










2.3 million Natural Gas Connections Project in 20 Governorates

Environmental and Social Impact Assessment For Armant-PRS

Luxor Governorate

Final Report

June 2022

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)
ALARP	Stands for "As Low As Reasonably Practicable", and is a term often used in the milieu of safety-critical and safety-involved systems. The ALARP principle is that the residual risk shall be as low as reasonably practicable.
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
EMOP	Egyptian Ministry of Petroleum
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management framework
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GBV	Gender-based violence
GPS	Global Positioning System
HH	Households
HP	High pressure
HSE	Health Safety and Environment
IFC	International Finance Corporation
LGU	Local Governmental Unit
LDC	Local Distribution Companies
LPG	Liquefied Petroleum Gas
mBar	milliBar
MOP	Maximum operating pressure
NG	Natural Gas
NGO	Non-Governmental Organizations
PAPs	Project affected persons
P&A	Property and Appliance Survey
PE	Poly Ethylene
PRMS	Pressure Reduction and measuring Station
PRS	Pressure Reduction Station
SDO	Social Development Officer
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SIA	Social Impact Assessment
Egypt Gas	Egypt Gas (LDC)
WBG	The World Bank Group
WHO	World Health Organization
$	United States Dollars
€	Euros

Exchange Rate: US$ = 18.68 EGP as of June 2022

Exchange Rate: € = 20.04 EGP as of June 2022

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0. Executive Summary

The objective of the proposed project is to construct a Pressure Reduction Station (PRS) at Armant Markaz, Luxor governorate in order to feed Armant district (about 7,500 households). The PRS for Armant will be designed to reduce an inlet pressure of 25-70 bar to an outlet pressure of 7 bar at a flow rate of 5,000 m^3/h. Flow rate can be increased to 10,000 m^3/h in the future according to demand increase. The new PRS will entail new land allocation, the current land location is a State-Owned Lands and was allocated to the Project according to EGAS procedures in Annex 3 and the coordination and inspection minutes of meeting between Egypt Gas (the local distribution company) and Local Government Unit (LGU) at Markaz Armant dated February 2022(**Annex-2** Land Document). Markaz Armant will take the necessary procedures to issue the final land allocation decree. The off-take point exists inside the land boundaries obtained according to the Minutes of meeting between Egypt Gas and LGU at Markaz Armant. No tenants, encroachers, residential laborers or other with customary claims or other of land use. Therefore, the WB OP/BP 4.12, will not be applicable.

The objective of the current Environmental and Social Impacts Assessment (ESIA) is to assess and propose mitigation measures for environmental and social impacts of the Armant PRS at Luxor governorate. Impacts of Natural Gas (NG) exploration, extraction, refining, and transmission addressed in are outside the scope of this ESIA. Impacts of distribution networks for different areas are separate Environmental and Social Management Plan (ESMP)

The local distribution company (LDC) responsible for project implementation in Armant is Egypt Gas.

EGAS and LDCs follow a set of agreed-upon procedures for the process of permanent Land acquisition for the construction of PRSs **Annex-3**. The procedure covers cases of land acquisition of State-Owned Lands or privately-owned Lands on a willing Buyer Willing Seller basis.

Consultation activities are conducted through the project cycle, dissemination of project information at the early stages of the project during the framework's preparation followed by consultation activities with the Project affected persons (e.g., Liquefied Petroleum Gas (LPG) distributors (formal and informal), LPG storage workers.

The proposed PRS will be located in a desert land within Armant district, Luxor governorate, about 0.95 km North East Ezbat Mostafa Qulayi, 0.45 km North new buldings not inhabited yet, 2 km North West Ezbat Abu Al Hajaj, 3.5 km North Nagaa Al Ghird, 5 Km west Nagaa Arab Al Ababdah, 6.5 Km North Armant city, 7.5 North West Armant Al Heit Village, 7.2 North East Riyana village.

The nearest residential area is Ezbat Mostafa Qulayi which is located approximately 0.95 km south west of the proposed PRS location. The project will be regulated by both the World Bank Policies and Egyptian regulations of environmental, social and occupational health and safety. A list of laws is presented in chapter 3 of this report.

The maximum air temperature varies between 22.9 °C in Jan and 40.9 °C in July whereas the average minimum temperature varies between 5.7 °C in Jan and 23.9 °C in July. The monthly average of precipitation ranges between 0.0 and 0.3 mm. The surface water resources of Luxor Governorate include the Nile River and main irrigation canals (Asfoon and Al Kalabya), in addition to other about 42 branched waterways and drainages used for agriculture and the rest for industrial and domestic uses.

The groundwater aquifers in Luxor Governorate are the quaternary and Plio-Pleistocene.

The air quality at the proposed site is exhibiting permissible limits of classic air pollutants the levels are way below the national and international guidelines.

With respect to the flora of significance, none were encountered in the proposed project area. The current PRS area is free of significant vegetation. The PRS offtake from the national grid does not come into contact with flora as it will be located inside the PRS boundaries.

Armant district is located in Luxor governorate. Municipal solid waste is collected to waste recycle factory located in Habil district by small trucks then the rejected wastes transferred to Luxor dump site.

Armant PRS is located in a desert area in Luxor governorate. The traffic surrounding Armant PRS is relatively of Low density.

The total population of Armant Markaz is 174,010 representing about 14% of the total population in Luxor governorate.

According to CAPMAS data of 2017, almost all individuals at Armant Markaz are using electricity for lighting, have access to the public water network and almost half of them connected to sanitation system. The PRS will be supplied by electricity from the National electricity grid.

The project will result in positive impacts on temporary job opportunities and potential supplies. However, it may result in some potentially negative impacts. The following is a summary table listing the impacts of relevance to the project:

Table 0-1: Impacts of relevance to the project

Potential Negative Impact	Impact significance
During Construction:	
Deterioration of soil quality	Medium
Air emissions	Minor
Noise	Medium - Minor
Occupational Health and safety	Medium
Impacts due to COVID-19 pandemic	Medium
Labor Influx	Medium
Child labor	Minor -Medium

Potential Negative Impact	Impact significance
Sexual exploitation and abuse (SEA)/ sexual harassment (SH) and gender-based violence (GBV)	Negligible
Waste generation	Medium
Traffic	Minor
Ground water contamination	Minor
Community health and safety	Minor
Impacts related to lands	Negligible
During operation:	
Occupational Health and safety	Medium
Impacts due to COVID-19 pandemic	Minor
Hazardous material and waste management	Medium
Noise	Minor

Mitigation and monitoring measures are presented in this report in chapter-7. The PRS related consultation activities in Armant covered a wide range of concerned stakeholders including individuals/households affected by the project activities, civil society organizations representing the interest of the community, and governmental bodies who will play a role in facilitating or regulating the implementation of site-specific project activities.

The surrounding individuals/households expressed their eagerness to host the project, as the natural gas will reduce their agony with the LPG cylinders. It is worth mentioning that due to the current situation of the COVID-19 pandemic and the required precautionary measures, the research team has adopted a new methodology for consultation. A limited consultation session , in addition to focus group discussions (FGD) and interviews conducted at Markaz Armant on 24th August, 2020 with 35 stakeholders. During which the public officials of the Governorate emphasized on expediting the implementation of the project in their districts.

Taking into consideration that the consultation activities is a continuous process and cover both the LP network and PRS during all the project phases. There was no single comment raised about the safety of the PRS or its activities. The PRS did not raise any concerns among the community in the vicinity area.

1. Introduction

1.1 Project Objectives

The objective of the proposed project is to construct a Pressure Reduction Station (PRS) at Armant Markaz, Luxor governorate in order to feed Armant district (7,500 households). It is worth mentioning that Low pressure network that includes Armant district is financed by the project.

The PRS for Armant will be designed to reduce an inlet pressure of 25-70 bar to an outlet pressure of 7 bar at a flow rate of 5,000 m^3/h. Flow rate can be increased to 10,000 m^3/h in the future according to demand increase.

1.2 Environmental and Social Impact Assessment (ESIA)

The ESIA is undertaken to assess and propose mitigation measures for environmental and social impacts of the PRS. Impacts of NG exploration, extraction, refining, and transmission are outside the scope of this ESIA; impacts of distribution networks for different areas are addressed in separate Environmental and Social Management Programs (ESMPs). It is worth mentioning that in **March 2014** an Environmental and Social Impact Assessment Framework (ESIAF)[1] was developed for 11 of the project's Governorates followed by an update of the ESIAF[2] in **January 2017** to cover the expansion of the project in 9 new Governorates including Luxor Governorate. In February 2021 an ESMP[3] study has been conducted for six districts in Luxor governorate named Armant, Luxor, Esna, El Habil, Munshaat El Imari and El Zenaqth districts. The aforementioned studies were cleared by the World Bank and disclosed on the EGAS website and the Bank website.

The ESIA objectives include:

- Describing project components and activities of relevance to the environmental and social impacts assessments.
- Presenting project alternatives and the no project alternative.
- Identifying and addressing relevant national and international legal requirements and guidelines
- Describing baseline environmental and social conditions
- Assessing potential site-specific environmental, social, and OHS impacts of the project
- Developing environmental & social management and monitoring plans in compliance with the relevant applicable laws
- Documenting and addressing environmental and social concerns raised by stakeholders and the Public consultation events and activities

[1] https://www.egas.com.eg/sites/default/files/201906/ESIAF%20for%20NG%20connections%20project%20for%2011%20Governorates.pdf
[2] https://www.egas.com.eg/updated-framework-studies
[3] https://www.egas.com.eg/luxor-governorate-esmp

The local distribution company (LDC) responsible for project implementation in the Armant district is Egypt Gas.

1.3 Contributors

Armant ESIA was prepared by Petrosafe (Petroleum Safety & Environmental Services Company) which is located in Cairo, Egypt with collaboration and facilitation from EGAS, Egypt Gas HSE, and Engineering Departments. The names of the Petrosafe experts who have participated in the preparation of the ESIA study are listed in **Annex-1** attached to this report.

Table 1-1: Shortlist of Main Contributors

Shortlist of Petrosafe main Team Members				
Project Manager (Senior ESIA Expert)		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

Natural Gas (NG) is processed and injected into the high-pressure lines of the National Grid (70 Bar) for transmission. Upon branching from the main lines to regional distribution networks, the pressure of the NG is lowered to 7 Bar at the PRS. An odorant is added to the NG at PRSs feeding distribution networks to residential areas[4] to facilitate detection in the event of leaks. In addition to excavation, key activities of the construction phase also include the installation of mechanical equipment.

The diagram below **Figure (2-1)** presents the components of a city's distribution network. The component covered in this ESIA is lined in red. Other components are addressed in a separate ESMP:

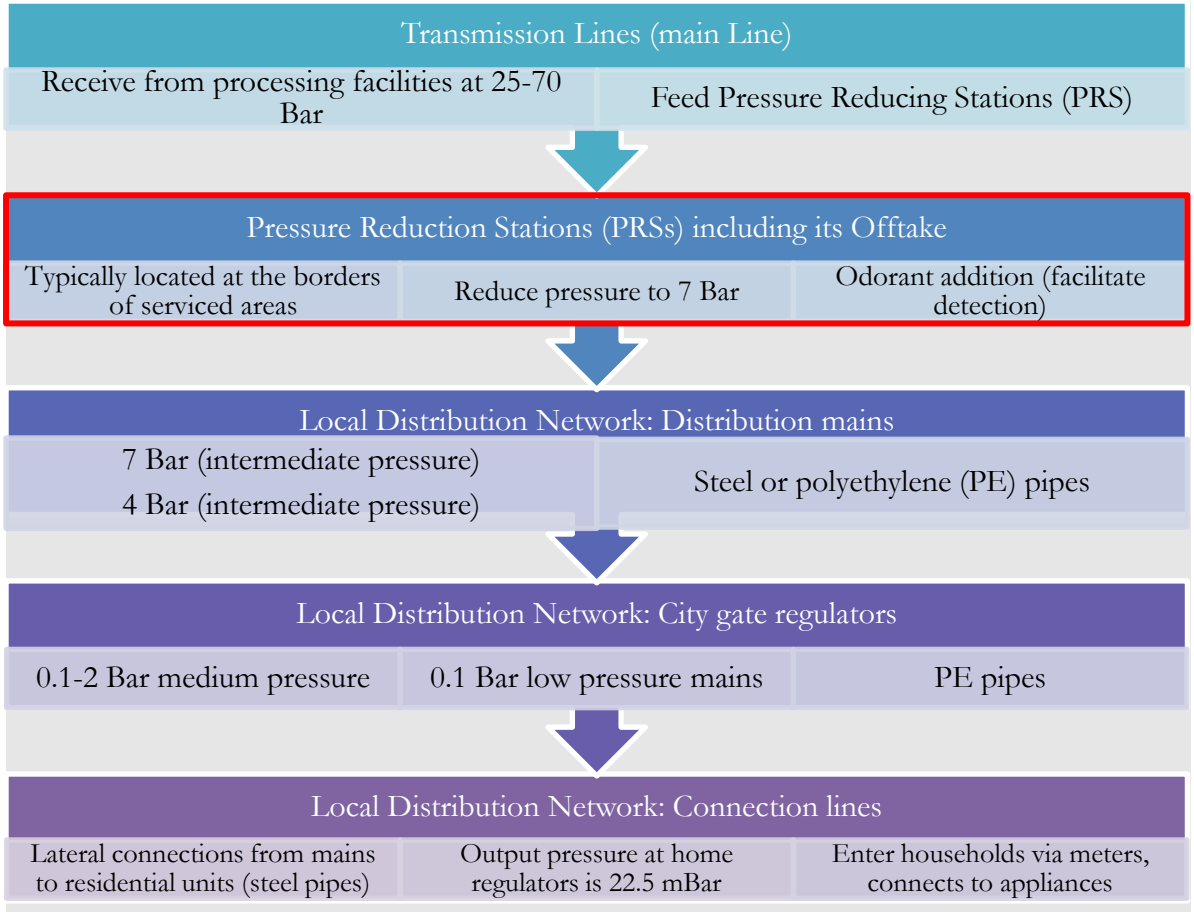

Figure 2-1: General components of the city's distribution network

[4] Because natural gas is odorless, odorants facilitate leak detection for inhabitants of residential areas.

2.2 Project Work Packages

2.2.1 Pressure Reduction Station (PRS)

The PRS consists of the following components: an inlet unit (isolated cathodic system), a liquid separation unit, a filtration unit, and equipment for automatically reducing and regulating the pressure (active regulator and monitor regulator). In addition, auxiliary devices include safety valves (Slam Shut), relief valves, odorizing unit, and ventilation equipment as shown in **Figure 2-2**.

Utilities existing in a PRS include a control room, a firefighting system (pumps [jockey, electrical, diesel pumps], firefighting water tank, firefighting valve), staff bathroom, a storage area, and an entrance room located adjacent to the entrance gate.

The proposed Armant PRS will be designed to reduce the inlet pressure of 25-70 Bar to an outlet pressure of 7 Bar at a flow rate of 5,000 m^3/h upgradable to 10,000 m^3/h capacity to feed Armant district.

2.2.2 Offtake

The national grid pipeline network has a MOP of 70 Bar. The offtake is the point on the HP national grid pipeline where a branch of the pipeline is constructed to connect the PRS to the national grid. In Armant PRS, the Off-take will be located on the high pressure (HP) pipeline "70 bar system" that lies within the boundaries of the PRS, (state-owned land , was allocated to the Project according to EGAS procedures in Annex 3 and to the coordination and inspection minutes of meeting between Egypt Gas and LGU at Markaz Armant, dated February 2022. At the offtake, there is a valve room/valve ditching to control the flow of the natural gas through the pipeline (branch).

