

Energy Valley

ESIA for the Energy Valley Project Abu Qir Battery Energy Storage System

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Table of Contents

List of Figures	iv
List of Tables	vi
List of Acronyms	vii
1. Introduction	1
1.1 Project Overview	1
1.2 Objective of the ESIA	3
1.3 Scope of Work	3
1.4 Structure of ESIA study	3
2. Project Description	5
2.1 Project Location	5
2.2 Process Description	7
2.3 Project Components	7
2.4 Construction Activities	11
2.5 Service Units	13
2.5.1 Water and Wastewater Tanks	14
2.6 Decommissioning Phase	16
2.7 Environmental and Social Aspects	17
2.8 Area of Influence	19
3. Baseline Environment	23
3.1 Physical Environment	23
3.1.1 Project Site	23
3.1.2 Climate	25
3.1.3 Topography	27
3.1.4 Soil	29
3.1.5 Geology	31
3.1.6 Geomorphology	31
3.1.7 Surface Water (Water Bodies)	32
3.1.8 Groundwater	35
3.1.9 Natural Hazards	37
3.2 Biological Environment	39
3.2.1 Project Location	39
3.2.2 Project Wider Area	40
3.2.3 The Project Site	43
3.2.4 Biodiversity	46
3.2.5 Ecological Value and Sensitivities	48
3.3 Economic and Social Environment	50
3.3.1 Demographic Profile	50
3.3.2 Economic activities	51
3.3.3 Land Uses	51
3.3.4 Infrastructure and Utilities	53
3.3.5 Health Facilities	55
3.3.6 Cultural Heritage	55

4. Policy, Legal, and Administrative Framework	58
4.1 National Legislation Pertaining to EIA	58
4.2 Applicable Egyptian Environmental Regulations pertaining to the project.....	59
4.2.1 Air Quality	59
4.2.2 Ambient Noise	60
4.2.3 Non-Hazardous Solid Wastes.....	60
4.2.4 Hazardous Materials and Wastes	60
4.2.5 Registers/ Records	61
4.2.6 Biodiversity Protection	61
4.2.7 Cultural Heritage.....	62
4.2.8 Work Environment.....	62
4.3 Strategic National Initiatives	66
4.4 International Conventions.....	67
4.4.1 Biodiversity	67
4.4.2 Climate change	68
4.4.3 Cultural Heritage.....	68
4.4.4 International Human Rights Conventions	69
4.4.5 Work Environment.....	70
4.5 Institutional Framework.....	71
4.6 International Standards and Guidelines.....	71
4.6.1 African Development Bank Group's Operational Safeguards (AFDB OS).....	72
4.6.2 EBRD Performance Requirements	74
4.6.3 IFC E&S Performance Standards	80
4.6.4 World Bank EHS Guidelines	82
5. Analysis of Alternatives.....	84
5.1 No Project Alternative	84
5.2 Alternative Site Location	84
5.3 BESS Alternatives.....	84
5.4 Cooling System Alternatives.....	86
6. Assessment of Environmental and Social Risks/Impacts and Mitigation Measures	88
6.1 Methodology	88
6.2 Impacts and Risks Identification.....	90
6.3 Assessment of Potential Negative Impacts and Proposed Mitigation Measures ...	91
6.3.1 Potential Impacts during Construction Phase	91
6.3.2 Potential risks and impacts during the Operation Phase	102
6.3.3 Potential Impacts during decommissioning	107
6.4 Risks and Impacts of the Environment on the project.....	109
6.5 Cumulative Impacts.....	109
7. Stakeholders Engagement.....	110
7.1 E&S Scoping activities.....	110
7.1.1 Key Discussion Points:.....	111
7.2 GRM.....	112
7.2.1 Grievance Handling Process	114
7.2.2 Monitoring	114
8. Environmental and Social Management Plan.....	116
8.1 Summary of Risks and Impacts, and Mitigation Measures	116

8.2	Environmental and Social Organizational Arrangements	121
8.2.1	Environmental and social management system and HSSE responsibilities	121
8.2.2	Environmental and Social Reporting to Lenders	122
8.2.3	Environmental and Social Policy	122
8.2.4	Risk assessment and hazard identification	122
8.3	Environmental and Social Management Plans (EMPs)	123
8.3.1	EMPs During the Construction Phase	123
8.3.2	Environmental Management Plans During the Operation Phase	127
8.3.3	Social Management Plan During Construction and Operation Phases	131
8.3.4	Project Decommissioning Plans	132
8.3.5	Summary of ESMP.....	132
8.4	Environmental and Social Monitoring Plan.....	139
9.	Conclusion.....	146
10.	References.....	147

Annexes

Annex 1: Borehole logs

Annex 2: Hydrological Study Report – Abu Qir BESS Site

Annex 3: Site Visit Report

Annex 4: National and Lenders Environmental and Social, Requirements Gap Analysis

Annex 5: ESIA Methodology

List of Figures

Figure 1-1: Proposed Project Location and Surrounding Activities	2
Figure 2-1: Activities/land uses surrounding the proposed site.....	6
Figure 2-2: Lithium-ion battery storage system	8
Figure 2-3: Closed loop liquid-based cooling system	9
Figure 2-4: AOI During construction phase.....	20
Figure 2-5: AOI during Operation Phase	22
Figure 3-1: Project site and surrounding uses	24
Figure 3-2: Image of the proposed project site	25
Figure 3-3: Wind Rose for Alexandria Governorate	26
Figure 3-4: The topographic map of the project site	28
Figure 3-5: The soil map of the project site	29
Figure 3-6: Image of the observed soil at the project site.....	30
Figure 3-7: The Geological map of the project site	31
Figure 3-8: The Geomorphological map of the project site	32
Figure 3-9: Surface water resources around the project site.....	34
Figure 3-10: Effective watersheds projected on Topo Map, showing no direct intersection with the study area.....	36
Figure 3-10: The Groundwater map of the project site.....	37

Figure 3-11: Earthquake Map of Egypt	38
Figure 3-12: BESS project site and the surroundings.....	39
Figure 3-13: Palm plantations located south of the Project Site.....	40
Figure 3-14: Agricultural plot located on the eastern borders of the Project Site.....	41
Figure 3-15: Agricultural ditch running parallel to the eastern fence of the Project Site	41
Figure 3-16: Wastelands located on the southern borders of the Project Site.....	41
Figure 3-17: Abu Qir Power Plant	42
Figure 3-18: Northern extension of Ezbet El-Settin, east of the Project Site	42
Figure 3-19: View of the reed-dominated site	44
Figure 3-20: Western walkway bordering the fence of the Abu Qir Power Plant.....	44
Figure 3-21: Water accumulation in the low-lying parts of the Project Site	45
Figure 3-22: View of the topsoil of the Project Site at the eastern walkway	45
Figure 3-23: Common Knotgrass (<i>Polygonum aviculare</i>)	46
Figure 3-24: Field Wormwood (<i>Artemisia campestris</i>).....	46
Figure 3-25: Small Mallow (<i>Malva pusilla</i>).....	46
Figure 3-26: Egyptian Mallow (<i>Malva parviflora</i>)	46
Figure 3-27: Vimba (<i>Pluchea dioscoridis</i>)	46
Figure 3-28: Quincy Pride (<i>Pluchea ovalis</i>)	46
Figure 3-29: Sensitivity to soaring migratory birds map.....	49
Figure 3-30: Land uses around the project site	52
Figure 3-31: Railway and Road Network around the project site	54
Figure 36: Health facilities	55
Figure 3-33: Archeological Sites around the project site.....	57
Figure 5-1: BESS systems	85
Figure 7-1: Proposed grievance mechanism system	113

List of Tables

Table 3-1: Environmental and Social Aspects	17
Table 2-1: Environmental and Social Aspects AoI during the construction and phase	19
Table 2-2: Environmental and Social Aspects AoI during the operation phase	21
Table 3-1: Coordinates of Project Site	23
Table 3-2: Maximum and Minimum Monthly Air Temperatures	26
Table 3-3: Average Monthly Amount of Rainfall	27
Table 3-4: Relative Humidity (%)	27
Table 3-5: Groundwater levels recorded during borehole drilling.....	35
Table 3-5: Coordinates of the Project Site (Africa Lambert Conformal Conic).....	43
Table 3-6: the migratory birds around the Project Site	48
Table 4-1: Maximum Limits of Ambient Air Pollutants according to Annex (5) of the Modified ERs of Law 4/1994 as well as the EU Maximum Limits	59
Table 4-2: Maximum Limit Permissible for Noise Level in the Different Zones according to Annex (7) of the Modified ERs of Law 4/1994 as well as EU Maximum Limits	60
Table 4-3: Maximum Noise Levels within Workplace (dB (LAeq))	63
Table 6-1: Assessment of the overall significance of impacts	89
Table 6-2: Average Noise Levels from Construction Equipment	99
Table 6-3: The Impact Assessment Matrix for the Construction Phase	101
Table 6-4: Typical Sound Power Levels of Main BESS Operational Noise Sources.....	102
Table 6-5: impact assessment matrix for the operation phase	108
Table 8-1: Summary of the social and Environmental Aspects, Mitigation Measures, and Residual risks and Impacts.....	117
Table 8-2: Overview of ESMP Plans During Construction.....	133
Table 8-3: Overview of ESMP Plans During Operation	136
Table 8-5: Environmental Monitoring Plan.....	140

List of Acronyms

The following abbreviations are used throughout this ESIA document, listed in alphabetical order.

