were implemented to reach the most vulnerable and difficult to reach community members.

8.2 Consultation objectives

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

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

The consultation outcomes will be used to:

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

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



8.3 Defining the stakeholder

In order to ensure an inclusive and meaningful consultation process, a stakeholder's analysis was conducted to get better understanding of the various groups and their roles, interests and influence on the project. For the purpose of this site specific ESMP, a focused stakeholders' identification shown in Table 8-1, was developed to identify the key groups of relevance to the project in this specific location. The main identified groups are very similar to those identified on the Governorate level but on a smaller scale. Local communities involving both men and women of projects beneficiaries, as well as the PAPs, local NGOs/CDAs, contractors and suppliers were among the key stakeholders on the local level.

Table 8-1: Stakeholders identified in Cairo Governorate

Stakeholder Category	Stakeholder Group	Relevance/Importance of the Stakeholder to the Project
Communities in the project sites	Residents of communities within the project Districts: <ul style="list-style-type: none"> • El Hikestep. • Bab El Sharia. • 15th of May • Helwan. • Zahraa El Maadi. 	Residents of these communities are more likely to be adversely affected by environmental and social impacts; for example, traffic during construction and other impacts relating to community health and safety. Residents of local communities will also potentially benefit from job opportunities or other positive economic outcomes, particularly; they will have access to the natural gas.
	Residents of other districts of Cairo Governorate	Residents of other districts in Cairo will benefit from job opportunities available in the project. Additionally, they will benefit from the savings of the LPG cylinders result due to the project implementation
	Vulnerable groups within the local communities	Vulnerable groups may be likely to be adversely affected by environmental and social impacts, while also being least likely to benefit from the Project. Women, disabled, old people and children might get injured if they crossed the excavated areas in main streets and allies. Children also may fall down in the excavated areas
	Small business owners	Local businesses have the potential to benefit economically from the Project. However, as local residents this group also have the potential to be impacted by any social and environmental risks and impacts (positive and/or negative). For example, the effects of excavation work.
Businesses outside of the Area of Influence	Suppliers and contractors	They will benefit from any supplies available for the project.
	Project Workforce (both direct and through	Project workers



Stakeholder Category	Stakeholder Group	Relevance/Importance of the Stakeholder to the Project
subcontractors)		a sound worker-management relationship is key for the sustainability of a company.
	Health care providers	Community health care providers Health institutions Health services providers
Health care providers	Health institutions Health services providers	The Project will secure health facilities to the workers through contracting health facility in Cairo to provide required service
NGOs and civil society	El Shoban El Moslemein, Resala, Misr El Kheir NGOs	NGOs might share information about the project: terms of contracting and safety measures of the NG
National government stakeholders	Egyptian Environmental Affair Agency	Responsible for reviewing and approving ESIA/ESMPs, and monitoring implementation of the Environmental Management Plan
	Information Centers on the districts level	Provide NG companies with underground utilities and infrastructure maps.
	Security Department	Secure the construction sites and prevent people from in- flushing into it
	Ministry of Antiquities	Very important to issue permissions for excavations and accompany the working teams,
	Ministry of Transportation	This Ministry may have interest in issues relating to transportation and traffic planning related to the Project.
	General Authority for Roads, Bridges and Land Transport	Responsible for permitting related to any road work for the Project (e.g., road cutting)
	Cairo Governorate Authority	They are cooperating with the project in terms of facilitating permissions and coordinating with other local Governmental authorities.
Local/provincial government stakeholders	District authorities Units	The District Authorities will perform rehabilitation of roads, which is one of the major issues raised by the community. Provision of solid waste management facility.
	Media	Television and radio representatives Newspaper Websites
Universities and Educational institutes	Faculty of Engineering	Review and enrich the ESMP study with feedback
	Secondary vocational schools	Propose needed capacity building for their students to potentially find employment with the project
	Researchers/consultants	Review results of the study and provide feedback



Stakeholder Category	Stakeholder Group	Relevance/Importance of the Stakeholder to the Project
Petroleum companies	EGAS	Implementing agency overseeing activities of the Environmental and Social Management Plan
	Town Gas	Local distribution company (LDC) who will implement, operate, and manage the ESMP
	Butagasco	It is the firm responsible for the LPG distribution. They will benefit from the project in terms of reducing the demand on LPG cylinders
	Petro trade	They are the responsible entity for collecting the consumption fees and the bank installment.

The abovementioned stakeholders were consulted using various tools (i.e. individual interviews, group meetings and public consultation). Most of the stakeholders have attended the public consultation hearings for the nine new governorates, conducted during October 2016. However, some of them were interviewed in their premises in order to enable them to spell out their concerns and worries freely.