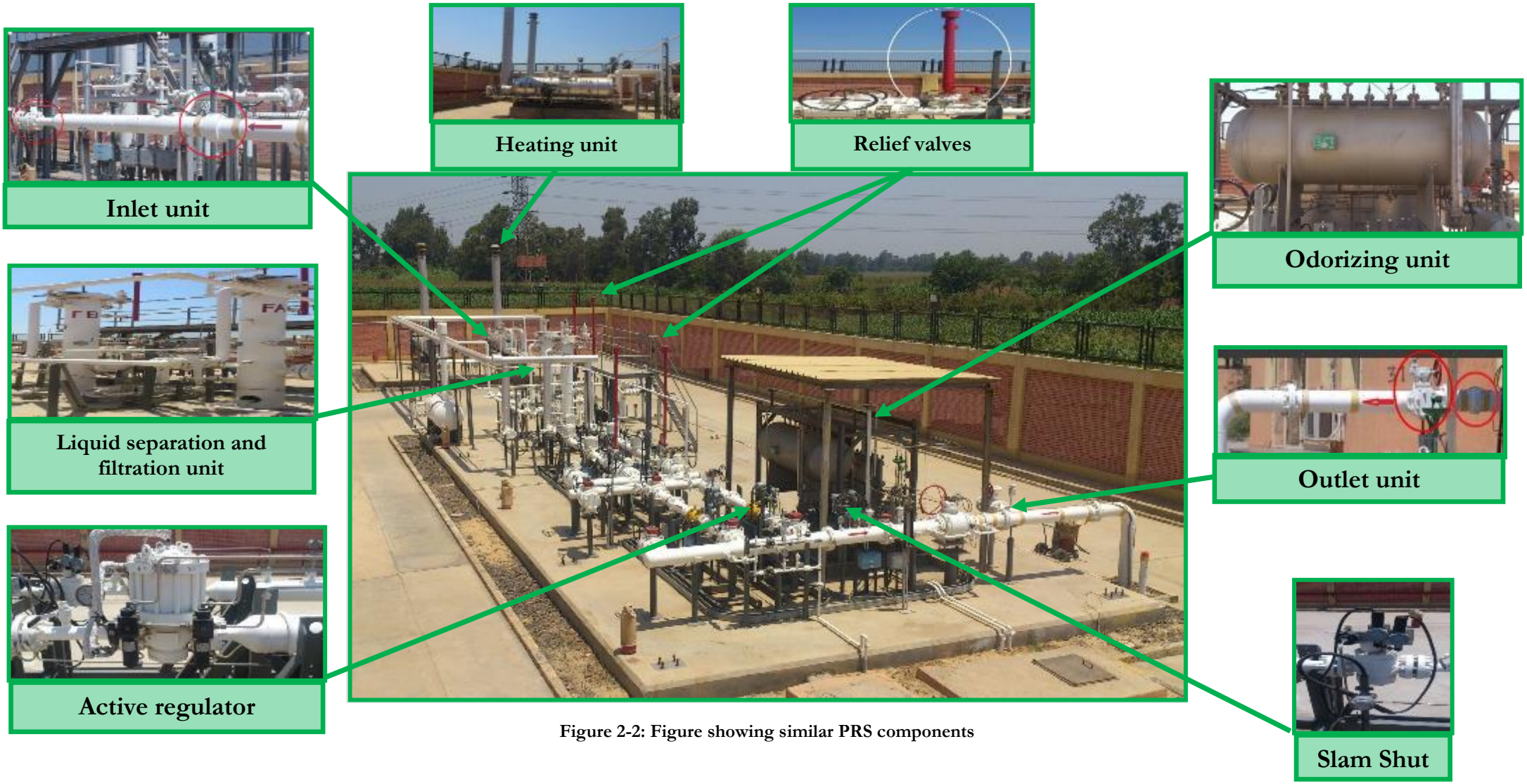

Figure 2-2: Figure showing similar PRS components

2.3 Project location

2.3.1 Pressure Reduction Station (PRS) and the Offtake

The proposed PRS will be located within El Zaydeya village, Armant Markaz, Luxor Governorate, about 0.95 km North East Ezbat Mostafa Qulayi, 0.45 km North new buldings not inhabited yet, 2 km North West Ezbat Abu Al Hajaj, 3.5 km North Nagaa Al Ghird, 5 km west Nagaa Arab Al Ababdah, 6.5 km North Armant city, 7.5 km North West Armant Al Heit Village, 7.2 km North East Riyana village, 2 km north west Riyana- Armant Road , 2.3 km north Al Gorah Road , 4.3 km north Aswan Western Agricultural Road, 7.6 km north Armant-Al Sbaeya Road. The geographical coordinates of the proposed PRS location are (latitude 25°40'7.05" N, longitude: 32°29'26.22"E). The offtake will be located on the high pressure (HP) pipeline "70 bar system" of the national gas network that is already existing within the proposed PRS land. The nearest residential area (Ezbat Mostafa Qulayi) is located approximately 0.95 km south-west of the PRS location as shown in **Figure 2-3, Figure 2-4, and Figure 2-5**

Figure 2-3: A satellite map showing the proposed location of Armant PRS and nearest residential areas.

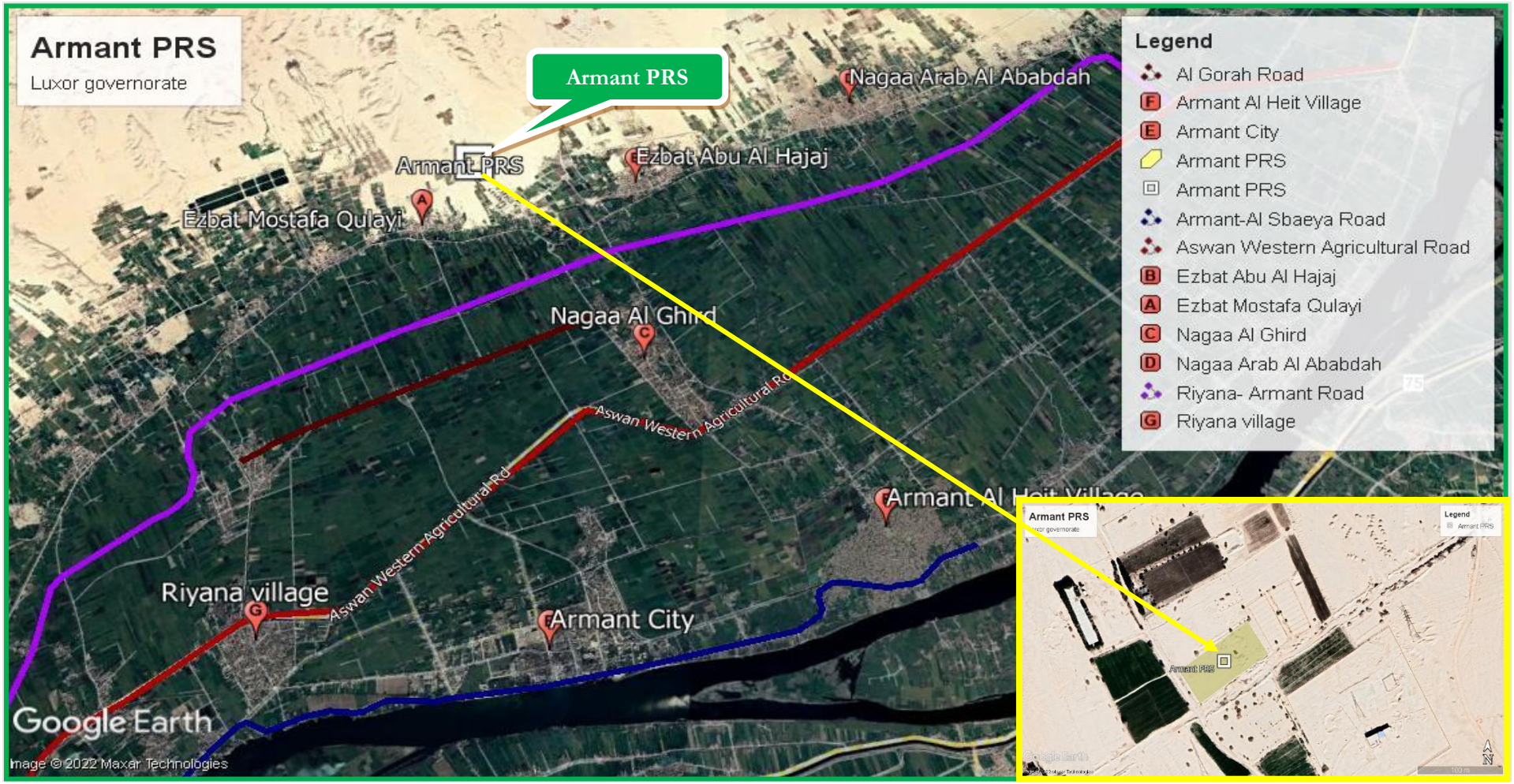

Figure 2-4: The proposed Location of Armant PRS

Figure 2-5: Pictures showing the proposed PRS and its surroundings

2.4 Project Execution Methodology

2.4.1 General survey

- Identifying availability of overhead and underground utilities in the area and their conditions (electricity, water, telephone lines, and sanitary pipelines) through data and maps from the relevant authorities.
- Identifying the location of the nearest national grid pipelines, gas networks.
- Identifying the PRS location and offtake location.
- Identify the route of inlet connection "25-70 Bar system"

2.4.2 Land allocation for the Project Activities

The new PRS will entail new land allocation, the current land location is a state-owned land, was allocated to the Project according to EGAS procedures in Annex 3 and to the Minutes of meeting between Egypt Gas and LGU at Markaz Armant, dated February 2022 (**Annex-2** land document). In the meantime, Markaz Armant will take the necessary procedures to issue the final land allocation decree. No tenants, encroachers, residential laborers or other with customary claims or other of land use.

(For further elaboration on EGAS procedures for land acquisition see **Annex-3**).

The Off-take will be located on the high pressure (HP) pipeline "70 bar system" of the national gas network that already exists within the PRS boundaries. Thus OP 4.12 is not applicable to Armant PRS, Hence, no RAPs will be required.

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

Once the final location of project components is finalized, a final design of the Offtake and PRS is utilized to estimate the materials and equipment needed to implement the project. Procurement of the materials includes local and international components. The main international purchases may include critical components and PRSs, regulators, and metering stations.

2.4.4 Construction works

2.4.4.1 Construction works of PRS

PRS area:

PRS siting was performed according to international best-practice and guided by minimizing the possible negative impacts on the project's surroundings; the safety of neighboring areas from possible gas release accidents; and noise associated with the operation of reducers. The PRS will be surrounded by a wall for safety and security purposes (including reducing noise impacts of the PRS reducers on the surrounding receptors). The nearest residential area is around 0.95 km (Ezbat Mostafa Qulayi) South West of the proposed PRS location **(Figure 2-5)**.

The PRS is to be accessible from Riyana- Armant road to ensure quick response in the event of repairs and/or emergencies.

Pressure Reduction Station Civil Works:

About a 6 weeks construction schedule is planned for Armant Proposed PRS with site preparation expected to commence in 2022after the WBG clearance and getting the related permits.

The main construction activities will include:

- Site preparation, acceptance and placement of major fabricated equipment items, construction of buildings, testing and commissioning.
- Initial construction activities involve clearing and grading of the site, sediment fences and silt traps will be installed, as necessary, to control erosion and sediment transport during site preparation activities
- Following site preparation, individual excavations will be made for fire-fighting tanks, domestic wastewater trenches, pipe racks, and a 6-m high wall (of cement) around the PRS.
- Concrete foundations for buildings and footings for mechanical equipment will be laid down;
- Facility piping (inlet, outlet and 4-inch firefighting line) both above and below ground, are installed.
- Construction of about 94 m^2 control room with a bathroom, an electrical unit's room, and a security room adjacent to the PRS.

Pressure Reduction Station Mechanical Works:

Armant PRS comprises of two pressures streams, the upstream (inlet) high pressure 25-70 Bar and the downstream (outlet) low pressure 7 Bar. The PRS design as per the Institute of Gas Engineers/ Safety Recommendations IGE/SR/9, 10, 16, 18, 22, 23, 24, 25; Institute of Gas Engineers/ Transmission Distribution IGE/TD/13; and National Fire Protection Association NFPA 15.

Following the construction of the foundation and fences, construction will continue with the installation of mechanical components. Mechanical components include the following:

- Inlet ball valve
- Solid filtration
- Liquid filtration
- Water bath heater
- Reduction regulator
- Active regulator
- Monitor regulator
- Slam shut /Safety valve
- Relief valve
- Measuring unit
- Odorizing unit
- Outlet unit

Please refer to **(Figure 2-2) and (Figure 2-6)**

Testing:

The proposed PRS will be equipped with valve and blind flange to the inlet and the outlet for the future upgrade.

In case of need for upgrade, the new facilities will be installed and connected to the system via the refereed valve to ensure the uniform supply for NG customers without any disruptions.

Following mechanical completion, testing of the facility components will be performed under the applicable standards (e.g. IGE/TD/13, IGE/UP/1, IGEM/SR/16, IGE/SR/9,22,23,24,25,…etc).

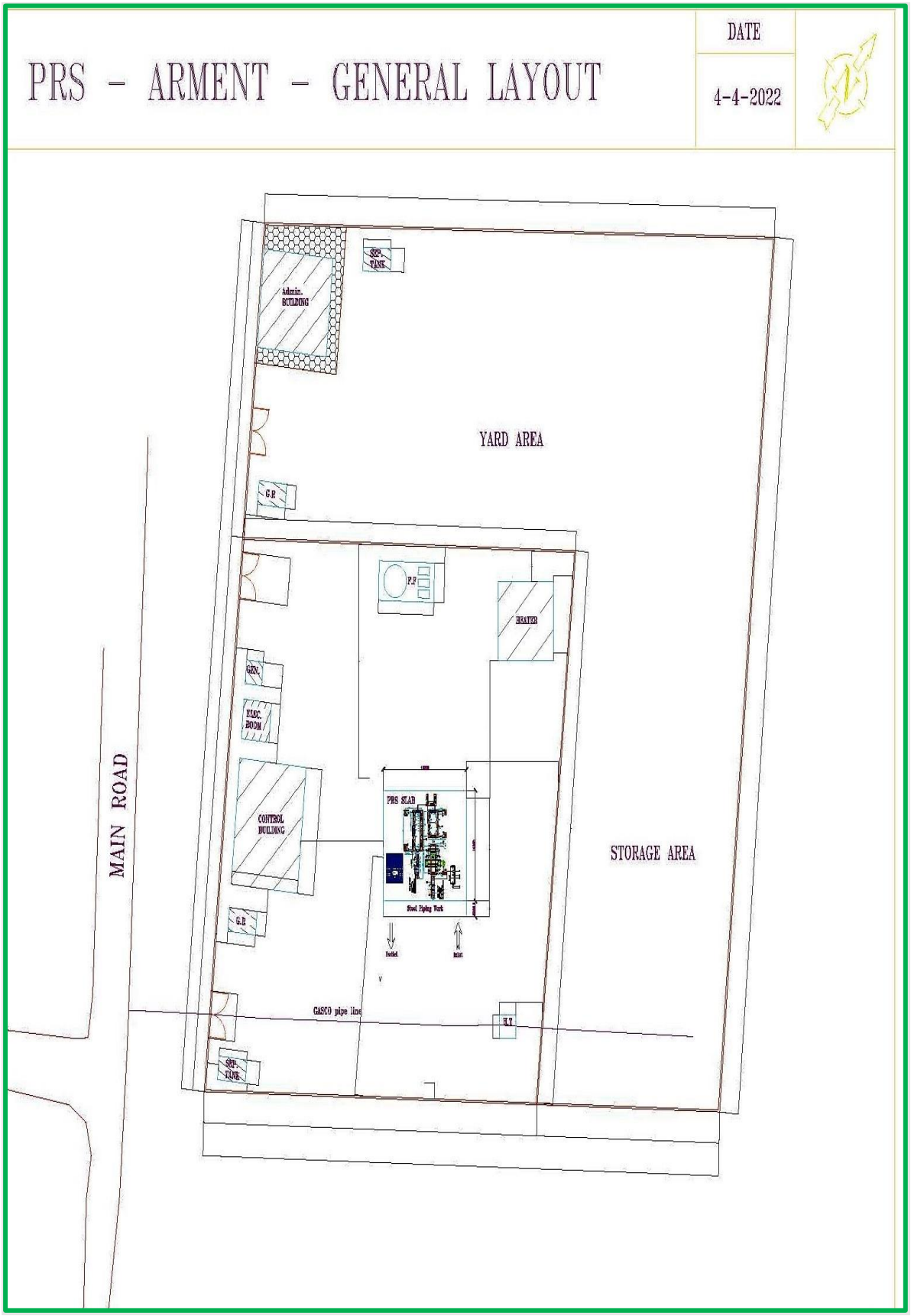

Figure 2-6: The proposed layout of Armant PRS

2.5 Operation phase

2.5.1 Operation of the PRS

Operation of the PRS involves the operation of the various components outlined in the construction phase as shown in **(Figure 2-2)**. Risks associated with those activities are further addressed separately in a Quantitative Risk Assessment (QRA) **(Annex-4)** and all its outputs will be adhered to, and the Emergency Response Plan (ERP) will be updated if necessary.

Inlet ball Valves

The inlet valve includes an insulation joint to completely isolate the PRS inlet from the cathodic system applied to the feeding steel. Insulation joints isolate the PRS as a measure of protection during strikes and current.

Filtration unit

The filtration unit consists of two main stages, a liquid filtration stage, and a solid filtration stage. The filtration unit aims to remove dust, rust, solid contaminants, and liquid traces before entering into the reduction stage. Two filters and two separators are installed in parallel; each filter-separator operates with the full capacity of the PRS to separate condensates and liquid traces. The solid filtration unit is designed to separate particulate matter larger than 5 microns. Filter-separator lines are equipped with safety devices such as differential pressure gauges, relief valves, liquid indicators, etc.