Acronym	Full Name / Description
AfDB	African Development Bank Group
BESS	Battery Energy Storage System
BMS	Battery Management System
CAA	Competent Administrative Authority
CAPMAS	Central Agency for Public Mobilization and Statistics
CESMP	Construction Environmental and Social Management Plan
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
EBRD	European Bank for Reconstruction and Development
EEAA	Egyptian Environmental Affairs Agency
EETC	Egyptian Electricity Transmission Company
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction (Contractor)
ESHIA	Environmental, Social, Health and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESR	Environmental and Social Requirement (EBRD)
EU	European Union
GBV	Gender-Based Violence
GER	Gross Enrolment Ratio
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
HSE	Health, Safety and Environment
HSMS	Health and Safety Management System
HSSE	Health, Safety, Security and Environment
IFC	International Finance Corporation
ILO	International Labour Organization
ISS	Integrated Safeguards System (AfDB)
LFP	Lithium Iron Phosphate (battery chemistry)
LTO	Lithium-Ion Titanate (battery chemistry)
MOTA	Ministry of Tourism and Antiquities
NCCS	National Climate Change Strategy (Egypt)
NMC	Lithium Nickel Manganese Cobalt (battery chemistry)
NREA	New and Renewable Energy Authority (Egypt)
OHS	Occupational Health and Safety

Acronym	Full Name / Description
OHTL	Overhead Transmission Line
PCS	Power Conversion System
SCADA	Supervisory Control and Data Acquisition
HVAC	Heating, Ventilation and Air Conditioning
WWTP	Wastewater Treatment Plant
SEAH	Sexual Exploitation, Abuse and Harassment
WBG	World Bank Group
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
ER	Executive Regulations
PRA	Probabilistic Risk Assessment
YEO	Youth Employment Office
AC	Alternating Current
AoI	Area of Influence
BAT	Best Available Techniques
CR	Critically Endangered
DC	Direct Current
DD	Data Deficient
E&S	Environmental and Social
EGP	Egyptian Pound
EN	Endangered
EUR	Euro
GHG	Greenhouse Gas
GPG	Gender Pay Gap
HR	Human Resources
HS	Hazardous Substances
HW	Hazardous Waste
kV	Kilovolt
kWh	Kilowatt-hour
MV	Medium Voltage
MVA	Mega-Volt Ampere
MW	Megawatt
MWh	Megawatt-hour
MWp	Megawatt-peak
NA	Not Applicable
NO₂	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPI	No Net Loss or Net Positive Impact
NT	Near Threatened
OS	Operational Safeguard
PPE	Personal Protective Equipment
RIR	Recordable injury rate
PS	Performance Standard

Acronym	Full Name / Description
SF6	Sulfur Hexafluoride
SO2	Sulfur Dioxide
TSP	Total Suspended Particulates
USD	United States Dollar
VU	Vulnerable

1. Introduction

1.1 Project Overview

Energy Valley is an integrated renewable-energy and electricity-storage development comprising four geographically separate but financially and operationally linked components in Minya, Qena and Alexandria Governorates. The overall development includes: (i) the Minya Hybrid Facility, comprising a 1.95 GWp solar PV plant, a nameplate capacity of 1,500 MWh BESS, the on-site generation substation and associated grid-connection infrastructure; (ii) the Naseeg Saririya (Consumer) Substation and associated 500 kV grid connections in Minya Governorate; (iii) a nameplate capacity 1,000 MWh BESS at Nagaa Hammadi, together with a shared 33/220 kV substation and associated 220 kV loop-in/loop-out connection; and (iv) a nameplate capacity of 1,435 MWh BESS and 33/220 kV step-up substation at Abu Qir, with the external 220 kV grid connection which is an Associated Facility, as it will be under the responsibility of the Egyptian Electricity Transmission Company (EETC).

The four components form part of the same Energy Valley development and financing package but are assessed through separate site-specific ESIA's because of their different locations, receptors and risk profiles. This ESIA addresses only Abu Qir BESS site and includes a high-level assessment of the 220 kV OHTL, as EETC is responsible for the OHTL and for preparing the corresponding standalone E&S assessment. The remaining components are addressed in the corresponding Energy Valley ESIA's.

The Abu Qir BESS project is designed to store and discharge electricity through a direct connection to the national electricity grid, thereby supporting grid stability, load balancing, and the effective integration of renewable energy into the national grid.

The project will be built on a land owned by West Delta Electricity Production Company, located in Abu Qir City on the Tabia – Rashid Road, at the administrative borders between Alexandria and Beheira Governorates. The closest settlement is the village of Ezbet El-Settin located, located approximately 100 m east of the Project Site. The project site can be accessed via Tabia – Rashid Road. The land will be leased through a usufruct agreement with the West Electricity Production Company.

The project is being implemented in collaboration with international financing institutions, including the European Bank for Reconstruction and Development (EBRD), the African Development Bank (AfDB), European Investment Bank (EIB) and Cassa depositi e prestiti S.p.A. (CDP). This demonstrates international partners' confidence in Egypt's sustainable investment climate and its capacity to deliver projects with lasting environmental and economic benefits.

Figure 1-1 below shows Energy Valley - Abu Qir BESS Project and the surrounding activities in the study area.

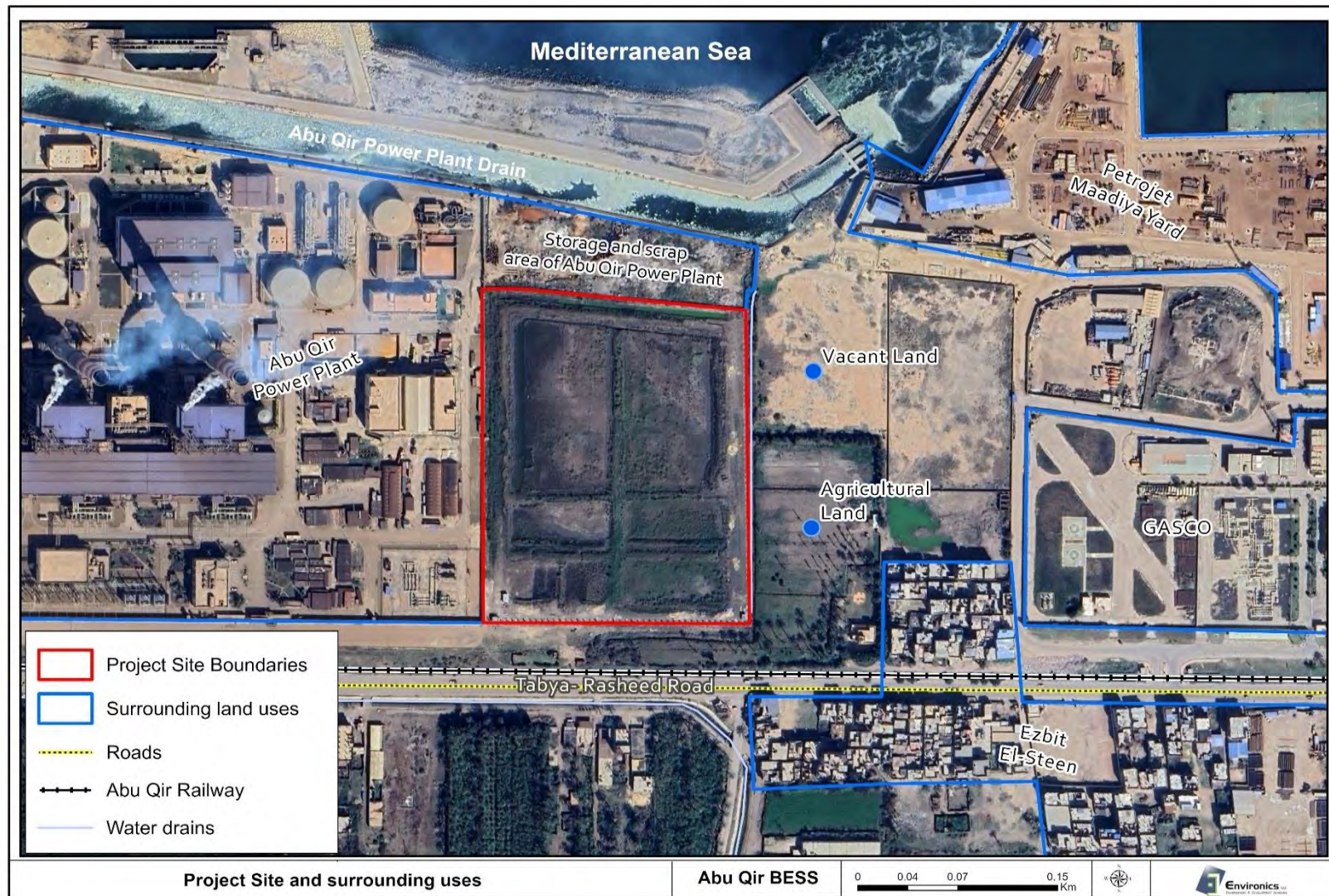


Figure 1-1: Proposed Project Location and Surrounding Activities

In accordance with Environment Law 4/1994 (as amended by Laws 9/2009 and 105/2015) and its revised Executive Regulations ERs, this Environmental Impact Assessment (EIA) study is prepared for the construction and operation of Energy Valley – Abu Qir BESS.

According to the initial meeting conducted with the Egyptian Environmental Affairs Agency (EEAA) on 6 January 2026, the BESS has been classified as Category Scoped-B project. In addition, according to the Lenders' categorisation, the project is a Category B project.

This classification reflects that the proposed BESS, with a total capacity of 1,435 MWh, is expected to have limited, site-specific environmental and social impacts, including manageable battery hazards without significant impacts, as detailed in the current ESIA.

1.2 Objective of the ESIA

The objective of the ESIA is to ensure that the project is environmentally sound and socially sustainable and that any potential negative environmental and social consequences are recognized early in the project cycle and taken into account before project implementation. It also aims to propose appropriate mitigation measures to prevent/reduce potential negative impacts during the construction and operation of the proposed project, to be within the limits of legal environmental and social requirements.

Moreover, the ESIA aims to satisfy the environmental legal requirements of the Egyptian Environmental Law 4/1994 modified by Law 9/2009 and Law 105/2015 as well as its executive regulations (ER) modified in 2005, 2011, 2012, 2017 and 2024.