8.4 Consultation Methodology and Activities

The research team for this study has adopted multi-dimensional consultation activities that enable the marginalized, voiceless, youth and women to gain information about the project. As well as, gaining information about their concerns and worries that regarding the project during various implementation phases. Due to the current situation of Covid-19 pandemic and the required precaution, measures, the research team has adopted a new methodology for consultation; about 140 persons attended more than 20 group meetings at the project districts as a replacement of the second public consultation session. (See lists of participants Annex-13), Following are the methodology and the main consultation activities adopted by the research team:

1. The study team visited the project districts in order to define various stakeholders.
2. The study team divided the various engagement activities of the project to:
 - Scoping phase,
 - Data collection phase,
 - Consultation activities.
3. The study team has adopted many tools during the consultation process such as:
 - Conducting Focus Group Discussions (FGDs) with the local communities.
 - Conducting panel meetings with the governmental officials and potential affected people.
 - Public consultation session.



4. Consultation activities have been developed for the different communities through the following phases:
- Phase I: Preparation of the updated ESIAF for Natural Gas Connection project in 20 governorates, 2016. [Annex-12-](#)
 - Phase II: The Consultation activities for the current ESMP conducted in Cairo selected districts during December, and January 2020/2021. [\(see lists of participants Annex-13\)](#).
5. Information sharing/stakeholder engagement related activities prior and during the construction works
- Place informative, illustrative posters and signs around the project sites including time plan, digging areas, and GRM.
 - Coordination with traffic authority and have time management for vehicles movement to avoid the peak hours.
 - Consultation with shops and shopping areas to enabling alternative entrances to the business.
 - Consultation with schools to secure safe access roads to children (In case of excavating close to the entrance gate).

All activities conducted were documented with photos and lists of participants in order to warrant appropriate level of transparency as following:

Table 8-2: Summary of Consultation Activities in Cairo Governorate (2016 - 2021)

Participants	Number		Methods	Date
	Males	Females		
During the Preparation of Updated ESIAF for Natural Gas Connection Project for 20 Governorates				
Government officials	25	7	Public Consultation Session	10 th October, 2016
Potential Beneficiaries.	37	10		
.Non-Governmental Organization	9	3		
Media	6	5		
Universities Representatives	4	1		
EEAA	1	6		
Petroleum Sector	32	13		
Electricity Sector	10	1		
Total	124	46		



During the Preparation of The Current ESMP at Selected Cairo Districts				
Participants	Males	Females	Methods	Date
Bab El Sharia District:				
Government officials	4	2	FGD & Individual interviews	23 rd December 2020
Community Potential Beneficiaries	9	3	FGD & Individual interviews	
Media Representatives		1	Individual interviews	
Affected Persons (LPG vendors)	4		FGD & Individual interviews	
Town Gas	2		Individual interviews	
Bab El Sharia Total	19	6		
Helwan District:				
Government Officials	3	1	FGD & Individual interviews	17 th December 2020
Community Potential Beneficiaries.	13	15	FGD & Individual interviews	
Potential Affected Persons PAPs	4		Individual interviews	
Petroleum Sector	3		FGD	
Helwan District Total	23	16		
15th of May District:				
Government Officials	3	1	FGD & Individual interviews	10 th December 2020
Community Potential Beneficiaries.	9	3	FGD & Individual interviews	
Potential Affected Persons PAPs	9		FGD & Individual interviews	
Petroleum Sector	4		FGD	
15th of May District Total	25	4		
Participants				
	Males	Females	Methods	Date

Zahraa El Maadi District

Government Officials	1	3	FGD & Individual interviews	11 th January 2021
Community Potential Beneficiaries.	9	4	FGD & Individual interviews	
Potential Affected Persons PAPs	2		Individual interviews	
Petroleum Sector	3		FGD	
Zahraa El Maadi District Total	15	7		

El Hikestep District:

Government Officials	2		FGD & Individual interviews	20 th December 2020
Community Potential Beneficiaries.	9	12	FGD & Individual interviews	
Petroleum Sector	2		FGD	
El Hikestep District Total	13	12		

Participants	Males	Females	Methods	Date
Cairo Districts Total	95	45		
	140			



Figure 8-1: Shows ESIAF Public consultation, October 2016



Figure 8-2: Shows consultation activities in Cairo districts during 2020/2021.

8.5 Summary of consultation activities

The field research team engaged in a number of social activities. These activities include focus group discussions with potential beneficiaries; and with potential affected people (LPG vendors and business owners), in-depth discussions with government officials, representatives of civil society, and community leaders. A consultation meeting was held at the District Authorities Units at the selected districts in Cairo Governorate, where the public officials of Governorate stressed on expediting the implementation of the project in all Cairo districts.

Throughout the discussions, interviewees were asked about six main points:

- The type of fuels currently in use, and its associated problems.
- The criteria of areas to be connected to natural gas.
- The upsides and downsides of NG, compared to other types of fuels.
- The effects of the project during constructions and operations.
- The cost of NG installation to households and the high bill of monthly consumption, which goes up nearly every year.
- The future positive/negative impact of NG connections project.