Heating unit/Water Bath Heater

This unit ensures that inlet gas to the reduction unit enters with a suitable temperature (the temperature of gas flow entering the station should be 15 °C; to avoid the formation of natural gas water hydrates in the line downstream of the choke or regulator (due to Joule Thompson effect). Temperature increases by heat exchange between gas pipelines passing through the heating unit filled with hot water. The unit was designed to be heated to 60 °C; while the heating temperatures for the outlet flow gas ranges between 35 °C and 45 °C.

The heating unit comprises the following components:

- Heater body/shell
- Process gas inlet/outlet
- Water Expansion tank
- Burner, Gas Train & BMS Panel
- Removable Firetube
- Exhaust stack
- Heating medium (Water Bath)

The PRS is equipped with two heaters in parallel (one of them being on standby in case of emergencies).

Reduction

The PRS includes two reduction lines in parallel (one of them being on standby in case of emergencies). The lines are equipped with safety gauges, indicators, and transmitters to maintain safe operating conditions. According to the IGEM standards, the reduction unit should be installed in a well-ventilated closed area or an open protected area.

Active and Monitor Regulator

The active regulator controls the outlet pressure while the monitor regulator assumes control in the event of failure of the active device.

Slam Shut Valve

The purpose of Slam shut is to automatically, and rapidly cut off gas flow when the outlet pressure exceeds or drops below the set pressure. The valve has to be installed to protect the system. The safety valve has to be sized for the maximum gas flow with the highest pressure that could be provided to the pressure-reducing valve.

Measuring Unit

After adjusting the outlet pressure, gas flow and cumulative consumption are then measured to monitor NG consumption from the PRS and to adjust the dosing of the odorant indicated in the subsection below.

Odorizing Unit

Natural gas is generally odorless. The objective of odorizing is to enable the detection of gas leaks at low concentrations before gas concentrations become hazardous. The normal dosing rate of the odorant is 10-20 mg/cm^3. The odorant system consists of a stainless-steel storage tank, which receives the odorant from 200-liter drums, injection pumps, and associated safety devices.

Outlet unit

The outlet unit includes an outlet valve gauge, temperature indicators, pressure and temperature transmitters, and non-return valves. The outlet pipes are also, like inlet pipes, isolated from the cathodic protection by an isolating joint. Please refer to **Figure 2-2**

2.5.2 Operation for the Offtake and HP pipeline

The main activities during the operation phase are the monitoring of the main offtake valve and the routine checking for the occurrence of gas leaks.

SCADA (Supervisory Control and Data Acquisition System):

GASCO is working with SCADA, a highly sophisticated integrated system used to control the national natural gas pipeline network. The SCADA system performs remote controlling of the valve rooms to adjust the operating pressure, and if necessary, change the flow of natural gas by bypassing the main route. The SCADA system can also detect natural gas leakage if a pressure drop was observed in a certain pipeline. The SCADA system is connected to a fiber optics system installed in the pipelines.

2.6 Resources consumption

2.6.1 During Construction

Water:

Water is mainly used during the Construction phase by the workers and engineers. There will be permanent source of water from the Water and Sanitation Company.

Water is mainly used during the construction phase in concrete preparation and domestic uses by the workers and engineers. Bottled water will be used for drinking purposes. The expected amount of water to be used during the construction phase of this project is:

- Domestic uses by the workers and engineers: about 3.6 m^3/day
- Construction activities: about 60 m^3

Fuel:

Diesel fuel will be mainly used for:

- Diesel generators that supply electricity to the construction activities including welding.
- Trucks and excavators' fuel

The expected amount of diesel fuel to be used in the construction phase of the PRS is about 60 liters per day. The fuel will be delivered to the construction site via trucks when needed.

2.6.2 During operation

Water:

Water is mainly used during the operation phase in the firefighting storage tank as well as for domestic use by workers in the PRS and drinking water.

The water source will be connected to the public water network.

Electricity

Electricity consumption during the operation phase is expected to be minimal and will be mainly consumed in the control room that will be supplied by electricity from the National electricity grid network existing in the area.

2.7 Waste Generation

All solid wastes which will be generated during the construction phase will be managed and disposed of following the applicable regulations and established best management practices. All generating waste will be reused and/or recycled to the maximum extent possible **(Table 7-2).**

2.7.1 During Construction

Solid wastes

The solid waste generated during the Construction phase will comprise of construction waste and domestic waste as per the following:

- Construction waste will consist mainly of left-over piping materials such as polyethylene pipes and carbon steel. The amount of waste is approximately 2% of the total amount of materials, which is collected by the Contractor and resold as scrap.
- Domestic waste will be generated by approximately 30 workers per day over a period of 6 weeks during the project construction activities. Workers will utilize public facilities provided by the village or city and use public resources (bins) to dispose of food waste, packaging materials etc. which will be transferred to Luxor dumpsite.
- Excavated soil is used for backfilling. Small amounts of leftover soil may remain will be covered and disposed of in legal dumpsites as per contract between the Contractor and the supplier

Hazardous wastes

Some hazardous wastes will comprise of Construction wastes such as paint containers, batteries, chemicals containers (solvents, lubricants, etc..), and used oils.

Liquid waste

Liquid waste will comprise mainly of domestic wastewater. Domestic water is the only continuous source during construction. Workers during the construction phase will use contractors portacabin bathroom and the sewage water will be collected in tanks and transported and discharged via a certified contractor to the nearest drain or sewer manhole with arrangements with local authorities.

2.7.2 During operation

Solid waste

The solid waste generated from the PRS is expected to be minimal and limited to domestic waste and it will be collected regularly by trucks belonging to the local units.

Hazardous waste

Mainly empty odorant containers and filters will be treated on-site, transported (using certified hazardous waste vehicles and personnel) to the Egypt Gas storage facility in Abu Rawash (Luxor) for final disposal at the UNICO hazardous waste facility near Alexandria.

Wastewater

The only wastewater source is domestic wastewater which is connected to the municipal sanitary network.

3. Legislative and Regulatory Framework

In this chapter, the applicable laws, regulations, and standards to which contractors are obligated will be presented.

Detailed discussion and comparison between National legislations and WB policies are presented in the updated Environmental and Social Impact Assessment Framework (ESIAF)[5] and Resettlement Policy Framework (RPF)[6].

3.1 Applicable Environmental and Social Legislation in Egypt

- Law 217/1980 for Natural Gas.
- Law 4 for the 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 the Year 1995 and the amended regulation No 1741 for the 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
    - EEAA guidelines on ESIAs preparation
- Law 38/1967 for General Cleanliness
- Law 93/1962 for Wastewater
- Traffic planning and diversions
    - Traffic Law 66/1973, amended by Law 121/2008 and Law 142/2014.
    - Law 140/1956 on the utilization and blockage of public roads.
    - Law 84/1968 concerning public roads.
- Work Environment and Occupational health and safety
    - Articles 43 – 45 of Law 4/1994, air quality, noise, heat stress, and worker protection
    - Law 12/2003 on Labor including decrees 211, 126, and 134 for the year 2003
    - EGAS updated HSE guidelines, LDCs will comply with EGAS updated HSE guidelines which work as regulation on PRS construction and operation (provided in **Annex-5** from the report)

3.2 World Bank Safeguard Policies[7]

Three policies are triggered for the project as a whole: Environmental Assessment (OP/BP 4.01), Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP 4.12). Environmental Assessment OP/BP 4.01 will apply to the Subproject. Physical Cultural Resources OP/BP4.11 will be applicable since Luxor governorate is known for its archeological and cultural sites, although no cultural resources are located in the project location. The chance finds procedures will be part of the contracts of the contractors.

With regards to OP/BP 4.12, it will not be applicable. Where the current land location is a state-owned land and was allocated to the Project according to EGAS procedures in

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

[6] https://www.egas.com.eg/sites/default/files/2019-06/updated%20Ressettlement%20policy%20framework%20for%20HH%20connection%20project%20in%2020%20governorate.pdf

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

Annex 3 and the coordination and inspection minutes of meeting between Egypt Gas and LGU at Markaz Armant, dated February 2022 (**Annex-2 Land Document).** In the meantime, Markaz Armant will take the necessary procedures to issue the final land allocation decree. No tenants, encroachers, residential laborers or other with customary claims or other of land use. In addition, it is not envisaged that the Subproject will result in any physical or economic dislocation of people for the construction of the new PRS in the project district.

WBG' labor influx guideline (2016)[8] as well as the Good Proactive Note on Addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) in Investment Project Financing involving Major Civils Works[9] were taken into consideration in addressing impacts of labor influx and SEA/SH. In addition to the above-mentioned safeguards policies, the Directive and Procedure on Access to Information[10] will be followed by the Project.

3.2.1 World Bank Group General Environmental, Health, and Safety Guidelines[11] & WBG Environmental, Health and Safety Guidelines for Gas Distribution Systems[12]

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which guide users on EHS issues in specific industry sectors. Gaps between requirements outlined by WBG guidelines and the Egyptian Law 4/1994 for Environment protection and the LDCs EHS guidelines have been analyzed. There are no significant differences between the requirements outlined by the WBG EHS Guideline on Gas Distribution Systems and the management and monitoring actions outlined by the ESIA.

"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 website[13].

3.3 Permits Required

- Approval from the Ministry of Agriculture to construct the PRS on agricultural land under the presidential decree number 615 of the year 2016.
- Army forces permit for the construction of the PRS.

[8] https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf

[9] https://thedocs.worldbank.org/en/doc/741681582580194727-0290022020/original/ESFGoodPracticeNoteonGBVinMajorCivilWorksv2.pdf

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

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

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

[13] https://www.egas.com.eg/natural-gas-connections-project-11-egyptian-governorates

- Constructions permit to be obtained from the local Governmental unit (LGU) in Armant – Luxor governorate.
- 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.
- Utility installation permission to the PRS (after construction phase)

4. Environmental and Social Baseline

4.1 Description of the Environment

Armant PRS located in a desert land bordered by an arid Desert from the North and East, agricultural reclamation lands from the South and West, Armant Markaz, About 0.95 km North East Ezbat Mostafa Qulayi, 0.45 km North new buildings not inhabited yet, 2 km North West Ezbat Abu Al Hajaj, 3.5 km North Nagaa Al Ghird, 5 Km west Nagaa Arab Al Ababdah, 6.5 Km North Armant city, 7.5 km North West Armant Al Heit Village, 7.2 km North East Riyana village.

The nearest residential area is Ezbat Mostafa Qulayi which is located approximately 0.95 km south west the proposed PRS location. (**Figure 4-1**).

During the site visit a few numbers of farmers were noticed. The exact number of farmers couldn't be identified as their numbers varies from time to time and season to season. Crops within the reclamation lands are cash crops like wheat and corn, please refer to item 4.1.5 there will be minor impact on farmers covered by item 5.2.2.12 (community health and safety). Farmers were consulted, please refer to consultations in section 8.

Figure 4-1: Satellite map showing Armant PRS Proposed location and surrounding communities

4.1.1 Air Quality

4.1.1.1 Site-Specific Ambient Air Quality:

The selection of the active air measurement location is based on the nature of the surrounding activities, the location of the nearest receptors to the PRS location, prevailing wind direction, site topography, and the future layout of the proposed project components. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method.

The measurement location was chosen on the basis that it is beside the nearest road adjacent to the PRS location.

One-hour average results for 8 hours of continuous measurements were conducted for pollutants of primary concerns, namely, carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), Total Suspended Particulates (T.S.P), and particulate matter (PM10).

Methodology,instrumentation, and results of Ambient Air Quality are detailed in Annex-6 attached to this report

Results of ambient air quality measurements:

The concentrations of measured air pollutants in the studied area are below national and WBG guidelines. All the measurements for the gaseous pollutants are complying with the maximum allowable limits according to Law 4/1994 for Environment protection and its amendments by Law No.9/2009 and the executive regulation issued in 1995 and its amendments no. 710 in 2012 and 618 in April 2017". Accordingly, the ambient air quality in the project areas is one of the tolerable areas in Egypt in terms of ambient air quality, which can be attributed to the absence of any major industrial sources.

Construction engines are certified, i.e., the exhaust is below permissible levels. Ambient concentrations of gaseous pollutants, NOx, SOx, and CO are unlikely to surpass permissible levels due to the operation of construction equipment. Management and mitigation plan for ambient air pollution is further addressed in chapters 6 and 7. During the construction phase, excavation and construction activities will likely cause dust levels to surpass permissible levels in 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.

4.1.2 Noise

4.1.2.1 Site-specific noise measurements

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

Methodology, instrumentation, and results of Noise measurements are detailed in Annex-6

Results of noise measurements

The noise measurements in the studied area are below national and WBG guidelines. They are complying with the maximum allowable limits according to Law 4/1994 for Environment protection and its amendments. The excavation and construction activities may cause noise levels to surpass permissible levels at the site. 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 chapter 7.

4.1.3 Climate

The maximum air temperature varies between 22.9 °C in Jan and 40.9 °C in Jul whereas the average minimum temperature varies between 5.7 °C in Jan and 23.9 °C in Jul. The monthly average of relative humidity in the study area is ranging between 25.0% in May and 55.0% in December. The monthly average wind speed varies in time and location with monthly average ranging between 5.9 km/h in October and 9.3 km/h in April. Rains are rare and occur randomly throughout the year. The monthly average of precipitation ranges between 0.0 and 0.3 mm.

4.1.4 Water resources

The groundwater aquifers in Luxor Governorate is the quaternary and Plio-Pleistocene as following:

The quaternary aquifer: The aquifer occupies the central strip on the Nile Valley forming the old cultivated lands on both sides of the Nile and forms the most important water-bearing formation in Luxor area. This aquifer can be categorized into two hydrogeological units:

- **Upper Holocene aquitard** made up of two sequential layers, a silty clay layer (18.5 m thick) which changes laterally into clay and fine sand, and a clay silt layer (13.5 m thick) at the base. The layer has greater thickness near the river channel and vanishes near the valley fringes. This unit has low horizontal and vertical permeability and receives the surface water seepage forming subsoil water and acts as an aquitard to the underlying aquifer.
- **Lower Pleistocene aquifer:** mainly formed of unconsolidated pebbly and bouldery gravel changed laterally into medium to coarse sands and gravel. The Pleistocene sediments about 64.5 m thickness in Luxor area are underlain by more than 100 m of brown clays of the Pliocene unit (Madamud Formation). The Pleistocene aquifer has high horizontal and vertical conductivity. The aquifer is highly productive of good water quality. It is recharged

mainly from irrigation water and seepage from irrigation canals through the Holocene aquitard. Discharge of this aquifer is through groundwater pumping for irrigation and drinking purposes and natural discharge towards the River Nile.

- **Plio-Pleistocene aquifer:** This aquifer represents the secondary aquifer in the study area and is exposed at the outer fringes of the Nile aquifer system adjacent to the floodplain. It is composed of clay, sand, and gravel. The aquifer has more thickness near the Quaternary aquifer and decreases towards the Eocene limestone boundary on both sides of the Nile valley. At the valley fringes, the groundwater in this aquifer is under phreatic conditions. This aquifer is of low productivity. The recharge of this aquifer is mainly from excess irrigation from the reclaimed and desert lands and from deeper aquifer systems. Discharge of this aquifer is through the groundwater pumping or to adjacent ground- water aquifers.

Surface water:

The surface water resources of Luxor Governorate include to the Nile River and main irrigation canals (Asfoon and Al Kalabya), in addition to other about 42 branched waterways and drainages used for agriculture and the rest for industrial and domestic uses as example:

1- Al Malaa with total length about 17.470 km
2- Al Salamya El Qeblya with total length about 8.875 km
3- Al Salamya El Baharya with total length about 8.75 km
4- Al Hosha with total length about 7.775 km
5- Al Luxor with total length about 16.65 km
6- Al Karnak Al Gharabya with total length about 9.7 km
7- Al Karnak Al Sharaya with total length about 10.63 km
8- Sahel Al Ashy with total length about 8.15 km
9- Al Hebiel Al Raesiya with total length about 11.68 km
10- Al Alya al Mostagada with total length about 9.54 km
11- Al watya with total length about 12.06 km

4.1.5 Terrestrial Biological Environment:

There is no current land use for the location of the proposed station. It is an arid desert land bordered by an arid Desert from the North and East, agricultural reclamation lands from the South and West and has no ecological importance, the project area is eventually free from any endangered species as shown in **Figures 4-2 and 4-3**.

Armant Proposed PRS Location


Figure 4-2: Shows an Overview of the proposed PRS location.