Moreover, the ESIA is also intended to satisfy the environmental and social requirements of the international funding institutions, including specifically the IFC, EBRD, and AfDB.

1.3 Scope of Work

The ESIA of the proposed project would assess the potential environmental and social risks and impacts across all project stages, including construction, operation, and decommissioning. The assessment will establish baseline environmental and social conditions within the project's area of influence.

The assessment will review relevant national, international standards and lender requirements. Potential impacts will be identified, evaluated and addressed through mitigation measures documented in an Environmental and Social Management Plan (ESMP), including monitoring and responsibilities.

1.4 Structure of ESIA study

This ESIA report includes:

- **Chapter 1: (the current chapter):** Introduction and Background on the project for which the ESIA is developed as well as the scope and objectives of the ESIA study
- **Chapter 2:** Description of the intended BESS construction and operation phases and the expected environmental and social aspects

- **Chapter 3:** Description of the environmental baseline and social context in the project area
- **Chapter 4:** Description of the local regulatory framework as well as the International Environmental and Social standards and requirements applicable to the project activities
- **Chapter 5:** Discussion of alternatives for different project components.
- **Chapter 6:** Assessment of the potential environmental and social risks and impacts and their mitigation measures.
- **Chapter 7:** The environmental and social management and monitoring plan for the BESS
- **Chapter 8:** Stakeholder Engagement

2. Project Description

The proposed project comprises the construction and operation phases of a utility-scale BESS with an installed nameplate storage capacity of approximately 1,435 MWh. The BESS will be developed on an approximate land area of 50,410 m², located within the Abu Qir Power Plant premises in Alexandria Governorate.

The Project is designed to store and discharge electrical energy through a direct connection to the national electricity grid.

The BESS system includes battery storage units, power conversion systems, internal electrical infrastructure, auxiliary systems, and a dedicated 33/500 kV step-up substation with a capacity of approximately 360 MVA.

The primary functions of the BESS are to:

- *Store renewable electricity generated by the PV power plant located in NREA concession East of Minya through the national grid;*
- *Discharge stored energy in accordance with grid requirements and operational arrangements;*
- *Support grid stability, provide load shifting and energy management;*
- *Enhance the integration of renewable energy into the national grid; and*
- *Contribute to national renewable energy targets and decarbonization objectives.*

2.1 Project Location

The proposed BESS project is located on land owned by West Delta Electricity Production Company. The project occupies an area of approximately 50,410 m² and is situated within the Abu Qir Power Plant premises. The land will be leased through a usufruct agreement with the West Electricity Generation Company.

The proposed project site is bordered by the following land uses:

North: Abu Qir Power Plant storage and scrap area.

East: agriculture drain, followed by vacant land, agricultural land, And Ezbet El Setin village at about 100m from the site.

South: El Tabia–Rashid Road and the Abu Qir railway line.

West: Abu Qir Power Plant.

Figure 2-1 below shows the activities/land uses surrounding the proposed site.

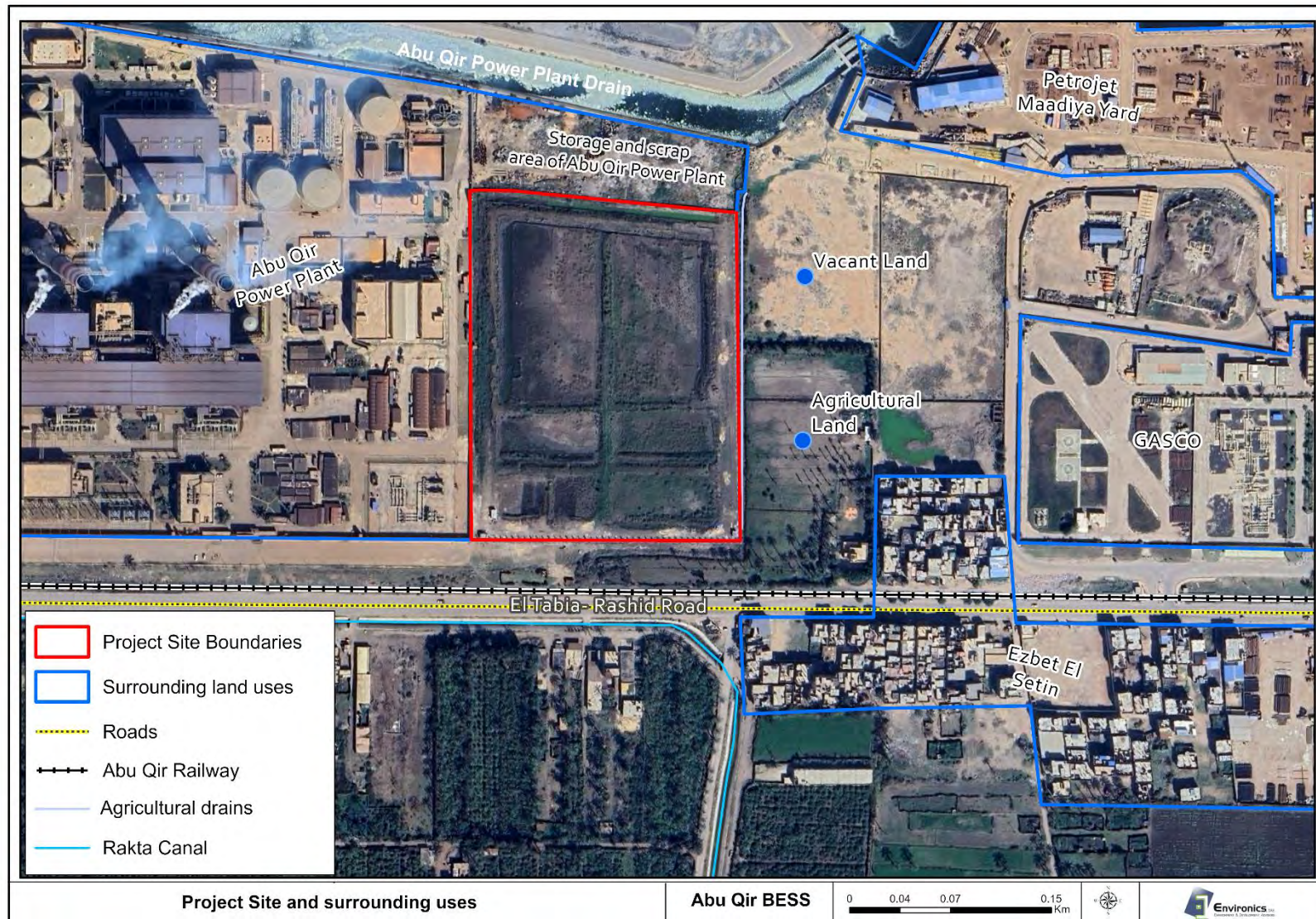


Figure 2-1: Activities/land uses surrounding the proposed site

2.2 Process Description

The project involves the installation and operation of a lithium-ion Battery Energy Storage System that stores electrical energy in chemical form during charging periods and releases it as electrical energy during discharge periods. It will operate automatically through integrated control, protection, and monitoring systems.

2.3 Project Components

The BESS consists of a lithium-ion battery energy storage system composed of multiple battery cells assembled into modules, racks, and containerized units. Each battery cell comprises of an encased cathode, anode, and electrolyte.

The BESS is expected to utilize lithium iron phosphate (LFP) chemistry, which is widely adopted in utility-scale energy storage projects due to its operational reliability, safety characteristics, and performance.

Battery modules will be housed within prefabricated, weatherproof containers, delivered to the site as pre-assembled units and arranged within the designated BESS compound. Containers will be installed on engineered and elevated foundations to reduce the risk of water accumulation and ensure long-term structural stability.

The total installed nameplate storage capacity of the BESS is approximately 1,435 MWh, distributed across approximately 201 containerized battery units.

A. BESS Battery Modules

- Lithium-ion battery modules with a total nameplate energy capacity of approximately 1,435 MWh and dispatchable AC capacity of 300MW for 4 hours.
- Battery modules are connected in series and parallel arrangements to achieve the required system voltage and capacity.
- Modules installed within insulated, weatherproof containers designed to withstand local climatic and environmental conditions.
- The BESS is expected to operate at up to one full charge–discharge cycle per day, subject to grid requirements and operational agreements.

Figure 2-2 shows the expected integrated lithium-ion battery storage system.

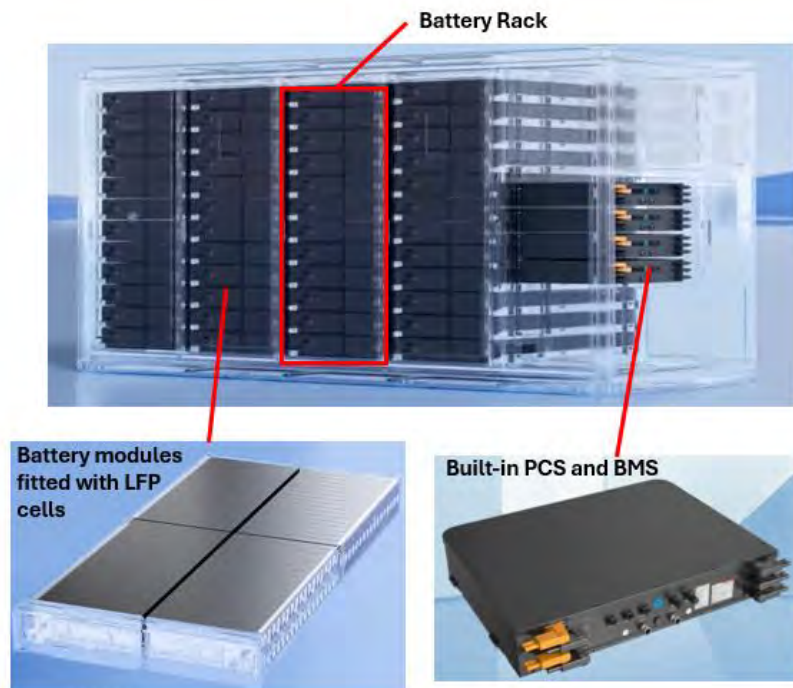


Figure 2-2: Lithium-ion battery storage system

B. Battery Management System (BMS)

The BMS is an essential component of the battery-based energy storage system. This system aims to monitor and manage the performance of batteries, ensuring they operate efficiently and safely. Some of the main tasks performed by the BMS include:

- *Voltage and Current Monitoring: to ensure they operate within safe limits.*
- *Charge Balancing: ensures balanced charging among all cells in the battery, which helps improve performance and extend battery life.*
- *Temperature Monitoring: The BMS monitors the battery temperatures and activates cooling or heating systems as needed to maintain optimal temperatures.*
- *Protection system: It protects against abnormal conditions such as overcharging, over-discharging, short circuits and over temperature.*
- *Diagnostics and Maintenance: The BMS provides regular reports on the battery status and helps detect potential faults before they cause significant problems.*

C. Cooling and Ventilation Systems

Lithium-ion battery modules generate heat during normal charging and discharging operations. To maintain battery temperatures within manufacturer-specified safe operating limits, the BESS will be equipped with a closed loop liquid-based primary cooling circuit combined with air-based secondary heat rejection and ventilation.