It was notable that the reactions and attitudes of the local communities towards the project are in favor of the project. The field research team noted a strong public support and eagerness towards the project. Beside some legitimate concerns expressed by the public, the field research team recorded the general view that NG is a far better substitute for the type of fuel currently in use.

The following table illustrates the different subjects, questions, comments and responses that were discussed throughout the different consultation activities.

Table 8-3: Key comments and concerns raised during the different consultation activities, and the way they were addressed during in the ESMP study

Subject	Questions & comments	Responses	Addressed in the ESMP Study
Cost of installing NG to households and options for payments	How much is the cost of NG installation, can you inform us if there is a system of monthly installments to settle the installation fee?	<p>The cost of the installation fees (about 2350 EGP) is expensive but the Government of Egypt provides a huge subsidy to enable all citizens' benefit from the NG, and NG cost is cheaper than LPG.</p> <ul style="list-style-type: none"> • There is an agreement with the Egyptian Banks to finance the cost of connection to the client, and he/she can pay the cost in installment. • AFD in cooperation with EU provide a grant of 1500 EGP for poor people according to illegibility criteria. • Moreover, Ministry of Petroleum has announced for new initiative to encourage more people to connect NG by paying the cost in installment for 6 years at zero-interest rate. 	Section 4. Environment and Social Baseline. And section 5 Table 5-2 Impact Assessment



Subject	Questions & comments	Responses	Addressed in the ESMP Study
Criteria for natural Gas connection	Why all the households in Cairo are not connected with NG	Connection with NG requires technical conditions, such as width of the streets, the buildings conditions and the availability of other public utilities (water, sewage, and electricity). Additionally, the government policy to support NG connections to all Governorates. The Government is giving a high priority to connect NG to all households.	Section 2. Project Description
The price of NG is going up	Why the price of NG is going up? The bill is higher than before	This due to the government policy to remove energy products subsidy. However, NG is still cheaper than other fuels, in addition to its advantages comparing to LPG.	Section 4. Environment and Social Baseline.
Information sharing about NG	The people should be informed about NG.	The NG project team provided information to the communities as follow: 1- During the site visits for P&A survey 2- During the preparation of the ESIA 3- During contracting process 4- Through the hotline 129	Chapter 7. ESM&MP. Table 7.1 & table 7.2 Section 8. Stakeholder engagement
Complaint system	What if we have any complaints about the project, where we can raise our complaints	The project is adhering to a grievance mechanism. This enable anyone to submit a complaint and respond to in 10 working days	Section 7. (GRM)
Street rehabilitation & land refill	-who is responsible to rehabilitate the street and land refill after the end of construction works?	Town Gas responded to this question, as they will be the implementing agency responsible for street rehabilitation in terms of budget. However, the local district units will implement the streets rehabilitation.	Section 7. ESM&MP
Loses of income for LPG Vendors	The NG connection project will affect the source of income for LPG vendors and the distributors	NG is not going to cover all areas; the Local District Authority Units will give new license in other areas.	Section 7. ESM&MP

8.6 Summary of Consultation Results

The consultation outcomes revealed that:

- The interviews with the implemented companies revealed that, they are fully aware about security and safety procedures in accordance with the nature of the region.
- The announcement of the Ministry of Petroleum initiative to encourage more people to connect NG, by paying the cost in installment for 6 years at zero-interest rate (30 EGP/month).
- The AFD in cooperation with the European Union will provide the poor with a kind of grant to be able to install the NG (more than 50% of the NG connection cost according



to specific criteria, and the principles which have adopted by the Ministry of the Social Solidarity to determine the poor areas). This initiative has been approved and will be applied to all project districts.

- During all consultation activities conducted, participating NGOs offered to host awareness activities related to the NG project. Therefore, the study recommended the participation of the community people in sharing information about NG project with the other people especially the illiterate groups. (The recommendation is not obligated for the project).
- There are many problems related to LPG cylinders such as:
 - o The LPG cylinders are not completely full (the formal weight is 12.5 Kg. each)
 - o Some of LPG cylinders are invalid to be used due to the poor maintenance (the risks of leakage).
 - o High cost, unavailability, the exerted effort to hold and install the cylinder,
- Some concerns about LPG security and safety (the risks related to the existence of LPG cylinder within the household). The interviews and the focus group discussions revealed some concerns raised by the community regarding the NG connection such as:
 - o Actual need to provide clear information about the project and some concerns about NG security and safety.
 - o The majority of the community people cannot afford to pay NG installation costs in one installment, they strongly recommended to pay in installments.
 - o Actual need to response to grievances in timely manner.

**The key message from the consultation events carried out for this project is that:
The acceptance and the support of governmental officials and the Public for the project are very strong.**

8.7 ESMP disclosure

A final report will be published on the WBG, EGAS and Town Gas websites. A copy of the ESMP report in English and a Summary in Arabic will be made available in the customer service office. Additionally, an Arabic summary will be made available in the contracting offices. An A3 poster will be installed in the contracting office informing about the results of the ESMP and the website link for the full ESMP study.