Overview of the PRS surrounding area	
West Neighbor (Reclamation lands cultivated by wheat)	**South East Neighbor (Reclamation lands cultivated by wheat)**
	

Figure 4-3: Shows an Overview of the PRS surrounding area

In conclusion, the project area is free from any flora or fauna of ecological importance and it is not going to intervene with any green cover. In addition, the activities will take place away from any protected areas or areas of any ecological importance.

4.1.6 Waste Management:

Solid Waste:

The responsibility of service planning, delivery, and monitoring in Armant Markaz within Luxor governorate is delegated to the Cleansing and Beatification Agency managed by the Presidency of the City Council. Solid wastes transferred to waste recycle factory located in Habil by trucks then the rejected wastes transferred to Luxor dumpsite (Lat.: 25°39'06.6" N, long.: 32°44'57.9" E).

Liquid Waste:

The project location within Armant Markaz is covered by public sanitation network which takes all the municipal sewage to be treated in Armant sewage treatment plant.

Hazardous Waste:

There is no hazardous waste site within Armant Markaz. any hazardous waste generated within Armant PRS will be temporarily stored in an isolated area inside the PRS borders 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 Traffic Profile

The traffic surrounding Armant PRS is relatively Low density with no rush hours, there are many types of vehicles including trucks, private cars, microbuses, and motorcycles. The surrounding roads are Riyana- Armant Road, Al Gorah Road (Low density) and Aswan Western Agricultural Road, Armant-Al Sbaeya Road (Low density).

Types of roads close to the PRS

Urban Roads

The main roads closest to the PRS area are unnamed paved roads.

Figure 4-4: Shows the main roads closest to the PRS area

4.2 Socioeconomic Baseline

Luxor Governorate has been one of Egypt's governorates by virtue of Presidential decree No. 378 of 2009. It is located 635 km south of Cairo. It is currently the smallest governorate in Egypt. The new PRS will be implemented in Markaz Armant within Luxor Governorate.

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 items: administrative division, urbanization trends, demographic characteristics, human development profile, access to basic services, roads and transport, poverty index, income and expenditure, fuel currently used in households, problems faced with the current household fuel, perception towards the project, and gender dimension of the current type of fuel.

4.2.1 Administrative division

According to the site visit, and data provided by the LDC, Luxor governorate is bordered in the East by Luxor eastern mountain and the Red Sea governorate, in the West by Luxor western mountain and the New Valley governorate, in the North by Qena governorate, and in the South by Aswan governorate. The total area of Luxor governorate is 25,926 km^2, while the total area of Markaz Armant is 145.5 km^2, as shown in the following table.

Table 4-1 Project District Areas[14]

Project district	Total area
Luxor governorate	25,926 km^2
Markaz Armant	145.5 km^2

4.2.2 Urbanization Trends

According to the site visit to Armant district and the field observations, Markaz Armant is classified as an urban to semi-urban area. While the proposed PRS will be located in an uninhabited area, the type of dwelling should be highlighted to identify the probability to install the NG to the houses there. Most of the buildings (90%) are constructed of concrete and red bricks. Almost all of the community members surveyed live in urban houses (apartments). The conditions and characteristics of urban houses are in compliance with the bases and preconditions for connecting NG. The majority of buildings at Markaz Armant range between 2 to 5 stories high. Concerning the legal status of buildings, all buildings and neighborhoods are legal as reported by the LGU after the new Reconciliation Law.

Figure 4-5: Pictures showing Building conditions at Markaz Armant.

Regarding the condition of the streets at the project districts, the average width of main streets range between (2 to 3) lanes wide, and side streets range between (1 to 2) lanes wide. Despite the modest conditions and maintenance of the asphalt, they are mostly paved out and convenient for NG installations. According to the (LGU), the Governorate is giving high priority for infrastructure upgrade, which included roads and streets, sanitary and sewage systems, and restoring main squares.

[14] ***Source: Giza governorate Website.***

Figure 4-6: Pictures showing Streets Conditions at Markaz Armant.

4.2.3 Demographic Characteristics

4.2.3.1 Total population and characteristics:

Total population, the number of households, and the average family size are presented in the table below:

Table 4-2 Distribution of the population in project districts[15]

District	Population			No. of Households	Average Family size
	Male	Female	Total		
Luxor Governorate	645,329	604,880	1,250,209	295,602	4.2
Markaz Armant	88,700	85,310	174,010	40,155	4.3

There are no ethnic or religious minorities in the project area and all stakeholders, including workers are speaking the same language (Arabic).

4.2.3.2 Rate of natural increase and Household size:

The birth rate in Luxor Governorate is 28.8 births per 1000 persons. The adult mortality rate is 6 per 1000 people. That gives a natural growth rate of 22.8 per 1000 persons in Luxor Governorate,. The average household size in Luxor Governorate is about 4.2 persons, which is similar to the average at the project district. As shown in Table 4-2.

4.2.4 Access to Basic Services[16]

Access to basic services, water supply, sanitation and electricity is one of the main pillars that determine the economic well-being of the community. According to the site visit to the project district, statistics data collected and the focus group discussions, the project district has access to basic services. Nearly 100% of individuals are using electricity, 95-100% of individuals have access to the public water network. Concerning the sanitation network, Luxor governorate is suffering from the poor sanitation system, only about 25% of the households in Luxor governorate have access to the public sanitation network. However, the households in Luxor city are enjoying a high

[15] ***Source: CAPMAS, 2017 and LDC***

[16] ***Source: CAPMAS data 2017***

percentage of sanitation system 91.7%, while only 38% of the households at Markaz Armant, have sanitation network. Natural gas will be connected only to the households, which have access to sanitation network according to the safety and technical criteria of the project. Thus, it will be possible to install the NG to the project districts, which have access to basic services.

4.2.5 Human development profile

Educational, health facilities, poverty index, income and expenditure, human activities, and work status should be highlighted to determine the current socioeconomic conditions of the target district in the Luxor governorate.

4.2.5.1 Education:

Education is perceived as the first shell that can help the population to withstand poverty. The review of CAPMAS data 2019, showed that the percentage of the illiterate rate, university education, and Intermediate Education on the governorate level and on the project district are similar as shown in the table below. Education status is an important indicator to choose the suitable channels for sharing the project information with the community.

Table 4-3 Distribution of the project districts' population by educational status[17]

District	Percent illiterate			Percent University Education	Percent Intermediate Education
	Total	Females	Males		
Luxor Governorate	26%	32.5%	19.7%	8.9%	36%
Markaz Armant	24.7%	32%	18%	8%	38%

4.2.5.2 Health Facilities

Providing health facilities is very important for workers' safety in case of any accident and/or emergency at the project districts. Recently Luxor governorate has joined the new Health Insurance System adopted by the Egyptian Government to supply health insurance for everyone. Many hospitals in Luxor are located in the project districts such as, Armant Hospital. International Luxor Hospital, Luxor Fever Hospital and Luxor General Hospital could also provide medical services for Armant citizens. Additionally, there are many health units and 19 ambulance centers in Luxor. Health facilities are easy to reach as they lie near the project sites within two to three kilometers distance and provide emergency medical services. Many participants of the focus group discussions and a number of Government officials reported that the new system would provide them with the required medical services. The LDC (Egypt Gas) is giving a high priority for protecting their

[17] ***Source: CAPMAS data 2019***

workers. All contracts between LDC and contractors /subcontractors have a special clause to guarantee providing the necessary medical services to the workers. In addition, Egypt Gas in the emergency cases provides the worker with all the required medical services.

4.2.5.3 Poverty index, Income, and Expenditure

According to CAPMAS recent Income, Expenditure and Consumption Survey in 2017- 2018, the percentage of poor people in Luxor Governorate is considered relatively high; about 55.3% of the population are considered poor people. The main results of the survey also showed that the average monthly income for each household is estimated to be 3690 EGP which nearly equivalent to their expenditure. However, based on the site visit and the focus group discussion 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 in installments to avoid the main problems related with the LPG cylinders.

4.2.5.4 Human activities in the project district

The economy of Luxor Governorate is heavily dependent upon tourism. Additionally, large numbers of people also work in agriculture activities, particularly in cultivating sugarcane, wheat and maize. According to the data collected from the CAPMAS, agriculture represents about 27% of the total economic activities in Luxor Governorate. Agriculture is also the main activity at Armant Markaz, in addition to the industrial ones, the most important is Armant factory for producing sugar and the new industrial area at El Boghdady village (south of Luxor), which has been established to create new jobs opportunity for people. There are also some commercial and services activities.

4.2.5.5 Unemployment and work status

Concerning the work status, CAPMAS Annual Bulletin of Labor Force 2017 indicates that the unemployment rate in Luxor Governorate is about 23%. However, there is a significant difference in unemployment rates between males about (17%) and females (62 %) that has been noticed.

Table 4-4 Estimation of Labor Force, Employed, and Unemployment in Luxor governorate[18]

Labor Force (15 years and above)			Estimated Employed Persons			Unemployment Rate		
Male	Female	Total	Male	Female	Total	Male	Female	Total
273,700	45,200	318,900	228,100	17,300	245,400	16.6 %	61.7 %	23.1 %

It is worth mentioning that the CAPMAS Annual Bulletin of Labor Force 2020, regarding labor force, reflected that the age of starting work is 15 years old. Both the Child Law and the Labor Law

[18] ***Source: CAPMAS data 2017***

state that children shall not be employed before they complete 14 years old, nor shall they be provided with training before they reach 12 years old; however, children between 12 and 14 years old are permitted to work as trainees. Furthermore, the governor concerned in each governorate, in agreement with the Minister of Education may permit the employment of minors aged 12-14 years in seasonal work which is not harmful to their health and growth, and which does not conflict with regular school attendance. Consequently, there is always a high probability to detect child labor in most of the projects implemented in Egypt. In the project districts where agriculture work and sales activities are in place, a big number of underage laborers were noticed. In the meantime, due to the technicality of the work in NG project, LDCs always seeks 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's obligations.

4.2.6 Perception towards the project

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

The majority of the samples surveyed in the project districts have positive perceptions about the 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 a limitation on the different problems of LPG such as:
  - ✓ The high price of LPG cylinders.
  - ✓ The fluctuations of the unformal LPG price, especially during winter.
  - ✓ Some LPG cylinders are invalid to be used due to the poor maintenance.
  - ✓ The LPG is not completely full. It is half filled.
  - ✓ Sometimes it might leak.
- It will save electricity that is used in electric heater and reduce the cost of electricity bill.

4.2.7 Physical cultural resources

The proposed PRS will be located in a desert land, bordered by an arid Desert from the North and East, agricultural reclamation lands from the South and West within Armant district, Luxor governorate and require limited excavation work. This area has been excavated before for installing other public utilities such as water, sanitary, sewage and electricity networks. For this reason, it is presumably less likely to chance find any artifacts or antiquities in the construction areas.

Additionally, there are no identified archeological sites or sites with cultural or historical value located within the PRS location may be affected by the new PRS construction works. However, in case of any unanticipated archeological discoveries within the project areas; **Annex-7**, entitled 'Chance Find Procedure,' details the set of measures and procedures to be followed in such cases

5. Environmental and Social Impacts

The environmental and social impact assessment (ESIA) is a process used to identify and evaluate the significance of potential impacts on various environmental and social receptors as a result of planned activities during (construction and operation) phases of the Project. Furthermore, the analysis of environmental and social impacts is important to detail an effective management and monitoring plan, which will minimize negative impacts and maximize positives. The evaluation of the potential impacts on various receptors is based on a significance ranking process described in the following subsection. Details are presented in **Annex-8**. attached to this report

5.1 Impact Assessment Methodology

To determine and assess the impacts of the project phases on environmental and social receptors, a semi-quantitative approach based on Leopold was first adopted. The impact of each activity on each receptor was assessed according to magnitude on a scale of -10 to 10, where negative values indicate a negative influence on the receptor, and importance on a scale of 0 to 10, which encompasses the probability of occurrence, frequency of the impact, etc. The numbering system is used as a relative measure, where more negative numbers correspond to impacts having a higher negative magnitude. Susceptible receptors and corresponding activity are deduced and addressed if both magnitude and importance are of minor severity. The impact assessment methodology adopted for this ESIA is a "cause-effect" matrix modified from Leopold; and Buroz´s Relevant Integrated Criteria to evaluate the impacts. The environmental impact assessment methodology encompasses a semi-quantitative assessment that considers the following:

- Probability of the impacts
- Spatial and temporal scale
- The intensity of the impacts (which also considers the sensitivity of receptors and the reversibility nature of the impact)

Each impact was identified considering:

- Type of impact: The negative or positive influence on the receptor.
- Magnitude: The extent of the impact within a scale (0-10)
- Significance: That includes the probability of occurrence, frequency, the intensity of the impact, etc., within a scale (0-10)

The "cause-effect" matrix identifies the impacts during the mentioned phases, considering the elements of the environment and social context (receptor of the impact).

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 worksite and immediate surroundings);	
51-75	**Medium** severity (larger-scale impacts: local or regional; appropriate mitigation measures readily available);	
76-300	**Major** severity (Severe/long-term local/regional/global impacts; for negative impacts mitigation significant).	

Detailed impact assessments results are presented in two tables in Annex-8.

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.

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

  The construction of Armant PRS is expected to result in the creation of job opportunities, both directly and indirectly. Based on similar projects implemented recently by EGAS and Egypt Gas, the daily average number of workers during the peak time will be about 30 workers, being 28 laborers and 2 supervisors. The workers can also include drivers, technicians, and welders.

  Indirect benefits

  Along the different stages of the project, indirect benefits are expected to be sensed in the targeted area due to the need for supportive services to the workers and contractors who will be working in the PRS location. This could include food supply, transport, trade, security, manufacturing… etc. For example, the transportation of workers to the PRS location will work for the benefit of car lease offices.

5.2.2 Negative Impacts

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

5.2.2.1 Deterioration of soil quality

The excavation activities will result in the disturbance of soil characteristics and cause soil erosion and soil compaction as a result of heavy equipment operation. In addition, potential soil

contamination as a result from sourcing of raw materials, material and waste storage, oil spills and leaks from other liquids (solvents, fuel, lubricants) which if not properly kept or due to accidents may adversely impact the soil and underground water. Sourcing of raw materials will have an impact on the environment at their point of origin either through extraction or industrial pollution associated with their production. Armant PRS project is located in a desert area and the duration of the impact is expected to be medium-term, with its spatial extent being limited to the PRS boundaries (area: 11,550 m^2).

The Off-take will be located on the high pressure (HP) pipeline "70 bar system" of the national gas network which is already exist within the PRS land.

The impact on soil considered **Medium**

5.2.2.2 Air Emissions

Construction of the PRS will include several activities such as transportation of the PRS material and equipment, the burial of cables and pipes, etc. Those activities in consequence are expected to emit air pollutants to the ambient air, however, they will be conducted for short periods. The following air pollutants are foreseeable for most of the construction activities:

- Fugitive dust emissions (PM10, PM 2.5)
- Exhaust from excavation equipment and heavy machinery (excavators, loaders, trucks) containing SOx, NOx, CO, VOCs, etc.

Dust emissions will slightly negatively impact ambient air quality and standing crops (if exists during the construction period), particularly during the initial phases of construction and during high wind periods. The nearest residential area is Ezbat Mostafa Qulayi which is about 0.95 km south west of the PRS site. Therefore, it is expected that the dust impact will be moderate. Soil characteristic at PRS site is mainly hard soil.

Emissions of CO2, CO, and PM will result from the operation of the construction machinery and road vehicles during the construction of the PRS. Air pollutants emitted from construction machinery are generally temporary (during the working activities). Winds may continue to create dust resulting in particulate matter even after working hours. The intensity of work activities and the number of vehicles traveling onsite would be relatively low for all tasks. The emissions will be mostly limited to the construction phase and therefore are temporary.

Therefore, the impact is assessed as **Minor**

5.2.2.3 Noise

Construction of the PRS will require using various construction equipment, vehicles, etc. in addition to the other activities that generate noise. These tools signify potential major sources of noise emissions that will have an impact on receptors.

The potential people groups who are susceptible to the construction noise during the construction of the Armant PRS are the following:

- Onsite workers
- Nearby farmers

It is worth mentioning that during the site visit few numbers of farmers are noticed within the surroundings of the PRS location. The proposed PRS site located in agricultural area (about 0.95 km from the nearest residential area which is Ezbat Mostafa Qulayi), where the noise baseline is relatively moderate and does not exceed the national and international standards. Construction activities may increase the already existing baseline ambient noise. However, increased noise emissions are anticipated to be for a short duration of time.

The main sources of noise and vibration during the PRS construction are the operation of the construction equipment and machinery such as diggers, cranes, loaders; farmers in the nearby agriculture land and worker are the main receptor.