- **Primary (Liquid) Cooling Circuit**

A liquid coolant circulates through integrated cooling plates or heat exchangers installed in close thermal contact with the battery cells. Heat generated by the battery cells during charging and discharging is transferred to the circulating coolant. The heated coolant is then

conveyed through a closed-loop system using electrically driven circulation pumps to an external heat rejection stage for cooling before being returned to the battery modules.

- **Secondary (Air) Cooling and Ventilation**

Heat absorbed by the liquid coolant is dissipated to the ambient environment through air-cooled heat exchangers, commonly referred to as dry coolers, where ambient air is forced across these exchangers to remove heat from the coolant.

After passing through the dry coolers, the cooled liquid is recirculated back to the battery modules as part of the same closed-loop cooling system. In addition, ventilation within the battery containers supports internal air circulation, preventing localized heat accumulation and maintaining suitable internal environmental conditions.

All components are monitored and controlled through the BMS and the site's Supervisory Control and Data Acquisition (SCADA) system.

Figure 2-3 illustrates the described closed loop liquid-based cooling system.

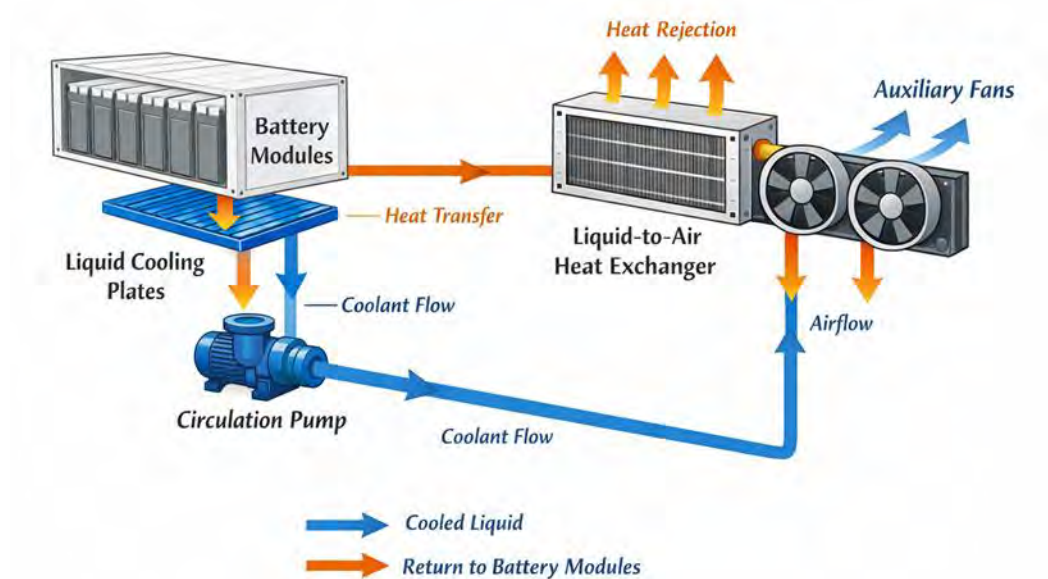


Figure 2-3: Closed loop liquid-based cooling system

D. Power Conversion and Medium Voltage Step-Up

- Power Conversion Systems (PCS) convert DC electricity from the batteries to AC electricity for grid export and vice versa during charging.
- PCS's are integrated into the containerized BESS units providing a combined low voltage AC output.
- The low voltage AC output of each BESS unit is connected to a containerized medium voltage step-up station, consisting of an LV/MV transformer and switchgear for protection.
- The output of MV step-up stations is reticulated via MV cables to the Project's step-up substation.

E. Control and Monitoring Systems

- A centralized SCADA-based control and monitoring system provides real-time system operation, performance monitoring, alarm management, and remote control.
- Sensors and communication interfaces with the BMS enable automated and safe operation of the BESS.

F. Step-Up Substation

A dedicated step-up substation will be constructed within the BESS project area to facilitate power export and import between the BESS and the national electricity grid. The substation is considered an integral component of the project and is included within the scope of this ESIA.

The step-up substation is expected to have an installed capacity of approximately 360 MVA and operate at 33/33/500 kV.

The substation will comprise of one 360 MVA power transformer, associated high- and medium-voltage gas insulated (SF6) switchgear, protection and control systems, and auxiliary equipment required for safe and reliable operation. The power transformer is expected to operate using oil-based insulation and cooling.

The transformer is expected to be loaded with maximum 90% of its ONAF rating and utilize an Oil Natural Air Forced (ONAF) cooling configuration, maintaining voltage regulation from – 15% to +15%. In this configuration, the heat generated within the transformer is dissipated through natural oil circulation and externally forced air cooling. This arrangement enhances operational efficiency and maintains transformer temperatures within acceptable operating limits.

The number, individual capacity, and detailed configuration of the transformers, including cooling fan arrangements, will be confirmed by the Company during detailed engineering design.

G. Electrical Connection to the Grid

The proposed BESS project will be connected to the national electricity transmission network through an external overhead transmission line (OHTL) to be constructed and operated by the Egyptian Electricity Transmission Company (EETC).

The proposed OHTL alignment originates from the 33/500 kV step-up substation located within the project site and extends southwards to connect with the existing electricity transmission network in the vicinity of the Abu Qir Power Plant.

The construction, operation, and maintenance of the OHTL will fall under the responsibility of EETC. The final route alignment and tower configuration will be confirmed during the detailed engineering design phase.

A separate Environmental and Social Impact Assessment (ESIA) will be prepared for the OHTL prior to construction, in accordance with applicable national and lender requirements.

H. Auxiliary and Safety Systems

- Fire detection and automatic aerosol suppression and exhaust ventilation systems are integrated within lithium-ion battery units.
- Emergency power supply systems (e.g. UPS and/or small backup power units for safety-critical equipment)
- Site lighting, security systems, and access control

The installation of the BESS for the proposed project will adhere to the following standards and regulations:

- NFPA 855: Ensuring installations are performed appropriately with vital life safety considerations.
- ISO 45001: Emphasizing occupational health and safety management.
- EN 62485-2: Covering safety requirements for secondary batteries and battery installations.
- Local Building and Fire Codes: Complying with local regulations for safety and construction.

2.4 Construction Activities

At the time of ESIA preparation, the project site is vacant, fully fenced, and free of permanent structures or active operations within the BESS footprint. The site contains a series of ponded areas, reflecting its previous use as a fish farm approximately three years ago. The area is characterized by localized reed vegetation dominated by *Phragmites australis*, and temporary water accumulation, primarily associated with rainfall. The site is predominantly low-lying, with slightly elevated walkways along the site perimeter.

The observed vegetation and surface water are confined within the project boundary and are addressed through the key construction activities described below.

A detailed description of baseline environmental and social conditions is provided in Chapter 3 Environmental and Social Baseline.

Construction of the BESS and the associated 33/500 kV step-up substation will commence following receipt of all required permits and approvals. The total construction duration is expected to be approximately 20 months. BESS and substation activities are expected to proceed concurrently, subject to the final detailed engineering design and EPC construction programme.

Key construction activities include:

- **Site preparation and Dewatering**

Site preparation will include clearance of vegetation within the defined footprint and management of rainwater accumulation currently present within ponded and low-lying clayey areas.

Vegetation clearance will be undertaken strictly within the fenced boundary using mechanical methods only, with no open burning permitted.

Topsoil containing organic matter will be stripped to an approximate depth of 15–30 cm, stockpiled separately within the site, and protected against erosion, sediment transport, and runoff for potential reuse or disposal at approved locations, in accordance with applicable national regulations and Good International Industry Practice (GIIP).

Where rainwater accumulation is present within existing ponded areas or low-lying clayey ground, controlled site dewatering of accumulated standing water, where required, will be undertaken prior to site preparation activities. Any water generated from dewatering activities will be collected and transported to an authorized public wastewater treatment plant for treatment and disposal.

- **Ground improvement and foundation works**
Ground improvement and foundation works will include raising and leveling all BESS infrastructure on engineered fill and/or reinforced foundations.
- **BESS Container installation**
Battery containers will be installed on prepared foundations using cranes and controlled lifting procedures. Adequate spacing between containers will be maintained to facilitate site drainage, fire access, and maintenance activities, consistent with the overall site stormwater management approach.
- **Substation construction and equipment installation**
Substation works will include construction of the foundations and associated control building, installation of the power transformer, medium- and high-voltage switchgear, protection and control systems, and auxiliary equipment required for safe and reliable operation.
- **Electrical and mechanical installation**
Electrical and mechanical works, including internal cabling, power conversion systems, and auxiliary equipment, will be undertaken on stabilized and dry working platforms.
- **Testing and commissioning**
Testing and commissioning activities, including system integrity checks, electrical testing, and functional commissioning, will be conducted in accordance with manufacturer requirements and applicable safety procedures.

The installation of the BESS and the substation will be implemented in accordance with Good International Industry Practice (GIIP). Specific mitigation measures will be applied to manage existing vegetation, saturated soils, and temporary surface water accumulation observed at the project site. Site preparation, drainage control, and ground improvement measures will ensure stable foundations, prevent water ingress into BESS infrastructure, minimize erosion, and protect soil, surface water, and surrounding environmental receptors throughout the construction phase.

2.5 Service Units

- **Temporary structures (during construction phase)**

During the construction phase, only minimal temporary facilities will be provided within the project site, commensurate with the limited workforce size and the short-duration construction activities.

The on-site facilities will be limited to:

- *A small temporary site office or site cabin, used by the contractor and the Employer's representatives for supervision and coordination.*
- *Basic sanitary facilities (portable toilets and handwashing units), provided in accordance with Egyptian health and safety requirements.*
- *Designated laydown and material storage areas for construction equipment and materials.*

Given the hiring of the workforce will be from surrounding communities and the same governorate, the construction workforce is expected to commute daily to and from the site, as suitable residential areas are available within reasonable commuting distance from the project location.,

No permanent mess or catering facilities will be established on site. Workers will rely on off-site food arrangements and nearby services during working hours.

All temporary facilities will be installed, operated, and maintained in compliance with applicable international occupational health and safety requirements and relevant Egyptian regulations.

Upon completion of construction activities, all temporary facilities will be removed, and the site will be reinstated to its pre-construction condition, where applicable.

- **Labor and Working Conditions**

The project will strictly adhere to the Egyptian Labor Law 14/2025 and international standards, including the ILO's "Minimum Age Convention, 1973 (No. 138)" and the "Forced Labor Convention, 1930 (No. 29)," to ensure the prevention of child labour and forced labour. The project will ensure that contractors are committed to abiding by the national minimum wage rate.

Additionally, the project will respect the workers' right to freedom of association and collective bargaining as per the ILO's "Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)" and the "Right to Organize and Collective Bargaining Convention, 1949 (No. 98)".

- **Permanent Buildings (Operation Phase)**

During the operation phase, limited permanent buildings will be established within the substation of the Project to support control, monitoring, security, and routine operation and maintenance (O&M) activities. Given the highly automated nature of the BESS, staffing levels during operation will be low, and facilities will be sized accordingly.

The main permanent structure will consist of a control building associated with the substation. The control building will be constructed using reinforced concrete and masonry. The building will house control, monitoring, and O&M functions. The facility will be designed and constructed in accordance with Good International Industry Practice (GIIP) and applicable Egyptian codes and standards.

2.5.1 Water and Wastewater Tanks

A. Water Supply and Storage

Construction Phase :

Water required during construction will include water for workforce sanitary needs, , equipment and vehicle cleaning, and other limited ancillary construction activities. Overall construction water demand is expected to be approximately 10 m³/day, although actual consumption will vary depending on the construction programme, weather conditions, and the need for dust suppression.

No water will be required for concrete production because ready-mix concrete will be supplied to the site. Water used for dust suppression is expected to be minimal due to the wet nature of the soil, water for cleaning will be limited to the quantities necessary for effective implementation of these activities. Water will be supplied by tankers sourced from approved suppliers and stored in prefabricated water tanks installed on site. Any wastewater generated from sanitary facilities or cleaning activities will be collected and disposed of in an authorized wastewater treatment plant..

Operation Phase:

During operation, water demand will be limited to office sanitary purposes only. Water consumption during the operation phase is expected to be approximately 0.3 m³/day.

The BESS does not require process water. Battery thermal management is achieved through a closed-loop liquid cooling system using a circulating coolant, which is not consumed or discharged during normal operation.

Water supply during operation will be provided through a connection to the available public water network.

B. Wastewater

Construction Phase:

Wastewater generation during construction will consist of domestic wastewater generated from sanitary facilities used by the construction workforce, in addition to existing standing water present within the project footprint at the start of construction.

Domestic wastewater will be collected in temporary septic tanks installed on site and will be removed by licensed contractors for treatment and disposal at approved wastewater treatment facilities.

Wastewater volumes during construction (domestic wastewater only) are expected to be approximately 8.5 m³/day.

Operation Phase:

During operation, wastewater generation will be limited to domestic wastewater from offices and sanitary facilities.

Estimated wastewater generation during operation is approximately 0.26 m³/day. Wastewater will be managed through the available wastewater infrastructure, via a connection to the public wastewater network.

C. Electricity supply*Construction Phase:*

Electricity required during the construction phase will be supplied through temporary diesel-powered generators.

Temporary electricity supply will be used to serve:

- *Small site offices*
- *Site lighting*
- *Limited construction equipment*

Total electricity consumption during construction is estimated at approximately 10–20 MWh.

Operation Phase:

During operation, electricity required for auxiliary loads of the BESS (including control systems, cooling systems, lighting, and offices) will be supplied directly from the national grid and/or internally from the BESS itself, in accordance with the system design.

D. Fuel supply*Construction Phase:*

Fuel required for construction vehicles and mobile equipment will be supplied off-site from licensed fuel stations.

- *No fuel storage will be provided within the project site.*
- *No refueling activities will take place on site.*

Operation Phase:

Due to the availability of a reliable grid connection, routine fuel use during operation is not anticipated.

For safety-critical systems (such as control systems, fire detection, security, and communications), a small emergency power source—such as a compact backup generator or an Uninterruptible Power Supply (UPS)—may be provided, subject to confirmation during detailed design.

E. Labour

The direct labour force required for the project construction could reach 250 workers at peak construction months, including skilled and unskilled labour. The contractors will hire workers from the local communities.

Permanent employees during operation are expected to be up to 8 workers. According to the company's employment policy, preference will be given to workers from neighboring areas, depending on the availability of suitable qualifications.

2.6 Decommissioning Phase

A. BESS and Substation Deactivation

Decommissioning will include the BESS, the substation, and all related electrical, mechanical, civil, and auxiliary infrastructure.

The BESS deactivation activities will include:

- *Controlled discharge and isolation of battery modules.*
- *Methodical disassembly and separation of battery components.*
- *Recycling or proper disposal of battery materials (e.g., lithium-ion) in compliance with environmental regulations and best practice/international and/or EU guidelines.*
- *Follow the standard decommission procedure provided by the BESS equipment supplier, where applicable and available.*

B. Electrical Component Deactivation and Substation Removal

The electrical component deactivation and removal activities will apply to both the BESS electrical systems and the step-up substation. These activities will include:

- Safe isolation and deactivation of transformers, switchgear, power conversion systems, protection and control systems, auxiliary equipment, and associated cabling.
- Drainage, recovery, and appropriate management of transformer oils, coolants, and other fluids by licensed contractors. Any contaminated equipment, materials, or soil will be handled in accordance with applicable hazardous-material and waste-management requirements.
- Removal and appropriate management of SF₆ or other gases contained in electrical equipment, where applicable.
- Comprehensive testing and assessment of electrical components to determine suitability for reuse or recycling.
- Environmentally responsible disposal of any hazardous materials contained within electrical equipment.

C. Foundations, Structures, and Site Reinstatement

Decommissioning will also include the removal of buildings, equipment bases, concrete slabs, foundations, underground cabling, drainage systems, and other below-ground infrastructure where required by the final decommissioning plan, applicable permits, or regulatory requirements..

Site reinstatement will include the removal of decommissioning waste and temporary facilities, , removal or treatment of residual foundations and below-ground structures where required, backfilling and grading, and restoration of the site to an agreed final land-use condition. Detailed measures will be included in a Decommissioning and Site Reinstatement Plan prepared before decommissioning activities commence.

2.7 Environmental and Social Aspects

Table 2-1: Environmental and Social Aspects

Environmental & Social Aspects		Source(s)		
		Construction phase	Operation phase	Decommissioning phase
Land Uptake	Land Access Restriction	N/A	N/A	N/A
	Land Transformation	- Site preparation, vegetation clearance, and ground improvement/dewatering works. - Temporary excavations and trenches for foundations (BESS containers, substation, auxiliary structures), followed by backfilling - Laydown area. - Substation construction. - Construction of temporary facilities.	- Permanent transformation of the Project footprint (~50,410 m²) within the existing Abu Qir Power Plant premises, on previously disturbed land formerly used as a fish farm.	- Removal of buildings, equipment bases, concrete slabs, foundations, underground cabling, and other below-ground infrastructure, where required. - Backfilling, grading, and restoration of the site to an agreed final land-use condition.
	Land Acquisition	N/A	N/A	N/A
Transportation Demand		- Transportation needs for BESS containerized units, substation equipment, and machinery. - Transportation of water, fuel, and other materials for construction activities. - Transportation of workers to and from the Project site.	- Limited transportation needs for O&M workforce (up to ~8 permanent employees), spare parts, and maintenance equipment.	- Transportation of dismantling equipment and machinery. - Transportation of decommissioning waste (e.g., battery modules, electrical components) to licensed disposal/recycling facilities. - Transportation of demolition and reinstatement materials.
Labour Demand		- Skilled and non-skilled construction workers (site preparation, assembly of BESS units, substation installation, etc.).	- Limited permanent workforce (up to approximately 8 workers), with preference given to local workers where suitable qualifications are available.	- Temporary specialized workforce for BESS deactivation, electrical component removal, and site reinstatement.
Water Demand		- Construction activities minimal for concrete curing and cleaning. - Potable (drinking) water. - Workers (sanitation, catering and other welfare facilities). - Dust suppression (limited need, given wet soils and surface water presence on site).	- Limited O&M workforce, sanitation, and other facilities.	- Limited demand for workforce sanitation and welfare facilities. - Occasional use for dust suppression during dismantling of structures.