Regarding the Construction of the PRS it is expected that the generated noise will mainly have an impact on workers and Neighbor farmers.

The impact of construction on workers is assessed as **Medium**
The impact of construction on the nearby farmers is assessed as **Minor**

5.2.2.4 Impact on worker health and safety

Potential health and safety impacts are expected to workers during the construction activities of Armant PRS in general are the same as those associated with any construction project involving the use of large equipment, transportation of overweight and oversized materials, working in trenches, construction and installation of facilities, also pose the risk of accidents and injuries if the project site is poorly organized or managed. Risks also includes working at heights, welding or other activities, risks from electricity, testing and trials after setting up the equipment, and worker onsite amenities and facilities for workers.

The occupational health and safety impacts are assessed as **Medium**

5.2.2.5 Impacts due to COVID-19 pandemic

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the SARS-CoV-2 virus. Depending on the severity of COVID-19's international impacts, outbreak conditions—including those rising to the level of a pandemic— it can affect all aspects of daily life, including travel, trade, tourism, food supplies, industrial and financial markets.

During the construction of the Armant PRS, the movement of staff inside and outside the project boundaries can increase the risk of transmission of COVID-19 to the workers and community.

Infection with COVID-19 can cause illnesses ranging from mild to severe and, in some cases, can be fatal. Symptoms typically include fever, cough, and shortness of breath. Some people infected with the virus have reported experiencing other non-respiratory symptoms. Other people, referred to as asymptomatic cases, have experienced no symptoms at all. Symptoms of COVID-19 may

appear in as few as 2 days or as long as 14 days after exposure. All workers since 24-11-2021 will not be allowed to enter the PRS site without getting vaccinated (vaccination is available for free within all Egypt).

The occupational health and safety impacts are assessed as **Medium**

5.2.2.6 Temporary Labor Influx

Generally speaking, having workers in small cities might result in unfavorable impacts on the available resources (e.g. pressure on food, health care, medication, and potable source of water). It may also result in inconvenience to the local communities, particularly in the areas where communities are conservative or not accustomed to having outsiders. Only a limited number of workers are present in the location during working hours, a portion of those workers are local workers and LDCs are imposing rules and code of conduct on the contractors to ensure good behaviors and limit any potential conflict with the communities. Moreover, no workers will be staying onsite during the project activities as all workers come from nearby surrounding areas

The impacts related to Labor Influx will be **Medium**.

5.2.2.7 Child Labor

As mentioned in the baseline, child Labor is a common practice in the project communities in the project areas. Children below 18 works 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 seek technical workers that are highly trained and experienced, so the risk of contracting children under 18 years is medium to a minor. This risk should be carefully handled in the ESMP.

Child Labor risk is assessed as **Medium -Minor**

5.2.2.8 SEA/SH

Gender-based violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (i.e., gender) differences between males and females. It includes acts that inflict physical, sexual, or mental harm or suffering, threats of such acts, coercion, and other deprivations of liberty. These acts can occur in public or in private. The SEA/SH risk of the project is rated as negligible since the PRS location is in an uninhabited area.

SEA/SH risk is assessed as **Negligible**

5.2.2.9 Inappropriate waste management

Normal construction non-hazardous solid wastes include scrap concrete, steel, bricks, packaging waste, used drums, wood, scrap metal, welding belt, building rubble will be generated. Domestic wastes by construction Labors, including sewage and garbage collected from the Labors onsite will be also generated. If waste is not disposed of in adequate sites, it will lead to a negative environmental impact.

Hazardous waste generated is likely to include empty containers, spent welding materials, solvents, paints or adhesives, and other hazardous waste resulting from Construction activities, i.e. spent oils, spent lube, waste oil filters, batteries, etc. Among the hazardous wastes also are the wasted or

faulted materials. Maintenance of the equipment and vehicles will be carried out in specialized service workshops outside the construction site.

Adverse impacts on the environment from the possible improper disposal of solid waste and hazardous waste are assessed of medium impact.

Therefore, the impact is assessed **Medium**

5.2.2.10 Traffic impact

The greatest potential for traffic impacts to occur arises during the short period where construction works peak (transportation of raw materials, equipment including heavy equipment and foundation materials). During the PRS construction period, there will be a low number of trailers trips that will not have significant impacts on the road (Riyana- Armant Road), as it has low traffic. Based on observation during the site visits, it is predicted that during transportation of the equipment and raw materials, only one lane will be used by the trailers and the movement of one trip will not last more than 8 hours.

Therefore, impact on traffic in the project site is assessed **Minor**

5.2.2.11 Impact on groundwater

Ground water may be impacted in case of improper disposal of wastewater from dewatering activities (if existed), sanitary wastewater (About 30 workers during the construction phase will use the contractor portacabin toilets), construction wastes or debris (generated from activities like ditching, and excavation). Poor site management, inappropriate storage or disposal of construction related waste and accidental spills may pose a risk to ground water and neighbouring agriculture fields. The site will be well controlled by waste management plan and emergency response plan to deal with any spills that occur in real time so the risk of poor storage or spills is low. Generated sanitary wastewater, as well as water resulting from the dewatering activities (if existing) during excavation will be collected and transported via a certified contractor to be discharged into the nearest drain or sewer manhole.

Therefore, the impact is assessed **Minor**

5.2.2.12 Community health and safety

Impacts on community health and safety can result from emissions of gaseous pollutants, dust, increased background noise levels, uncontrolled dumping of construction waste, accidental falls in temporary excavated trenches and accidental contact with equipment etc.

Taking into consideration that the PRS planned to be located in a desert area and about 0.95 km of the nearest residential area (Ezbat Mostafa Qulayi), we will find that the above-mentioned impacts will be greatly minimized

Therefore, the impact is assessed **Minor**

5.2.2.13 Land related impact

The PRS needs a plot of land of 11,550 m². The plot of land is a state-owned land and was allocated to the Project according to EGAS procedures in Annex 3 and the coordination and inspection minutes of meeting between Egypt Gas and LGU at Markaz Armant, dated February 2022 (2.4.2-Land acquisition for PRS) (Land related documents are attached in **Annex-2**). In the meantime, Markaz Armant will take the necessary procedures to issue the final land allocation decree. No tenants, encroachers, residential laborers or other with customary claims or other of land use. Also, there is no land needed for the off take where it is will be in the selected land.

(For further elaboration on EGAS procedures for land acquisition see **Annex-3**).

Therefore, the impact is assessed **Negligible**

5.3 Impacts during Operation

5.3.1 Positive impacts

5.3.1.1 Impacts related to employment

The project may not create extra job opportunities during the operation phase but it will help in keeping the existing jobs, as the average number of existing workers in the existing PRS is about 12 workers in two shifts (6 workers/ shift) from the permanent workers of the LDC; 4 technicians, 2 engineers, and 6 security staff.

5.3.2 Negative impacts

Various impacts assessed in accordance with the impact assessment methodology. The project relevant impacts will be as follows:

5.3.2.1 Impact on worker health and safety

Possible impacts to health and safety during operations include working around energized equipment, and possible contact with natural hazards. However, during the operation and maintenance phase, if there is any incident or emergency after applying all the control measures and safety precautions in the EGAS updated HSE guidelines (**Annex-5**), the impact will negatively endanger the surrounding community and establishment.

Odorant handling is part of the operation of the PRS and is addressed in the Quantitative Risk Assessment "QRA" (**Annex-4**) as a separate study. An odorant is added to the NG to enable detection upon leakage. The odorant is classified as a hazardous substance.

An odorant leak can result from improper handling of the odorant including Storage in unsafe conditions, in terms of occupational health and safety. In case of emergency, the risk resulting from the odorant release or gas leak will be managed by Armant's PRS (updated)'s emergency response plan.

Therefore, the impact is assessed as **Medium**

5.3.2.2 Impacts due to COVID-19 pandemic

During the operation of the Armant PRS, the Movement of staff inside and outside the project borders may increase the risk of transmission of COVID-19 to the workers and community health. Given the fact that the average number of workers during operation of the Armant PRS will be about 6 workers/ shift from the permanent workers (well trained and took awareness for COVID-19 precautions) of the LDC.

The Infection with COVID-19 between workers or from workers to the community is relatively minor (as all workers after 24-11-2021 will not be allowed to enter the PRS without getting vaccinated which is available for free) but still more precautions can be applied.

Therefore, the impact is assessed as **Minor**

5.3.2.3 Hazardous and non-hazardous waste management

During operation and maintenance of the PRS, hazardous (odorant containers), non-hazardous waste, and small quantities of domestic waste (solid and liquid waste) will be generated. Hazardous waste is likely to be generated during routine operations (e.g., lubricating oils, odorant containers, chemical containers). These wastes are typically stored temporarily, and transported by a licensed contractor to an appropriate permitted off-site disposal facility as a standard practice, according to EEAA regulations for hazardous waste management (as shown in **Table 7-2)**.

Therefore, the impact is assessed as **Medium**

5.3.2.4 Noise impact

The pressure reducers normally cause noise generated from the reducers' pipes. The maximum noise level expected from the reducers is 80 dB. The generated noise is constant (not intermittent). Assuming ambient noise levels are complying with WB/IFC requirements and Law 4/1994-9/2009- 105/2015 standards for low noise residential areas (about 0.95 km), a 20-meter buffer distance kept between the reducers and the PRS fences should lead to minimal impact outside the PRS borders. Additionally, the PRS is located on a well Paved Road (Riyana- Armant Road).

Regarding the operation of the new PRS, it is expected that the generated noise will only have an impact on workers

Therefore, the impact on workers is assessed as **Minor**

5.4 Impacts during Accidental Events (Operation Phase)

Regarding the Quantitative Risk Assessment Study (QRA), which demonstrate the following hazards:

- Gas Release
- Fires (Heat Radiation)
- Explosion (Overpressure Waves)

- Suffocation (Odorant Leak)

And referring to the risk calculations determined in the Armant QRA study, the individual risk level to the exposed workers/public based on the risk tolerability criterion has been identified as Acceptable risk for both workers and Public near to the PRMS area. Even So, some Recommendations should be considered to keep the risk tolerability, and this will be described under item (7.4) (for more details refer to the QRA Study under **Annex-4**)

Table 5-2 Impact Assessment

Detailed impact assessments results are presented in two tables in **Annex-8**.

Impact	Description	Type	Significance
	During Construction		
Deterioration of soil quality	PRS construction will lead to degradation of soil quality, Excavation and movement of heavy machinery on unpaved surface soils during site preparation and foundation-laying could cause a physical breakdown of soil particles potentially causing destabilization of the soil structure. In addition, potential soil contamination as a result from sourcing of raw materials, material and waste storage, oil spills and leaks from other liquids (solvents, fuel, lubricants) which if not properly kept or due to accidents may adversely impact the soil and underground water. Sourcing of raw materials will have an impact on the environment at their point of origin either through extraction or industrial pollution associated with their production	Negative	**Medium**
Air emissions	WBG requirements and Law 4/1994 (modified by-laws 9/2009 & 105/2015) stipulate strict air quality standards. Air emissions (gases and particulates) during construction (from transportation and machine operation) shall arise from: - Particulate matter and suspended solids from cleaning and transportation operations - Exhaust from equipment and machinery containing SOx, NOx, CO, VOCs, etc. - Traffic congestions result from road closure or slowing down of traffic due to transportation of equipment. <u>Dust</u> The impact of dust generation (particulate matter) will be mainly on workers mostly limited to the working hours which lead to a temporary reduction of air quality, winds may continue to create dust resulting in particulate matter even after working hours, however is unlikely to cause major air emissions impacts on the nearby standing crops (if exists during the construction period) or the nearest residential area which is about 0.95 km from the PRS location Except in high wind periods	Negative	**Minor**

Impact	Description	Type	Significance
	Gaseous pollutants emissions Provided machinery used during construction is certified and maintained as per guidelines, the increase in emissions stemming from the exhaust of machinery is unlikely to increase ambient levels beyond national and WBG permissible levels.	Negative	**Minor**
Noise	Noise impact on worker - Noise impacts on construction workers, technicians and engineers in direct vicinity of the excavation works and heavy machinery are considered more significant than those on nearby farmers.	Negative	**Medium**
	Noise impact on nearby farmers During the site visit a few numbers of farmers are noticed (within the agricultural reclamation lands surroundings of the PRS location from the South and the West,), Some noise impacts are expected during the construction period (which is limited) of the PRS while they are working on the reclaimed agricultural lands.	Negative	**Minor**
Risks on Occupational health and safety	Inhalation of air pollutants, high noise levels, injuries, and potential death as a result of operating heavy equipment, and handling hazardous materials, also poor site management and lack of appropriate PPE may result in accidents and injuries for workers. Also, includes the risks from working at heights, welding or other activities, risks from electricity, risks from testing and trials after setting up the equipment, and worker onsite amenities and facilities for workers	Negative	**Medium**
Impacts due to COVID-19 pandemic	During construction of the Armant PRS, Movement of staff (All workers after 24-11-2021 will not be allowed to enter the PRS without getting vaccinated) inside and outside the project borders can increase the risk of transmission of COVID-19 to the workers and community health.	Negative	**Medium**

Impact	Description	Type	Significance
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 the worksite).	Negative	**Medium**
Child Labor	As mentioned in the baseline, child Labor is a common practice in the project communities in the project areas. Children below 18 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 seek technical workers that are highly trained and experienced, so the risk of contracting children under 18 years is medium to a minor. This risk should be carefully handled in the ESMP.	Negative	**Medium - Minor**
Risk of SEA/SH	Gender-based violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (i.e., gender) differences between males and females. It includes acts that inflict physical, sexual, or mental harm or suffering, threats of such acts, coercion, and other deprivations of liberty. These acts can occur in public or in private. The SEA/SH risk of the project is rated as negligible since the PRS location is in an uninhabited area	Negative	**Negligible**
Waste generation	Inappropriate waste disposal and improper management of construction waste materials could lead to spillages that will cause soil and/or groundwater contamination. Improper disposal of such waste 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. Poor handling and inappropriate storage of hazardous and non-hazardous materials on site, as fuel, engine oil and paints may result in poor containment of induced leaks.	Negative	**Medium**

Impact	Description	Type	Significance
Reduction of Traffic Flow	The traffic flow that will be created during the construction period will to some extent depend on which type and number of trips to and from the proposed site will not have significant impacts on the road (Riyana- Armant Road) which has low traffic.	Negative	Minor
Groundwater pollution	Ground water may be impacted in case of improper disposal of wastewater from dewatering activities (if existed), sanitary wastewater (About 30 workers during the construction phase will use the contractor portacabin toilets), construction wastes or debris (generated from activities like ditching, and excavation). Poor site management, inappropriate storage or disposal of construction related waste and accidental spills may pose a risk to ground water and neighbouring agriculture fields.	Negative	Minor
Risk on Community health and safety	Impacts on community health and safety can result from emissions of gaseous pollutants, dust, increased background noise levels, uncontrolled dumping of construction waste, accidental falls in temporary excavated trenches and accidental contact with equipment etc. Impacts associated with Community Health and Safety are limited to the inside the fence of the PRS. Therefore, there are minor impacts related to community health and safety during construction.	Negative	**Minor**

Impact	Description	Type	Significance
Impacts related to lands	The PRS needs a plot of land of 11,550 m². The plot of land is a state-owned land and was allocated to the Project according to the coordination and inspection minutes of meeting between Egypt Gas and LGU at Markaz Armant (EGAS procedures in Annex 3). No tenants, encroachers, residential laborers or other with customary claims or other of land use. (**Annex-2** land document).	Negative	**Negligible**
Operation			
Risks on Occupational health and safety	At PRS site, inhalation of air pollutants (odorant or natural gas leak), exposure to noise levels, injuries, and potential death as a result of operating equipment with high-pressure tools and equipment and handling hazardous materials. In case of emergency/accidents, resultant risks are studied in detail in the attached Quantitative Risk Assessment, which shows that the required mitigation measures are already in place and no further measures are needed. In cases, where further mitigation measures are required, action plans are set for implementation and follow up by the concerned departments	Negative	**Medium**
Impacts due to COVID-19 pandemic	During the operation of the Armant PRS, the Movement of staff inside and outside the project borders may increase the risk of transmission of COVID-19 to the workers and community health. Given the fact that the average number of workers during operation of the Armant PRS will be about 6 workers/ shift from the permanent workers (well trained) of the LDC, COVID-19 vaccinated and maintain social distancing.	Negative	**Minor**

Impact	Description	Type	Significance
Hazardous material and waste	**Hazardous material** An odorant leak can result from improper handling of the odorant and storage in unsafe conditions, in terms of occupational health and safety. According to the Armant QRA study, modeling the vapor release will extend outside the PRS fence from the South side. **Hazardous waste** During operation and maintenance of the PRS, industrial hazardous wastes will be generated (e.g., lubricating oils, odorant containers, chemical containers). Poor waste management practices may have a significant impact on the environment (soil, groundwater, visual, health, and safety).	Negative	**Medium**
Noise	The pressure reducers normally cause noise. The maximum noise level expected from the reducers is 80 dB/shift (12 hours per shift). the generated noise is constant (not intermittent).	Negative	**Minor**

6. Analysis of Alternatives

6.1 No Project Alternative

The main target of the proposed project is to supply natural gas to households in Armant District and other surrounding areas in the future. This Natural Gas Connections to Households Project is expected to yield many economic and social benefits in terms of providing a more stable, energy source, achieving savings in LPG consumption, and enhancing safety in utilizing energy.

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

6.2 Technology Alternatives

6.2.1 Outlet Pressure

The PRS will reduce the Natural Gas pressure from 25-70 Bar in the HP pipeline to 7 Bar to be suitable for distribution or use in domestic or industrial applications.

Armant' s PRS will produce 7 Bar outlet pressure for the local distribution network (intermediate pressure). The LDC choose to produce 7 Bars instead of 4 Bars due to the high consumption rate expected in Armant city. It is designed to accommodate future expansion to feed other cities and/or villages surrounding the Armant district.

Outlet pressure 7 bar is the best alternative for accommodate future expansions to provide NG to other concerned districts.

6.2.2 Odorant Handling

Environmental and safety control considerations and measures are integrated into the selected technology design. For example, to reduce emissions from the odorant unit, the odorant will be automatically added or by using a plunger pump. Automatic and sophisticated unit management systems ensure safe and easy operation and can encompass the complete remote operation of the units.

The selected technology design for odorant handling is the best alternative for Environmental and Safety considerations

6.3 Location Alternative

As mentioned in item 2.4 (Project Execution Methodology) and item 5.2.2.12 (land related impact), the main criteria for PRS siting are:

- Proximity to High-pressure gas main lines to minimize Off-take length
- Availability of space with adequate dimensions and affordability of the land for PRS construction and possible expansion
- The PRS will be installed inside a desert land. The land location is a state-owned land, and was allocated to the Project according to the coordination and inspection minutes of meeting between Egypt Gas and LGU at Markaz Armant (**Annex-2**). And EGAS procedures (**Annex-3**)

6.4 Conclusion through analyzing the alternatives

Through analyzing the above alternatives, it could be concluded that implementing the project is recommended as long as its impacts are identified, analyzed and their mitigation measures are determined and executed (accordingly to the study recommendations), and its social, economic, and environmental advantages to the Egyptian Public and Government.

7. Environmental and Social Management & Monitoring Plan

7.1 ESMMP Objectives

The Environmental and Social Management and Monitoring Plan (ESMMP) consists of a set of mitigation, management and monitoring measures to be taken during the 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 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 estimated 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 on the field. Additionally, EGAS has mobilized a supervision-consulting firm (Petrosafe company) to strengthen EGAS supervision capacity to make sure that all mitigation measures are applicable. During the operation phase, the PRS shall have at least one permanent staff member for health, environmental, and safety.

Overall, the following Environmental and Social measures are complementary to and do not substitute compliance to the detailed HSE guidelines, procedures, and actions adopted by EGAS and its subsidiary LDCs. **Annex-5** attached to this report

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

7.2 Environmental and Social Management Measures

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	Impact on soil	- 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 - The contractor should obtain raw materials for construction from sources that are compliant with Egyptian Regulations - The contractor will procure quantities that are sufficient for the intended works only and recycle as far as practical to curtail wastage. - The contractor will commit to extensive use of recycled raw materials as appropriate.	Minor	Contractor	LDC –HSE department	Field supervision (audits)	- 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		
	Air emission	- Monitoring of wind speed and direction to manage dust-generating activities during undesirable conditions. - Management of the number of vehicles and equipment on the site. - Appropriate maintenance, engine tuning, and servicing of construction equipment to minimize exhaust emissions - Minimize unnecessary journeys or equipment use - Adopt a policy of switching off machinery and equipment when not in use (idle mode). - Minimizing drop heights for material transfer activities such as unloading of friable materials. - Transportation of construction waste by a licensed contractor. - Sheeting of Lorries transporting friable construction materials. - Appropriate sitting and covering of stockpiles of friable materials with adequate cover in addition to regular water spraying to minimize dust blow. - Ensure material and waste containers are always stacked and sealed properly and secured from tipping /falling /damage /direct sunlight during transportation and storage - Avoided dust generating activities during high wind periods.	Negligible	Contractor	LDC –HSE department	Contractual clauses + Field supervision (audits)	- Contractor costs - LDC management costs

	Noise	**Workers** Application of the normal precautions normally taken by construction workers as follows: - All machines and vehicles should be shut off when not used - Choosing vehicles, equipment of good technical specifications, and status - Good maintenance of this equipment to reduce the resulting noise - Effective scheduling of installation activities to avoid the overlap of noise sources - All machinery is 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 machines and vehicles should be shut off when not used - Provide Earmuffs, earplugs, certified noise PPE for workers - Noise exposure periods should be minimized for workers so as not to exceed the safe limits mentioned in the environmental laws in addition to the occupational health and safety standards **Nearby farmers:** - Notification to the surrounding farmers before the construction phase. - Time management and construction schedule according to the WBG regulation provided by the contractor before the construction phase.	Minor - Negligible	- LDC - Excavation Contractor	LDC–HSE department	Contractual clauses + Field supervision (audits) Field supervision Complaints receipt from local administration	- Contractor costs - LDC management costs
Physical receptor	waste generation	- Temporary storage in covered areas with impervious floor - Safe handling using PPE and safety precautions - Empty cans of oil-based paint resulting from painting the steel connection pipes of the PRS project are to be collected and sent	Minor	- LDC - Excavation Contractor	LDC HSE department	Field supervision and review of certified waste	- Indicative cost items included in contractor

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		back to the nearest LDC depots (Abo Rawash) for temporary storage until disposal at a hazardous waste facility (Nassreya or UNICO in Alexandria). - If hazardous waste quantities generated are too small for isolated transport to the Nassreya landfill, a temporary storage site can be created. Coordination with waste authority will be imperative to secure a location and implement adequate procedures for storage depending on quantities and type of wastes until collection and shipping to Nassreya landfill. - Hand-over selected oils and lubricants and their containers to Petrotrade Co. for recycling **Table 7-2 presents more details about waste management**				handling, transportation, and disposal chain of custody	bid: - Trucks from licensed handler - Pre-treatment (if needed) - Disposal cost at Nassreya - Approximate cost of the above (to be revised upon project execution): 8000 EGP - 10000 EGP per ton

Social receptor (health and safety)	Occupational health and safety	- The project will hire a qualified contractor/sub-contractor with 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 - Regular inspection to the compelling worker to use their PPE - Training and licensing industrial vehicle operators of specialized vehicles. - The contractor also will be obliged to maintain daily attendance sheets as well as keep records of ID cards of workers to verify the attendance of workers to ensure first, that workers below 18 years old are not included on-site, second, in case of accidents the injured persons will be provided with proper health requirements according to the health insurance supported by contractor/subcontractor. - Health insurance should apply to the contractor workers and workers contracted by a sub-contractor - Full compliance to EGAS and LDC HSE requirements, manuals, and actions as per detailed manuals adopted by EGAS - The safety work Permits, in general, will be issued before each activity on-site by the LDC safety team according to the EGAS updated HSE guidelines (**Annex-5**) - Ensure the provision of the appropriate personal protective equipment and other equipment needed to ensure compliance with HSE manuals - The new contracts with contractors/subcontractors will include an annex with mitigation measures to address labor-management issues through having in place labor-management procedures. The annex will include all the social requirements in the worker ' contract such as: _ The right of workers to report their thoughts. _ 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)	Minor	- LDC - Excavation Contractor	LDC HSE Department	Field supervision inspection and review of HSE report+ Field supervision (audits)	- 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		
			- Worker GRM, allows the worker to submit his complaint. - First aid and an emergency protocol in place in case of an accident - Incident and accident report log system in place. - There is a regular training and safety drills in case of emergency for all workers to ensure identified protocols and equipment is used properly.					

	Impacts due to COVID-19 pandemic	**Assessing Workforce Characteristics** - Minimize contact and keep a distance not less than 1 meter with community people **Entry/Exit to the Work Site and Checks on Commencement of Work** - Confirm that workers are COVID-19 vaccinated - 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 - Provide briefings to workers before 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 (paid by LDC) or isolating such worker for 14 days. - Prevent sick workers from entering the site, referring them to local health **General Hygiene** - 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 handwashing 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 **Cleaning and Waste Disposal** - Provide adequate cleaning equipment, materials, and appropriate PPE (face masks, gloves….) as necessary	Minor	- LDC	- LDC Patrolling committees EGAS HSE department	Field supervision and review of HSE report+ Field supervision (audits)	- Contractor costs - LDC management costs

		- 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 **Adjusting Work Practices** - Adapting work processes to enable social distancing and training workers on these processes - Continuing with usual safety training 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 the site immediately and refer to the nearest hospital / local medical facility for medical examination - any suspected cases should be self-quarantined 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 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 **Training and Communication with Workers** - Workers are made aware of the procedures that have been put in place by the project, and their 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 - **in addition to EMOP and WBG Guidelines related to COVID-19 infection (Annex-9).**					

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
	Child Labor	- The project will hire a qualified contractor/sub-contractor with high health and safety standards. - Rigid obligations and penalties will be added to the contractor ToR to warrantee no child Labor occurs in the project - The ToR also will oblige the contractor to keep a copy of IDs of Laborers to monitor the hired staff below 18 years old - The contractor also will be obliged to maintain daily attendance sheets to verify the attendance of workers to ensure first, that workers below 18 years old are not included on-site, second, in case of accidents the injured persons will be provided with proper health requirements according to the health insurance supported by contractor/subcontractor.	Minor	- LDC - Excavation Contractor/subcontractor	- LDC– HSE department	- Field supervision and review of HSE report+ Field supervision (audits)	- 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		
	Risk of Labor Influx	To minimize impacts of labor influx the following should be thoroughly implemented: - 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-10** of this report). - All workers should be trained on the Code of Conduct. - 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 newcomers 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 like The National Council for Women's Rights (15115) - Raising awareness of the local populations about the project commitment towards communities' and the measures taken for that through public consultation and focus group discussions - Apply Penalties to workers violating the code of conduct.	Minor	Contractors and subcontractors	LDC HSE for guidance super vision	-Field supervision by LDC and EGAS. Received grievances	_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	Traffic	- Time management for transporting the materials, equipment, debris, etc. - Clear sign surrounding the construction site and the exit gate. - Coordination with traffic department (ministry of interior) for vehicles route and movement and road open-cut crossing. - Vehicle speed restrictions should be applied across the project site, - Flagman will be considered whenever needed. - Safety precautions taken during night driving will be according to EGAS updated HSE guidelines (**Annex-5**)	Negligible	Contractors	LDC + Traffic department	Contractor has valid conditional permit + Field supervision	- Contractor costs - LDC management costs
	Concerns of Community	- The detailed grievance mechanism (GRM) is presented in Annex-11 attached to this report is to be shared with the community beneficiaries. - 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. Posters will be prepared and made available to the beneficiaries in the contracting office. Additionally, they will be available in the customer services office. Sufficient and appropriate information about the GRM will be disseminated to the communities before the construction phase. - Informing neighboring farmers through posters about the project details, location signing up to the network and receiving the service, project-level GRM	Negligible	Contractors LDC –HSE department	- LDC – HSE department EGAS SDO	Contractual clauses + Field supervision Field supervision	- Contractor costs - LDC management costs - LDC management costs

Table 7-2: Waste management During Construction Phase

Waste Type	Hazardous/Non-Hazardous	Treatment and Disposal
Cement and Concrete Wastes (Including Cement Contaminated Soil)	Non-Hazardous	- Will be sent to Luxor dumpsite
Domestic Waste (food waste, packing,)		
Wood – Scrap	Non-Hazardous	- Temporarily stored in isolated area on-site, then transported to Abu Rawash storage site (Egypt Gas facility) to be sold as scrap.
Tires		
Cardboards		
Containers		
Paints containers	Hazardous	- Temporarily stored in an isolated area of the site, the transported- by licensed hazardous waste handling vehicles and personnel- to Abu Rawash storage site (Egypt Gas facility) for final disposal at hazardous waste facility (Nassreya and / UNICO).
Batteries		
Chemicals (solvent, lubricants,…) containers		
Used Oils	Hazardous	- Temporarily stored in isolated area on-site, then transported to Abu Rawash storage site. The final disposal will be by Petrotrade Co.

Table 7-3: 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		
Social –Health	Community and Occupational health and safety	- ESMP will provide the provision of the health, safety, and precaution of the environmental impacts and its mitigation measures to be followed during operation. - Produce Hazardous Area Classification drawings - Provide fixed firefighting system (pumps, hoses, tank, etc.) and portable firefighting devices distributed in different sizes, trip distance considered according to its type. - Preventive maintenance policy and station manual - Provision of onsite first aid facilities (in addition to local medical services (**Annex-12**) - Provision of self-contained breathing apparatus (2 pieces for each station) for handling odorant leaks - Install an elevated wind sock and provision of portable gas detectors - The design should fully comply with IGE TD/3	Minor	- LDC project Department Designer	- LDC project department - Engineering dep. - HSE dept. EGAS	- Drawing and design Document Review - Policy and manual review - Inspection by operators Signage inspection and site visits	- Project cost LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		code requirements - Ensure that first aid and an emergency protocol in place in case of an accident - Ensure that incident and accident report log system in place. - Regular specific safety, site management training (as: protocols for the handling and storage of hazardous material, maintenance of safety systems, and waste management and disposal) and safety drills in case of emergency for all workers to ensure identified protocols and equipment is used properly (Annex 12). - Raising awareness of the farmers in the surrounding area about the project commitment towards communities' and the measures taken in case of emergency or accidents					

	Impacts due to COVID-19 pandemic	**Assessing Workforce Characteristics** - minimize contact and keep a distance not less than 1 meter with community people **Entry/Exit to the Work Site and Checks on Commencement of Work** - Confirm that workers are COVID-19 vaccinated - 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 - 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	Negligible	- LDC	- LDC Patrolling committees - EGAS HSE department	- Field supervision and review of HSE report+ Field supervision (audits)	- Contractor costs - LDC management costs

		General Hygiene - 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 **Cleaning and Waste Disposal** - 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 **Adjusting Work Practices** - 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 **Project Medical Services** **Local Medical and Other Services** - Any suspected case should leave site immediately and refer 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 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 **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 - **In addition to EMOP and WBG Guidelines related to COVID-19 infection (Annex-9).**					

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
Physical receptor	waste generation	- Strict use of chemical-resistant suits and PPE when handling odorant barrels, tanks, or spills - Evacuation of odorant from barrels into holding tank with utmost care and full PPE - Covering possible odorant spills immediately with sand and treatment with sodium hypochlorite as per EGAS and LDC practices - On-site treatment of empty containers with sodium hypochlorite and detergent as Per EGAS and LDC practice - Ship empty containers to a certified hazardous waste facility via company depot using certified handling and transportation contractors - Ensure full and empty (treated) odorant containers are accompanied by a trained HSE specialist during transportation to and from the depot and to/from the hazardous waste disposal facility (UNICO and/or Nassreya) - Others measures as per item 7.4: Armant Quantitative Risk Assessment study recommendations. In order to minimize risk of spillage of hazardous odorant, the following general precautions should be taken:	Minor	PRS staff	LDC HSE Dpt.	Quaternary auditing	- Project cost LDC management costs

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		- Pre-Plan the anticipated amounts of odorants to be used in order to minimize leftovers and residuals. - Handle with extreme care and always perform visual checks on the integrity of the odorant container - Avoid rough handling rolling or dropping of odorant containers - Avoid exposure to direct sunlight during storage or transportation - Ensure odorant containers are always sealed properly and secured from tipping/falling/damage during transportation and storage (temporary and long-term) - Always have sufficient amounts of sand, sodium hypochlorite and detergent on standby during usage of odorant - ALWAYS handle containers or spills with care and full PPE compliance - Never release or empty residual odorant from its container to any receptor or for any reason other than filling the odorant tank at the PRS - NEVER use empty odorant containers for any other purpose - In case of odorant spillage: - avoid inhalation and sources of ignition - immediately cover and mix with					

Receptor	Impact	Mitigation measures	Residual impact	Institutional Responsibility for Implementation		Means of Supervision	Estimated Cost of mitigation / supervision
				Mitigation	Supervision		
		sufficient amounts of sand and sodium hypochlorite using necessary PPE and tools - collect contaminated sand in clearly marked secure containers/bags - Add sand to inventory of hazardous waste					

7.3 Monitoring and Review

Procedures to monitor and measure the effectiveness of the management program, 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 program. The monitoring results shall be documented and the necessary corrective and preventive actions in the amended management program and plans shall be identified consequently.