Environmental & Social Aspects	Source(s)		
	Construction phase	Operation phase	Decommissioning phase
– Ambient Noise & Vibration for construction and decommissioning phases – Workplace noise for operation phase	- Transport vehicles, deliveries, and vehicle movement. - Foundation installation activities and heavy equipment/machinery. - Cutting machines and assembly of BESS units and substation components.	- Power Conversion Systems (PCS/inverters). - Auxiliary cooling units (hybrid liquid/air cooling system). - Transformers, switchgear, control and auxiliary electrical equipment. - Use of backup generators during power outages.	- Dismantling equipment and machinery. - Vehicle movements associated with removal and transport of components.
Dust/Particulate Matter/Gaseous Emissions	- Emissions from construction equipment exhaust (nitrogen oxides, sulphur oxides, carbon monoxide). - Localized dust and particulate matter from site preparation, material handling and stockpiling, and vehicle movement (expected to be limited given wet soils and surface water on site).	- Emissions from the emergency backup generator	- Emissions from dismantling equipment and vehicle exhaust. - Localized dust from demolition of foundations and below-ground structures.
Wastewater Generation	- Accumulated pre-existing standing water and rainwater within the Project footprint, collected via temporary drainage channels/sump pits for disposal by licensed contractors. - Domestic wastewater from the construction workforce, collected in temporary septic tanks and removed by licensed contractors.	- Minimal wastewater generation from office and sanitary facilities, collected by an approved contractor and discharged to designated treatment plants.	- Domestic wastewater from the decommissioning workforce. - Limited wastewater from equipment cleaning/decontamination activities, where applicable.
Waste Generation (Hazardous and non-hazardous)	- Non-hazardous: Stripped topsoil, cleared vegetation (grasses/reeds), construction debris (concrete, metals, plastics, packaging), and domestic waste from the workforce. - Hazardous: Solvents, paints, and empty containers of hazardous substances.	- Non-hazardous: Maintenance-related waste in small quantities, office supplies, and domestic waste from the workforce. - Hazardous: replacing damaged battery cells , if any, End-of-life battery modules and used lubricants and oils; cleaning materials; replaced electrical/mechanical components.	- Non-hazardous: Concrete, foundations, slabs, masonry, steelwork, fencing, scrap metals, cabling, and structural/container materials. - Hazardous: End-of-life lithium-ion battery modules, containers and racks; waste transformer insulating oils, lubricants, coolants and hydraulic fluids; waste cooling liquids/refrigerants; potentially contaminated soil, absorbents, PPE, rags and filters.

Environmental & Social Aspects	Source(s)		
	Construction phase	Operation phase	Decommissioning phase
Electromagnetic Fields	N/A	- within the workplace: Step-up substation and transformers. - Switchgear and protection systems. - BESS power conversion systems.	N/A
Community Health, Safety & Security	- Community exposure to construction traffic, - Limited community interface given the fenced, secured facility within the existing power plant premises.	- Limited community interface given the fenced, secured facility within the existing power plant premises.	- Community exposure to demolition/decommissioning traffic,.

2.8 Area of Influence

The area of influence (Aoi) includes regions likely to be affected by the project and its directly managed activities and facilities. It also encompasses areas impacted by unplanned but predictable developments caused by the project, which may occur later or at different locations. Additionally, it covers areas where the project indirectly affects biodiversity or ecosystem services that are crucial to the livelihoods of local communities. The identified project E&S aspects within the project's direct area of influence are described in the tables below. Impacts within the potential indirect area of influence, if any, would be addressed in the impact assessment section.

Table 2-2: Environmental and Social Aspects Aoi during the construction and phase

Environmental & Social Aspects		Area of Influence (Aoi)
		Construction phase
Land uptake	Land Access Restriction	The project footprint
	Land Transformation and soil disturbance	The project footprint
Traffic and Transportation Demand		Project access road, Tabia–Rashid Road, and other routes used for delivery of equipment, construction materials, water, wastewater, and waste
Labour Demand		The nearest communities and government
Water Demand		The nearest water supply plant.
Wastewater		The nearest wastewater plant
Waste Generation		The nearest waste management facility
Noise & Vibration		The project footprint and immediate surroundings
Dust/Particulate Matter/Gaseous Emissions		The immediate vicinity of the project area
Habitat Loss		Project footprint.
Occupational Health & Safety		Project footprint.
Community Health & Safety		Project access point, Tabia–Rashid Road.

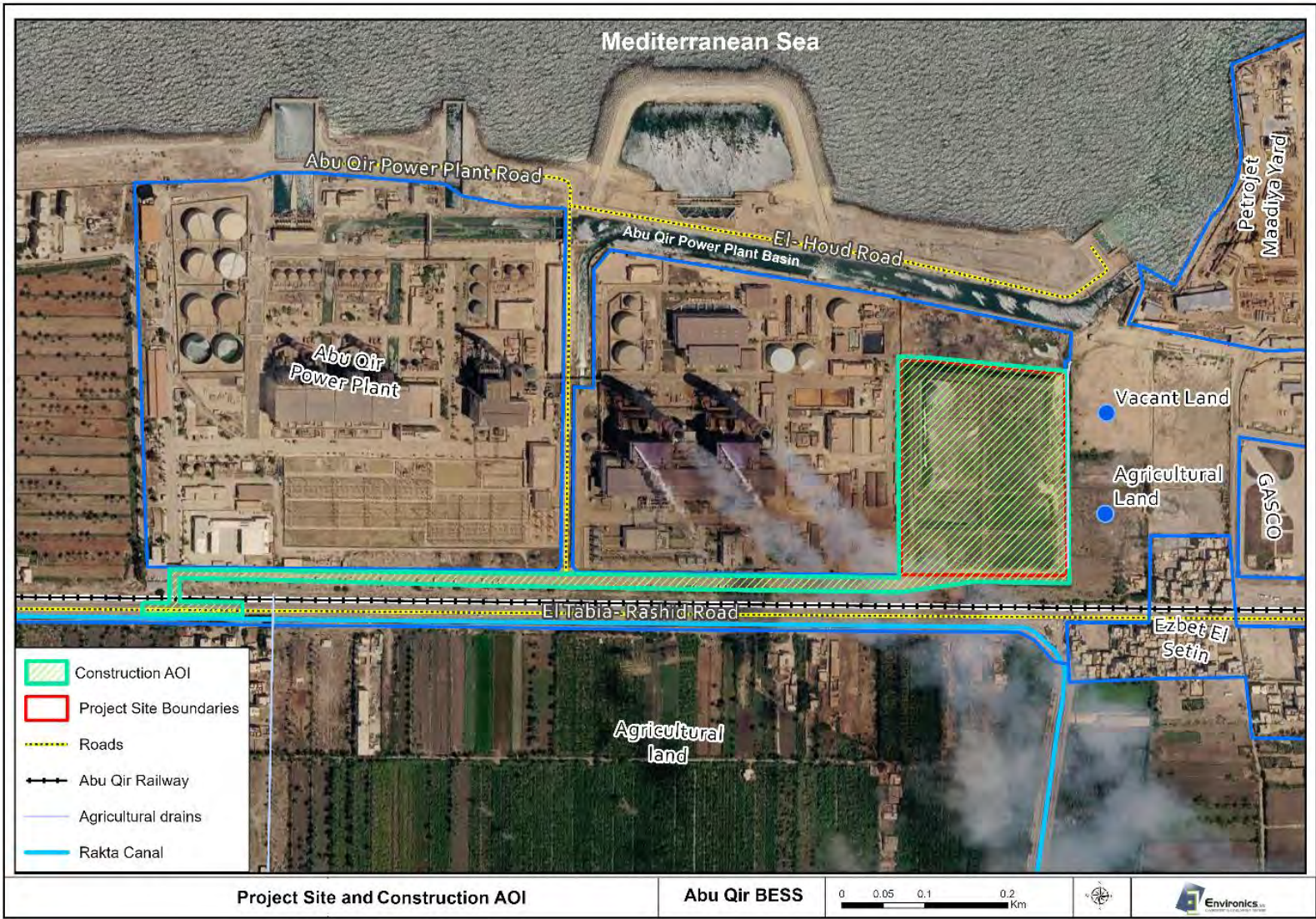


Figure 2-4: AOI During construction phase

Table 2-3: Environmental and Social Aspects Aol during the operation phase

Environmental & Social Aspects		Area of Influence (Aol)
		Operation phase
Land Uptake		Project footprint
Traffic and Transportation Demand		Limited needs for the same roads as for construction for transportation during O&M
Water supply and wastewater		Limited needs during O&M - supply to be secured either through trucking or a dedicated water connection.
Waste management		To be trucked from the site to the nearest waste management facility
Noise & Vibration		Limited to the workplace - Localized within the project footprint
Dust/Particulate Matter/Gaseous Emissions		N/A
Occupational health and safety		- Project footprint.

Based on the two tables above, the Aol during the construction phase encompasses the Project footprint, project access roads, Tabia–Rashid Road, and other routes used for the transportation of equipment, materials, water, wastewater, and waste. During operation, the Aol is primarily limited to the Project footprint and the roads and facilities associated with routine O&M activities.