7.3.1 Monitoring procedures

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

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

EGAS also conducts supervisory visits through an external consultant 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.

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

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Ambient air quality	Increased air emissions and dust	- Inspection of vehicle and machinery maintenance schedule - Inspection of the construction activities - Exhaust emissions concentrations from diesel generators	LDC HSE	Monthly during construction + before construction and twice for machines	Vehicles licensing Department	Measurements and reporting of exhaust emissions of construction activities machinery Complaints log	LDC management costs
Ambient noise levels	Increased noise levels	- Noise intensity, exposure durations and noise impacts - Use of earmuffs by Construction workers	LDC HSE	Regularly during site inspections	Construction site	Measurements of noise levels Complaints log	LDC management costs
		Complaints from neighbors	LDC HSE	Weekly during construction.	Construction site	Documentation in HSE monthly reports	LDC management costs
Physical receptor (soil, groundwater, visual)	Waste generation	Observation of accumulated waste piles	LDC HSE	During construction. Monthly reports	Construction site	Observation and documentation	LDC management costs
		Chain-of-custody and implementation of waste management plans	LDC HSE	Area reports	Construction site and document examination	Site inspection and document inspection	LDC management costs
		Observation of water accumulations resulting from dewatering (if encountered)	LDC HSE	During construction. Weekly reports	Around construction site	Observation and documentation	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
Labor conditions		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
	Occupational Health and safety	- Total number of complaints raised by workers - Periodic Health report - Periodic safety inspection report - Incident register - Insurance policy and Attendees lists with workers IDs - The insurance expiry dates	LDC HSE	Two times per year for the PRS (at least once during the construction phase)	Construction site	The safety supervisor should follow commitment of workers to use the protective equipment -Inspection & recording of the performance -Reports about the workers and complaints	LDC management costs
		Provide a suitable tool for wind direction (Windsock) to be installed in a suitable place to determine the wind direction.	LDC HSE and Projects Dpt.	Daily during construction	Construction site	Supervision & reporting	LDC management costs
		Cooperation should be done with the concerned parties before planning for housing projects around the PRS area.	LDC Projects Dpt.	Daily during construction	Construction site	Supervision & reporting	LDC management costs
	COVID-19 pandemic	- Number of Suspected or confirmed COVID-19 cases, their location, condition, and all related actions taken - Periodic Health	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	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Frequency of monitoring	Location of monitoring	Methods of monitoring	Estimated Cost of monitoring
		report - Using of facemasks				measures are being implemented on all construction sites, these committees report to EGAS on daily basis whereas EGAS report to EMoP on a weekly basis	
	Child Labor	Attendees lists with workers IDs Complaints and accidents reports	LDC HSE	monthly for PRS	Construction site	Safety supervisor observe the Laborers Random checkup for Laborers IDs	LDC management costs
	Risk of labor influx	- Code of conduct is in place - A list of workers who have attended the 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	Construction sites	Supervision & reporting	Contractor Cost
Local traffic and accessibility	Reduction of traffic flow and accessibility to local community	Comments and notifications from Traffic Department	LDC HSE	Weekly during construction.	Construction site	Documentation in HSE monthly reports Complaints log	LDC management costs

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

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Monitoring Frequency	Location of monitoring	Methods of monitoring	Monitoring Estimated Cost
Ambient air quality	Improper management of odorant during operation	- Log of spillage incidents - Number of treated containers - Odorant delivery forms	LDC HSE	Quarterly for each PRS	- PRSs	Compare Environmental Register with odorant delivery forms, observation of site	LDC management costs
Ambient noise levels	Noise of PRS operation	- Noise intensity	LDC HSE	Quarterly for each PRS	- PRSs	- Noise meter	LDC management costs
Physical receptor (soil, ground water, visual)	Waste generation	- Best practice of handling and intermediate storage - Disposal to appropriate and licensed landfill	LDC HSE	Quarterly for each PRS	- PRSs	- Hazardous waste Register	LDC management costs
Labor conditions	Occupational Health& safety	- Total number of complaints raised by workers - Periodic Health report - Periodic safety inspection report	LDC, EGAS	Four times per year, each three months	- Safety supervisor should follow the commitment of workers to use the protective equipment - Inspection and recording of the performance - Reports about the workers& complaints	Complaints log LDC	No cost
		Review the emergency response plan and update the plan to include all scenarios in this study **and other needs including:**	LDC HSE (ERP document)	Yearly (ERP doc.)	PRS location	HSE annual audit	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Monitoring Frequency	Location of monitoring	Methods of monitoring	Monitoring Estimated Cost
		Firefighting brigades, mutual aids, emergency communications and fire detection / protection systems.	LDC HSE (ERP document) LDC HSE and Operation Dpt. for facilities.	Yearly (ERP doc.) Weekly	Area head office / PRS location PRS location	HSE annual audit Inspection checklist	LDC management costs
		Dealing with the external road in case of major fires.	LDC HSE (ERP document)	Yearly (ERP doc.)	PRS location	HSE annual audit	LDC management costs
		First aid including dealing with the odorant according to the SDS for it, with respect of means of water supply for emergency showers, eye washers and cleaning.	LDC HSE (ERP document) LDC HSE and Operation Dpt. for facilities.	Yearly (ERP doc.) Weekly	Area head office / PRS location PRS location	HSE annual audit Inspection checklist	LDC management costs
		Safe exits in building according to the modeling in this study.	LDC HSE (ERP document) LDC HSE and Operation Dpt.	Yearly (ERP doc.) Daily	Area head office / PRS location PRS location	HSE annual audit Inspection checklist	LDC management costs
		Inspection and maintenance plans and programs are according to the manufacturers guidelines to keep all facility parts in a good condition.	LDC Operation and maintenance Dpt.	Periodic maintenance plan according to manufacturers	Area head office / PRS location	HSE annual audit	LDC management costs
		All operations are according to standard operating procedure for the PRS operations and training programs in-place for operators.	LDC Operation Dpt.	Daily for operation Yearly for training	Area head office / PRS location	HSE annual audit	LDC management costs

Receptor	Impact	Monitoring indicators	Responsibility of monitoring	Monitoring Frequency	Location of monitoring	Methods of monitoring	Monitoring Estimated Cost
		Provide the site with SCBA "Self-Contained Breathing Apparatus" (at least two sets) and arrange training programs for operators.	LDC HSE and Operation Dpt.	Daily	PRS location	Inspection checklist	LDC management costs
		Cooperation should be done with the concerned parties before planning for housing projects around the PRS area.	LDC Security Dpt.	Daily	Around PRS location	Patrolling and recorded in logbook	LDC management costs
	COVID-19 pandemic	- Number of Suspected or confirmed COVID-19 cases, their location, condition, and all related actions taken - Periodic Health report - Using of Face Masks	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 EMoP on weekly basis	LDC management costs

7.4 Armant Quantitative Risk Assessment Study Recommendations

Regarding to the modeling scenarios and risk calculations to workers / public which find that both the risks to Workers and public in the Acceptable region, Even So, some Recommendations should be considered to keep the risk tolerability in its region as follows:

Recommendation	Timeline Phases	Egypt Gas Remarks
• **Ensure that**		
- All PRMS facilities specifications referred to the national and international codes and standards.	Design	
- Inspection and maintenance plans and programs are according to the manufacturers guidelines to keep all facility parts in a good condition.	Operation	
- All operations are according to standard operating procedures for the PRMS operations and training programs in-place for operators.	Operation	
- Emergency shutdown detailed procedure including emergency gas isolation points at the PRMS and Off-Take Point in place.	Operation	
- Surface drainage system is suitable for containment any odorant spillage.	Design	
• Considering that all electrical equipment, facilities and connections are according to the hazardous area classification for natural gas facilities.	Design	
• Updating the emergency response plan for the PRS to include all scenarios in this study and other needs like:	Operation	
- Firefighting brigades, mutual aids, emergency communications and fire detection / protection systems.	Operation	
- Dealing with the external road in case of major fires.	Operation	
- Safe exits in building according to the modeling in this study, and to the PRS from other side beside the designed exit in layout.	Design	
• Provide the site with SCBA "Self-Contained Breathing Apparatus (at least two sets) and arrange training programs for operators.	Operation	
• Cooperation should be done with the concerned parties before planning for housing projects around the PRMS area.	Operation / Design / Construction	
• Update the PRS layout to include the layout scale and the North direction to be compatible with the coordinates and Google Earth North.	Design	

7.5 Reporting of Mitigation and Monitoring Activities

During construction and operation, environmental performance against targets is reviewed by management monthly 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 monthly to be collated and input into the LDC's (Egypt 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.

7.5.1 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 incidents and complaints from the surrounding establishments and residents near the construction site.
- Unusual traffic delays or accidents 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
- The monthly report should include any incidents of high dust emissions or smoke during construction works including the natural dust that might be encountered.
- The number of near misses and the number of incidents including injuries.
- There should be a form prepared by LDC's HSE department for the contractor to keep records of quantities, types of waste received, and the location where it has been received from.
- The monthly report of the HSE supervisor from LDC should report the evaluation of the contractor's compliance with 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 monthly of the accident or the worker's obedience.
- Reporting monthly, the total number, and the type of heavy equipment used during the construction phase.

- Monthly report on health and safety performance. This report will include any incident and complaint regarding health and safety measures performed by the contractor.
- A monthly report on supervision sites visits (environmental, social and safety), by Petrosafe Company to EGAS including all non-compliances and an action plan to correct the situation by LDC.
- Reporting on the implementation of the labor management procedures on the ground, including child labor, worker GRM, disturbance to communities due to labor influx, insurance coverage.
- Reporting on the activities related to dissemination of information
- As per the GRM manual reporting will include as a minimum number of grievances received, type of grievance received, number of grievances solved and closed / unsolved (reasons for not solving them), timeframe to solve a complaint, and number of complains due to labor influx (community disturbance). Data to be disaggregated by gender and channels for receiving the complaints. All complaints to be registered in an online-unified system (for example Excel Sheet). Daily report to be prepared on construction work of the pressure reduction station.
- Daily report in a logbook to consider any outside construction works around the PRS location that related to public or industrial buildings.

7.5.2 Reporting of severe incidents

- According to Decree 126- 2003, in case of worker/community work-related severe accident or fatalities, immediate reporting should take place by the LDC to the relevant regulatory authorities and the Project Management at EGAS.
- EGAS will report the major accident to the World Bank within 24 hours at the latest.
- The report will include 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

7.5.3 During the operation phase, reports should include as a minimum

According to law 4/94 amended by law 9/2009 and its executive regulation, each facility should prepare an environmental register. Components of the environmental register are presented in annex three of the executive regulation. All environmental procedures included in the EMMP are to be recorded in the Environmental Register so that they can be communicated effectively and clearly. It will include (monitoring plan, solid waste management plan, emergency response plan,).

Environmental Register shall contain:

- Any complaint related to the noise generated from the PRS

- Regular noise and air measurement reports.
- Record keeping of the generated waste and their quantity and management (bills of waste transportation).
- Summary of the HSE monthly report.

According to Article 29-32 from law 9/2009 and its executive regulation, the PRS shall prepare a hazardous material and waste register containing the handling and storage of hazardous material and waste in the facility (types, quantities, material safety data sheets, type of storage and means of transportation). Additionally, the register should contain a contract and /or bills of hazardous waste disposal at UNICO and /or Nassreya.

7.6 Emergency Response Plan

Egypt Gas developed an Emergency Response Plan (ERP) which relates to its operations for the PRS and 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 in line with EGAS's Emergency Response Plan. For full details about the emergency plan, kindly refer to **Annex-12** attached to this report.

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

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 the 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 a 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
- The 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 the 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.

7.6.1 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.

7.7 Institutional Framework for ESMMP Implementation

7.7.1 Environmental Management Structures

EGAS is the supervisory body. Egypt Gas is the implementing body. To make sure that all mitigation measures are in place, EGAS has assigned a new consulting firm to implement the supervision tasks and strengthen EGAS supervision capacity. Below is the management structure of Egypt Gas.

Being the implementing body of the natural gas network in the project area, Egypt Gas has direct involvement with the environmental management and monitoring of the natural gas network. Egypt Gas has a good environment, occupational health and safety, and social background.

One of the standard tasks of the HSE Departments of Egypt Gas, supervised by EGAS, is to ensure that the E&S clauses; as identified in the construction mitigation plan, are included in the contractor's contract, along with non-compliance penalties, also ensure that the Environmental and Social Management Plan of the project is implemented in all the phases of the Project. Egypt

Gas has assigned two social development officers at the Head Quarter in addition to a social officer in Armant. The main tasks of the social development officers are:

- SDOs are responsible for the implementation of the Land Acquisition procedure during the process of land selection for the construction of Pressure Reducing Station.
- Carry out social screening to determine whether the project components will result in any resettlement impact and accordingly SDOs from EGAS and LDCs will decide the need for the preparation of a resettlement action plan or an abbreviated Resettlement Action Plan.
- SDOs will address all grievances raised by community members, particularly the ones related to resettlement activities (more information will be addressed in the GRM section).

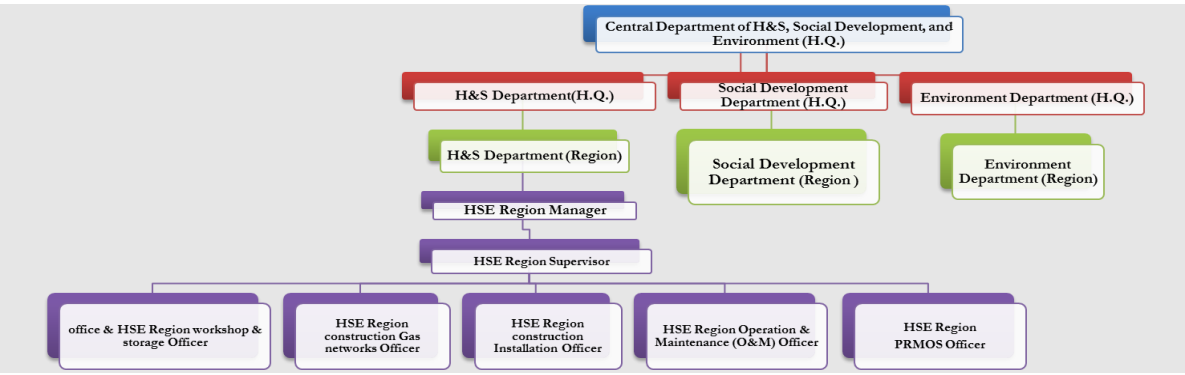

Figure 7-1: Egypt Gas ESMP organogram.

In the structure above (roles and responsibilities attached to **Annex-5**), designated site engineers perform daily implementation, monitoring, and reporting of activities as per the ESMMP with special attention to:

- Worker and contractor compliance to EGAS updated HSE manuals and ESIA procedures
- Occurrence of HSE incidents and suggestions for incident avoidance (Refer to Item 7.4)
- Management of broken asphalt (if any), unused backfill, solid waste, metal scrap
- Management of paint cans, refueling & lubrication, soil contamination
- Management of liquid waste such as leaked condensate hydrocarbons (if any) or chemicals used in heaters; and
- 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 waste is issued from the EGAS Environment Department
- Using analyzers to measure noise, SO2, CO, CH4, and NO2 in ambient air, and detect possible natural gas leaks
- Ensure and log compliant handling of odorant/odorant containers, odorant-contaminated-soils (in case of spillage)
- Measure noise at different locations of the PRS
- Other tasks as outlined in ESM & MP

Daily reports are to be compiled and sent to the regional HSE officer for the preparation of monthly summary reports. **Annex-5**

The monthly reports will send to HSE officer at Egypt Gas head office for compilation into quarterly reports to EGAS. EGAS in return will supervise the OHS, Environmental and social implementation through audits which will be executed by an independent entity. For that purpose a new contract was signed by EGAS 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. Petrosafe conducts at least one / two supervision visits each month according to EGAS plan.

7.7.2 Required Actions

1- Involvement of environmental and social officers during the design, costing, tendering, and construction phases would be advantageous.
2- An updated and detailed assessment of Egypt Gas EHS institutional capacity and available resources for the implementation of the ESMP
3- Specifically, Egypt Gas should take steps to develop the capacity of site engineers and HSE officers with specific courses focusing on the implementation of the ESMP detailed in this ESIA.

7.7.3 Management of grievances (Grievance Redress Mechanism)

EGAS and the LDCs aim to be recognized as responsible operators 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. Also, the Egyptian worker law No. 12 for the year 2003 provides for the Formal Grievance Procedure in case a worker, has been laid-off, discharged, dismissed, removed, or otherwise terminated from employment. The LDC has an internal division responsible for receiving, recording, and tracking the resolution of grievances.

Effective grievance management helps to:

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

GRM details will be shared with the community beneficiaries before and during construction works as well as during the contracting period. SEA/SH issues will be disseminated to encourage women to submit their complaints to the different project GRM channels (if they have any complaints) or to other channels like The National Council for Women's Rights (15115). Posters will be prepared and made available to the beneficiaries in the contracting office, in the neighboring area, other publicly accessible venues, and the customer services offices. It is worth mentioning that the customer's services offices are the main channel to receive complaints of Egypt Gas clients all over the country, while the hotline is the main channel to receive complaints in emergency cases. On the other hand, the GRM system for the current project has been tailored to handle the complaints of the project beneficiaries in a professional manner. Following are the various stages for handling project-level grievances. The proposed mechanism is built on three tiers of grievances:

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

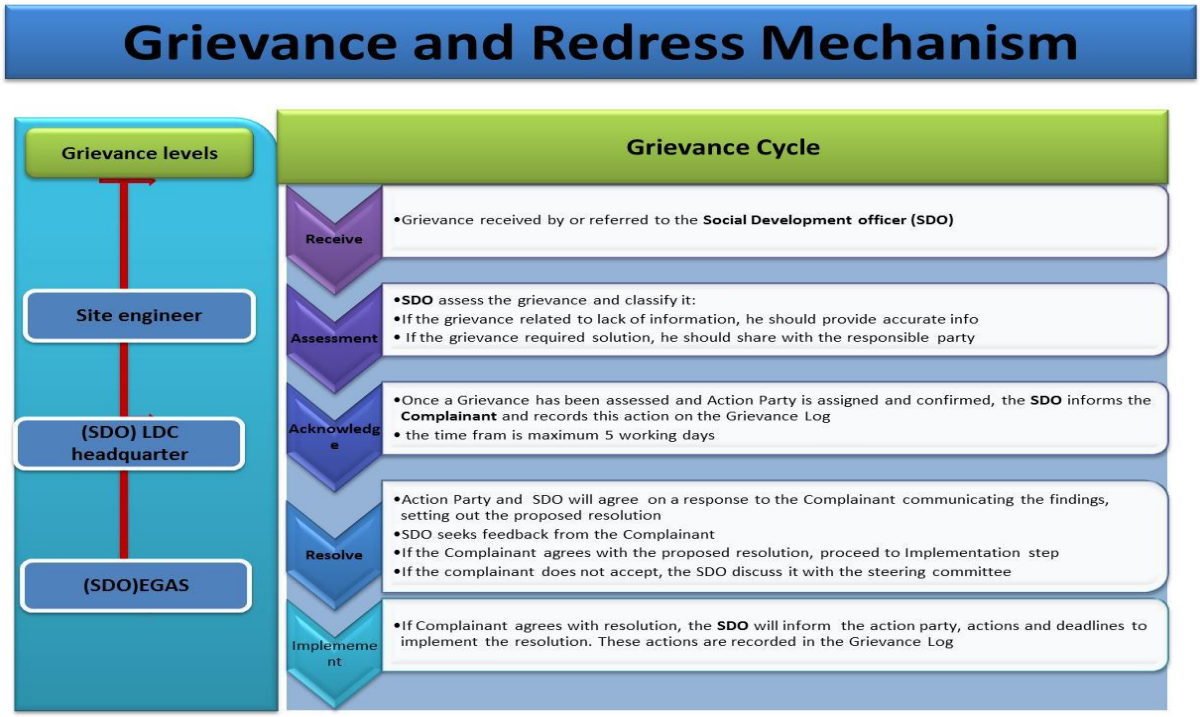

Figure 7-2 Proposed Grievance and Redress Mechanism

7.7.3.1 The first tier of grievances

To ensure a 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. Egypt Gas has assigned a least one Social Development Officer (SDO) who will be working closely with the assigned SDO of EGAS. It is the responsibility of Egypt 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 a response by then. (a complaint form is attached see **Annex-11**)

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,

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

7.7.3.2 Second-tier of grievances:

If the aggrieved person is not satisfied with the decision of the first tier, they can present the case to Egypt Gas headquarters. The complaint form is attached in **Annex-11**. SDO, where they should provide resolution within 10 business days, following, is the second level of grievances:

- The Social Development Officer in Egypt Gas headquarters will handle technical, environmental, and land acquisition complaints. Egypt Gas headquarters SDO should receive the unsolved problems. Thereafter, the SDO gets in contact with the complainant 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.

7.7.3.3 Third-tier of grievances:

If the aggrieved person is not satisfied with the decision of the SDOs of Egypt Gas at Stage 2, they can present the case to EGAS SDO where they should provide a 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.

7.7.3.4 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 complainant's 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 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.
- The SDO within the LDC and EGAS

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

7.7.3.5 Response to grievances

Response to the grievance will be through the following channels:

- The response to grievances should be through an officially 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 promptly as mentioned above, thereby conveying genuine interest in and understanding of the worries put forward by the community.
- EGAS and Egypt Gas should maintain a record of complaints and results., However, an anonymous complaint can receive a code and should be investigated appropriately and treated courteously. The correction action should be published on the LDC website.

7.7.3.6 Worker Grievances

The Project Management Unit (PMU) will require the Contractor/subcontractors to develop and implement a Grievance Redress Mechanism (GRM) for their 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 contractors/subcontractors will include an annex with mitigation measures to address labor-management issues, through having in place 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, and anonymous complaints, 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.

7.7.3.7 Monitoring of grievances

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

Table 7-6 Means of verification and indicators

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

7.7.3.8 Institutional Responsibility for the Grievances

The entity responsible for handling grievances will mainly be the Environmental Affairs Department within the implementing agency (EGAS). The Social Development Officer (SDO) working within EGAS in cooperation with Egypt 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.

8. Stakeholder Engagement and Public Consultation

The purpose of the consultation activities is informing stakeholders about the project and gaining their views, concerns and values. Additionally, increasing public confidence, improving transparency and accountability in decision-making and reducing conflict. This section will highlight the key consultation and community engagement activities that took place as part of the preparation of the ESMPs and ESIAs for the project in Luxor governorate and their outcomes.

In line with the strategy of the Ministry of Petroleum in promoting the utilization of Natural Gas in the household sector in all Egyptian Governorates, Egypt Gas has started its ambitious plan to connect Natural gas to Luxor districts. Luxor currently has more than 10 thousand residential customers using Natural Gas services. Therefore, the new household connections in Luxor governorate are supplementary to the current existing natural gas connection network there.

In December 2018, Luxor governorate has joined the current Natural Gas Connection Project financed by the WBG (as one of a new nine Governorates joined the project).

A public consultation session for the new nine governorates was held in October 2016 for the updated ESIAF for the whole project (20 governorates), which 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, limited consultation activities were held.

in Armant Markaz on 24th August, 2020 have covered both the PRS and all the Low pressures pipelines networks activities.

All those 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 legislation:

- WBG policies related to disclosure and public consultation, namely,
  - World Bank Operational Policy (OP 4.01).
  - 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 NG project in Luxor Governorate has witnessed several phases of consultation activities during the preparation of ESIAs and ESMPs as will be mentioned below. Due to the precautionary measures to prevent the spread of COVID-19 pandemic, a new methodology was adopted by the study team for consultation. 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;
- Avoid 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 ESIA accordingly.

8.3 Defining the stakeholder

To ensure an inclusive and meaningful consultation process, a stakeholder analysis was conducted to get a better understanding of the various groups and their roles, interests, and influence on the project. For Armant site-specific ESIA and ESMP for Luxor LP network In February 2021 (Armant, Luxor, Esna, El Habil, Munshaat El Imari and El Zenaqth districts), 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 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 Markaz Armant, Luxor 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: • Luxor governorate • Markaz Armant	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 natural gas. 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 will positively be affected from the Project specially Women, special needs and old people as they will not have to get LPG cylinders at their homes after they will be connected with the NG.
	Small business owners	Local businesses have the potential to benefit economically from the Project. However, as residents, this group also has 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 subcontractors)	Project workers	Workers will benefit from available job opportunities in the project. The workforce is fundamental to the Project and 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	The Project will secure health facilities for the workers by contracting health facilities at Armant to provide the required service
NGOs and civil society	El Shoban El Moslemein, Social & women development	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 ESIAs/ESMPs, and monitoring implementation of the Environmental Management Plan
	Information Centers on the governorate level	Provide NG companies with underground utilities and infrastructure maps.

Stakeholder Category	Stakeholder Group	Relevance/Importance of the Stakeholder to the Project
	Security Department	Secure the construction sites and prevent people from in- flushing into it
	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)
Local/provincial government stakeholders	Luxor governorate Authority	They are cooperating with the project in terms of facilitating permissions and coordinating with other local governmental units
	Local Governmental units (District authorities and village authorities)	Rehabilitation of roads, which is one of the major issues raised by the community, will be performed by the LGU. Provision of solid waste management facility
Media	Television and radio representatives Newspaper Websites	Inform the community about the project and its impacts and support dissemination of the main results of the ESIAs/ESMPs studies
Universities and Educational institutes	Faculty of Engineering	Review and enrich the ESIAs/ESMPs studies 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
Natural Gas companies	EGAS	Implementing agency overseeing activities of the Environmental and Social Management Plan
	Egypt 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 for 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). However, some of them were interviewed on their premises 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 regarding the project during various implementation phases. It is worth mentioning that the consultation activities have covered both

the PRS and all the Low pressures pipelines networks activities. Surprisingly, there was no single comment raised about the safety of the PRS or its activities. All questions raised during the consultation activities were related to the connection process (Low pressures pipelines networks), where most of the people are not familiar with the PRS activities. So, all questions, comments, and responses were concentrated on the NG connection activities and have been addressed in the ESMP study for the low-pressure network.

Due to the current situation of the COVID-19 pandemic and the required precaution, measures, the research team has adopted a new methodology for consultation; a limited consultation session in addition to FGD and interviews with some stakeholders conducted at Markaz Armant on 24th of August, 2020 with a participation of 35 Where the public officials of the Governorate stressed expediting the implementation of the project in their districts. **(See lists of participants Annex-13)**. It is worth mentioning that consultation activities have included the farmers (who are cultivating plots surrounding PRS site). EGAS in collaboration with the LDC will ensure that farmers and local communities in neighboring land plots will be informed about the project activities. All farmers expressed their satisfaction and their eagerness to have NG at their homes.

Consultation activities were conducted after the LDC received the preliminary land allocation from the local government unit. The final allocation decree was issued with some delays. The PRS is located in a desert area near agricultural reclamation land, 0.95 km away from the nearest residential area. Prior to construction, the EGAS in collaboration with the LDC will ensure that farmers and local communities in neighboring land plots will be informed about the GRM details and the project timeline.

Following are the methodology and the main consultation activities adopted by the research team for all project phases:

1. The study team visited the project district 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 potentially affected people.
    - Conducting different scoping meetings with different groups.

4. Consultation activities have been developed for the different communities through the following phases:
    - Stakeholder Engagement and Public Consultation for the project phase II (9 new governorates 2016).
    - Phase II: The Consultation activities were conducted in project district (Armant Markaz) in August 2020. (Lists of participants Annex-13)
5. Information about the project has been shared through:
    - During the site visits for the P&A survey at the early stage for project planning.
    - Consultation activities during the preparation of ESIAs and ESMPs for a different phase of the project.
    - Site engineers and Contracting offices

All activities conducted were documented with photos and lists of participants to warrantee appropriate level of transparency as follows:

Table 8-2: Stakeholders Engagement during the Preparation of The Updated ESIAF for Natural Gas Connection Project for 20 Governorates (October 2016)

Participants	Number		Methods	Date
	Males	Females		
Government officials and Potential beneficiaries.	62	17	Public Consultation Session	10th October, 2016
Non-Governmental Organization	9	3		
Media and Universities Representatives	10	6		
EEAA	1	6		
Petroleum Sector	32	13		
Electricity sector	10	1		
Total	124	46		

EGAS & MoP representatives welcoming the participants, October 2016	Participants during the Public consultation, October 2016

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

It is worth mentioning that Luxor Governorate representatives were about 7.7 % of the total attendees during the public consultation session for the update of the ESMF to include 9 more Governorates that was held in October 2016.

Table 8-3: Stakeholders During the Preparation of the Current ESIA at Armant District (Luxor Governorate August, 2020)

Participants	Number Males	Number Females	Methods	Date
Government Officials	3	2	FGD & Individual interviews	24th August, 2020
Community Potential Beneficiaries.	7	5		
Non-Governmental Organization	3	--	Individual interviews	
Affected Persons (LPG vendors)	4	--	Individual interviews	
Petroleum Sector	11	--	FGD	
Armant Total	28	7		

A panel with government officials at LGU headquarters Armant District	**FGD discussion with LPG distributors at Armant District**
	
Scoping meetings with NGO & LDC members at Armant District	**FGD discussion with** Local Community **at Armant District**

Figure 8-2: Consultation Activities at Armant District.

8.5 Summary of consultation activities

The field research team engaged in several social activities. These activities include in-depth discussions with government officials, individual interviews with potential beneficiaries; and with potentially affected people (LPG vendors), representatives of civil society, and community leaders. Consultation meetings were held at the LGU at Markaz Armant, where the public officials of Governorate stressed expediting the implementation of the project in all Armant districts.

Throughout the discussions (which included some beneficiaries who have already connected with natural gas at their homes), interviewees were asked about the following main points:

- The type of fuels currently in use, and its associated problems.
- The high cost of LPG cylinders.
- Some LPG cylinders are not suitable to be used, due to poor maintenance.
- 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 construction and operations.
- The cost of NG installation to households.

- The future positive/negative impact of the 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 strong public support and eagerness towards the project. Besides 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 in Luxor Governorate. Most of them are addressed at Luxor ESMP study. Such as cost of NG installation, Criteria for Natural Gas connection, Coordination between governmental organizations during connecting different public facilities, Street rehabilitation & land refill, etc. As mentioned before there was no single comment raised about the safety of the PRS or its activities. All comments were generality about the project as a whole.

Table 8-4: Key comments and concerns raised during the consultation activities, and the way they were addressed in the current ESIA study

Subject	Questions& comments	Responses	Addressed in the ESIA Study
Job opportunities	Can the project permanently employ our sons	The project Provide different job opportunities to skilled and unskilled labors, and create indirect job opportunities, in terms of supporting services to the workers and contractors who will be working in the various locations.	**Section 5**
Information sharing about NG	Shouldn't the gas company distribute flyers or brochures with clear information about the project?	The LDC adopts multi-level of information sharing. The first level during the P& A survey where technicians share information about the project with households. The second level through contracting offices, Posters are installed there to share information about the NG and contracting procedures. Additionally, there is a hotline that can share information with any of the targeted beneficiary	**Section 7.** **Section 8**
Complaint system	What if we have any complaints about the project, where we can raise our complaints? Why some complaints take too much time to respond.	The project is adhering to a grievance mechanism. This enables anyone to submit a complaint and respond to it in 10 working days and the different channels to support his complaint.	**Section 7.**

Subject	Questions& comments	Responses	Addressed in the ESIA Study
LPG problems	LPG is not always full and in a bad condition	Some private companies are working in fueling LPG bottles, and need more control and monitoring from the government.	**Section 4.**

8.6 Summary of Consultation Results

The consultation outcomes revealed the following:

- The Natural Gas connection project is achieving a great success during the last eight years, and community people have eagerness towards the project.
- The Ministry of Petroleum is giving a high priority for NG connection project and facilitate all the procedures to encourage more people to be connected by NG by offering the following:
  - ✓ Paying the cost in installment for 6 years at a zero-interest rate (30 EGP/ month).
  - ✓ A grant for poor people from AFD in cooperation with the European Union (1500 EGP/household) representing more than 50% of the NG connection cost according to specific criteria, and the principles which have been adopted by the Ministry of the Social Solidarity to determine the poor people.
- Community people asked for more information dissemination about the project and NG security and safety especially in the rural areas.
- The majority of the community people are in favor of the Ministry of Petroleum initiative to pay NG installation cost in installment (30 EGP/month).
- The community people are asking for speeding up NG connection to their homes, which will help them to overcome the problems related to LPG cylinders.
- The community people in favor of installing the pre- payment meters to overcome the problem of delay in collecting NG consumption bills.

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 ESIA disclosure

A final report will be published on the WBG, EGAS, and Egypt Gas websites. A copy of the ESIA report in English and a Summary in Arabic will be made available in the customer service office. Additionally, an Arabic summary will be made available in the contracting offices. An A3

poster will be installed in the contracting office informing about the results of the ESIA and the website link for the full ESIA study.