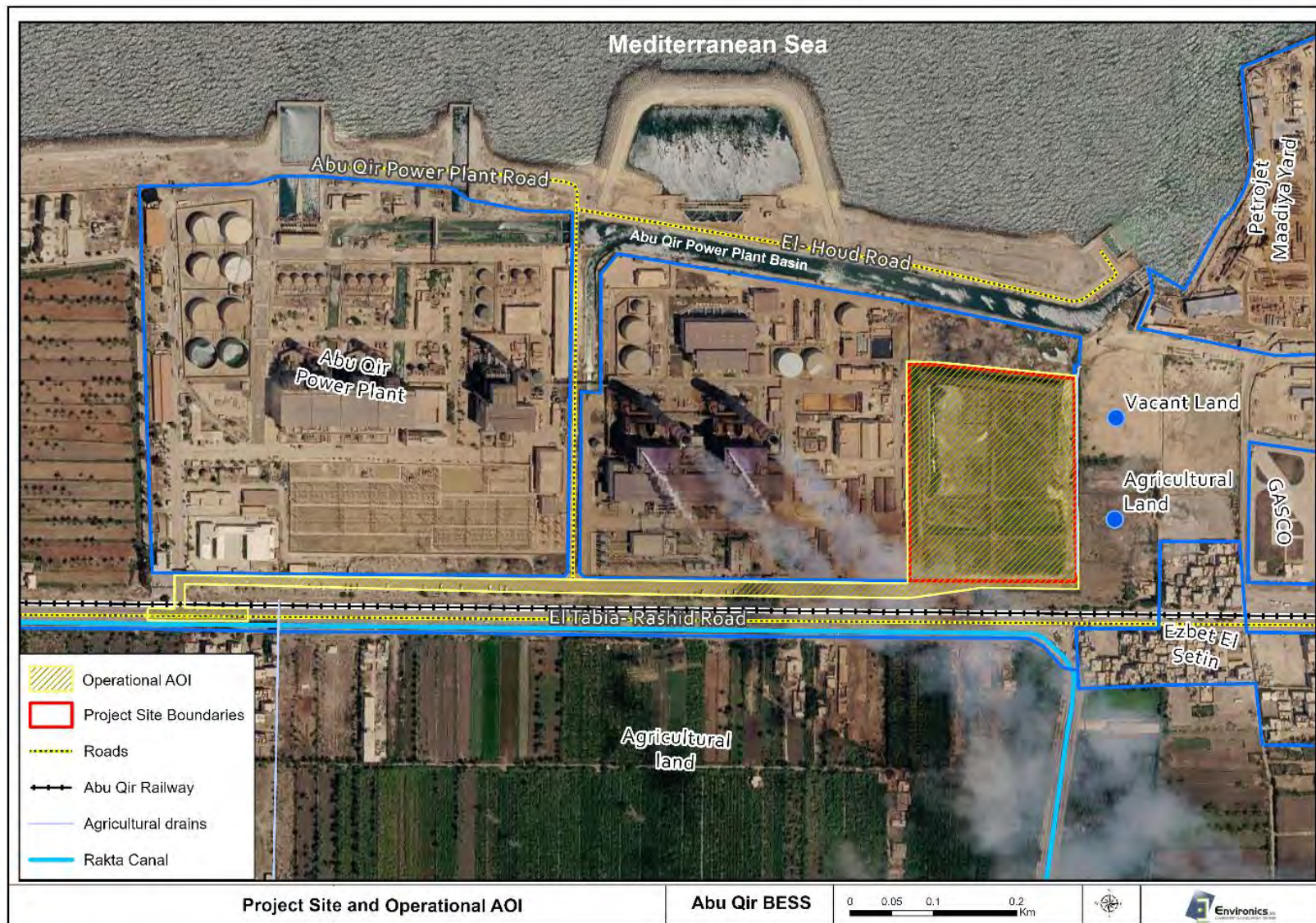


Figure 2-5: AOI during Operation Phase

3. Baseline Environment

3.1 Physical Environment

Information was gathered from published material, previous reports, online meteorological data such as Meteoblue and Weatherbase, interpretation of geological and hydrogeological maps, analysis of satellite images and application of GIS analysis tools. Topographic maps and groundwater information are based on the Geotechnical Encyclopedia of Egypt (2003) and other local sources.

3.1.1 Project Site

The proposed BESS project is located on land owned by new Abu Qir Power Plant. The proposed project area approximately 50,410 square meters, about 180 m south of the Mediterranean Sea, approximately 2.2 km from Lake Idku, about 10 km from Abu Qir City, and about 25 km from Alexandria.

Administratively, this land is located within the boundaries of El Tabia village, Montazah II District, Alexandria Governorate, on the administrative border between Alexandria and Beheira Governorates. The proposed project site can be accessed via the El Tabia- Rashid Road.

According to information obtained during the site visit conducted by the Consulting Team on January 22, 2026, and the photographs taken during the visit as shown in Figure 3-2, the site was previously leased by Abu Qir Power Plant to a private investor for the establishment of a fish farm; however, the project operated for only around six months before being abandoned, after which the land reverted to Abu Qir Power Plant.

The proposed project site is bordered by the following:

- North: Abu Qir Power Plant storage and scrap area.
- East: An agricultural drain, then vacant land, agricultural land, and Ezbet El Setin
- South: El Tabia- Rashid Road and the Abu Qir railway line.
- West: Abu Qir Power Plant.

The nearest residential area is Ezbet El Setin village, located about 100 m east of the project, as shown in Figure 3-1.

Table 3-1: Coordinates of Project Site

Point	Longitude (East)	Latitude (North)
1	541817.1	3420210
2	541825.5	3420210
3	541851.8	3420209
4	542035.4	3420185
5	542030.2	3419915
6	541809.4	3419923



Figure 3-1: Project site and surrounding uses



The northwestern part of the project site

The northeastern part of the project site

Figure 3-2: Image of the proposed project site

Source: Environics site visit on January 22, 2026

3.1.2 Climate

This section summarizes information pertaining to wind speed and direction, maximum and minimum air temperatures, rainfall, and relative humidity at and Abu Qir region. The climatic data presented below are extracted from the Central Agency for Public Mobilization and Statistics (CAPMAS) (2025) and the Meteoblue database (2026) of Alexandria Governorate.

a. Wind

Alexandria Governorate experiences notable variability in wind speeds throughout the year, with an annual average of approximately 25 km/h. The prevailing wind direction is northwesterly, as shown in Figure 3-3.

Alexandria
31.20°N, 29.92°E (9 m asl).
Model: ERA5T.

meteoblue®

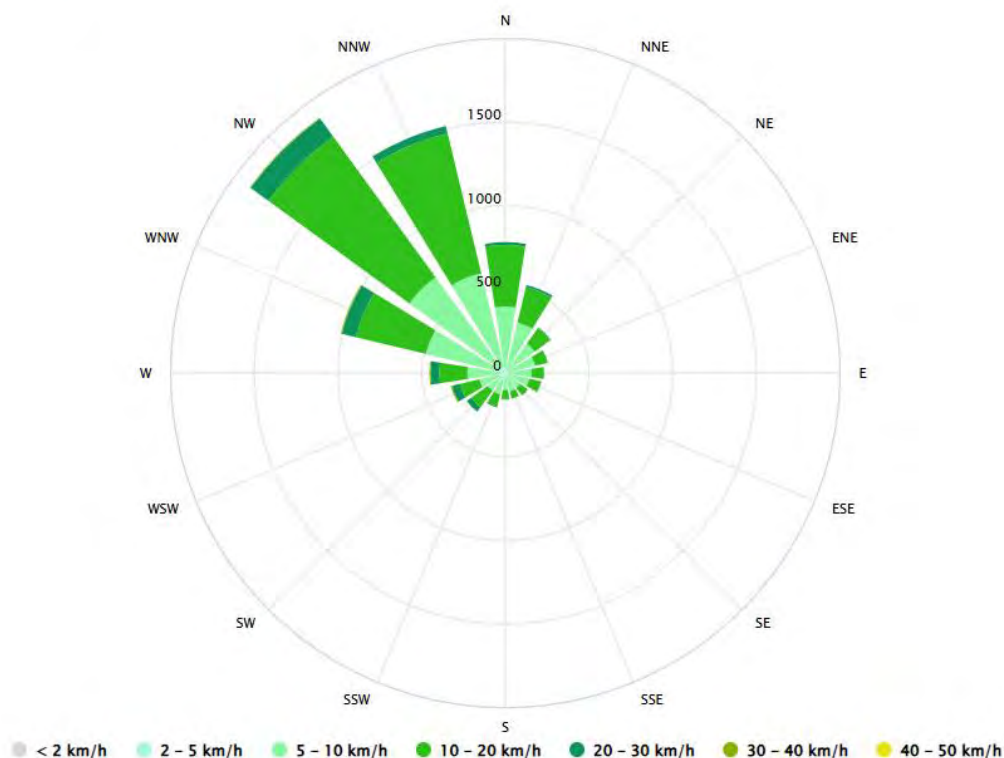


Figure 3-3: Wind Rose for Alexandria Governorate

Source: Meteoblue database (2026)

b. Temperature

Records from the Alexandria meteorological station indicate that the highest temperature (maximum) was recorded during August at 30°C, while the lowest temperature (minimum) was recorded in January and February at 10°C table 3-2 shows Maximum and minimum monthly air temperatures

Table 3-2: Maximum and Minimum Monthly Air Temperatures

Air Temp. (°C)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum	17	18	20	23	26	28	28	30	28	27	23	19
Minimum	10	10	11	14	17	20	22	23	22	18	15	11

Source: CAPMAS 2025

c. Rainfall

Alexandria is located in a coastal climatic region characterized by a relatively moderate climate with high humidity levels. The city experiences varying amounts of rainfall during the winter season, while precipitation is significantly lower in the summer. As shown in Table 3-3, the maximum rainfall occurs in January with 10mm, followed by February with 9mm.

Table 3-3: Average Monthly Amount of Rainfall

Month											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10.0	9.0	5.0	2.0	1.0	0.0	0.0	0.0	1.0	2.0	5.0	8.0

Source: CAPMAS 2025

d. Relative Humidity

The average monthly relative humidity in Alexandria is 71.3%. The highest value is observed in August, at 75%, while the lowest is in May, at 53%. Table 3-4 presents the monthly average of relative humidity.

Table 3-4: Relative Humidity (%)

Parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Relative Humidity (%)	61	59	57	57	53	67	56	71	59	60	58	59

Source: CAPMAS 2025

3.1.3 Topography

According to the Geotechnical Encyclopedia of Egypt (2003), The governorate's topography generally slopes gradually from south to north, where ground elevations exceed 140 meters above mean sea level in the southern areas and gradually decrease northward to reach sea level. The land surface across the governorate is generally flat, with a gentle and gradual slope from south to north.

The project site is located on a semi-level terrain, with an average ground elevation of approximately 2 m above mean sea level as shown in Figure 3-4. Results of the site visit indicate that most of the Project Site is low-lying due to the previous presence of fishponds, while the side walkways are flat and levelled.

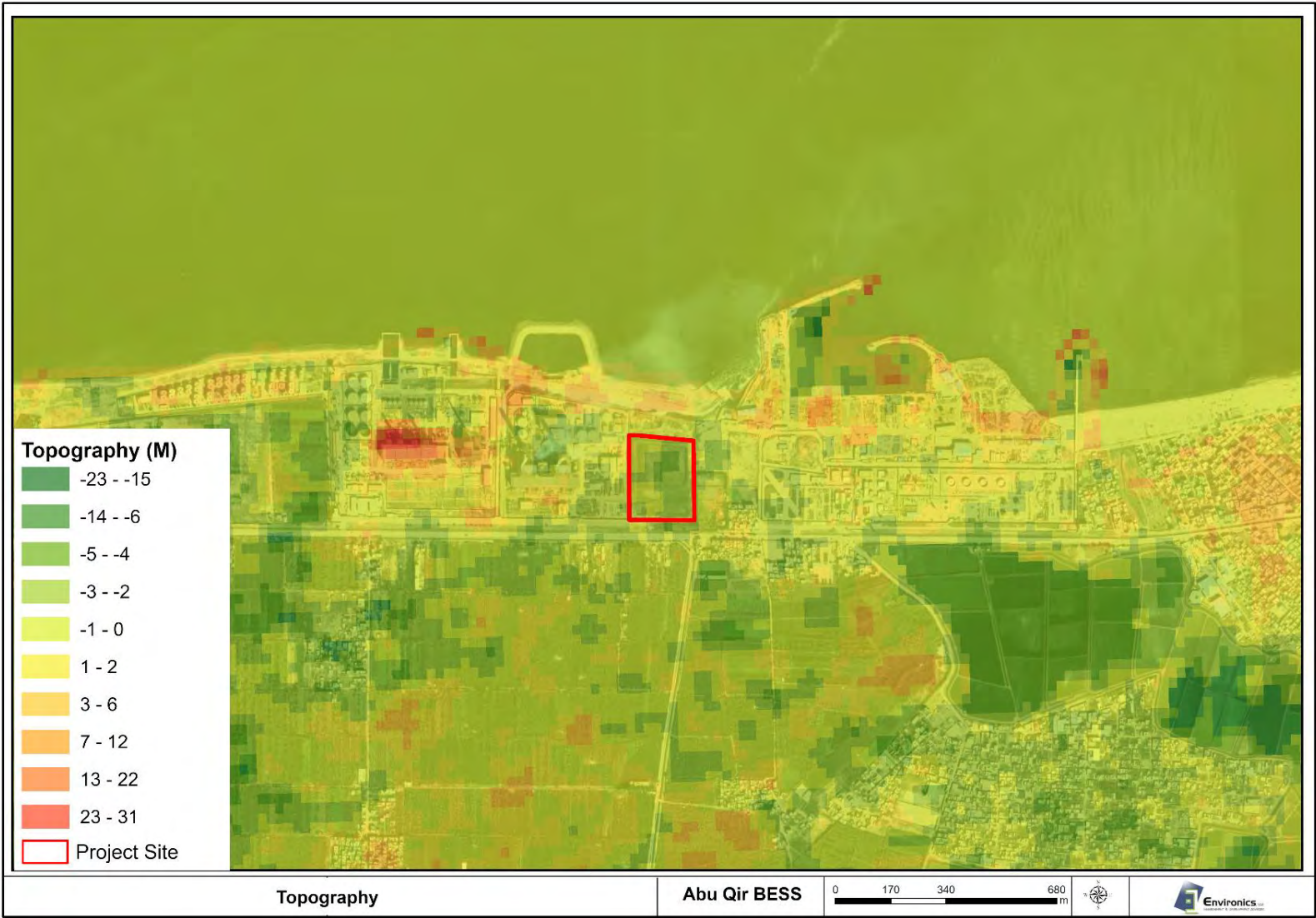


Figure 3-4: The topographic map of the project site

3.1.4 Soil

According to the Geotechnical Encyclopedia of Egypt (2003), the soil composition at the project site is a layer of poor to moderate strength clay loam soil. This layer may be interspersed with, or underneath, veins or layers of sand with different proportions of clay, with a thickness ranging from 1 meter to 5 meters. The thickness of this layer ranges from 6 to 19 meters. Figure 3-5 presents the soil classification map of the project site; Figure 3-6 shows two photographs of the observed soil.

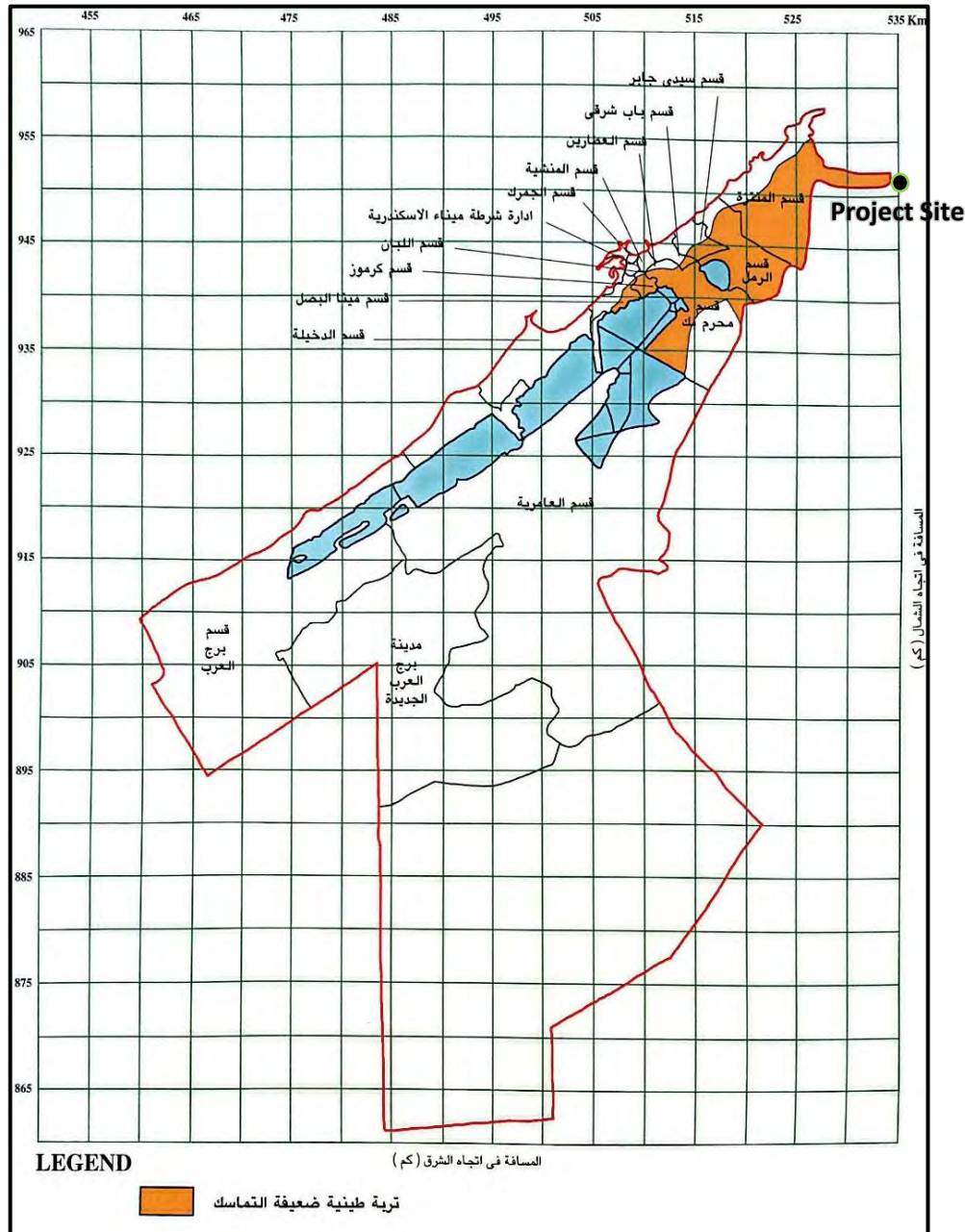


Figure 3-5: The soil map of the project site

Source: Geotechnical Encyclopedia of Egypt, 2003, Cairo University



Figure 3-6: Image of the observed soil at the project site

Source: Environics site visit on January 22, 2026

3.1.5 Geology

According to the Geological map of Egypt shown in Figure 3-7, most of Alexandria Governorate is covered by Quaternary sediments, which include two geological formations as follows:

- Holocene Deposits (The upper layer): These deposits are composed of clay and silt, with thickness ranging from 20 to 25 m. These deposits could be found at a depth of more than 20 meters below the surface.
- Pleistocene sediments (The lower layer): These deposits are composed of sand and gravel, with some clay lenses, with thickness ranging from approximately 60 m to 120 m. These deposits could be found on the surface of the soil.

The lithological units in the project area are mainly of Quaternary deposits and belong to the Holocene age. They are composed of clay and silt.



Figure 3-7: The Geological map of the project site

Source: Geological map of Egypt, 1981

3.1.6 Geomorphology

According to the Geotechnical Encyclopedia of Egypt (published by Cairo University in 2003), Alexandria Governorate is characterized by six types of geomorphological units, which are as follows:

- The coastal plains parallel to the Mediterranean Sea
- Old alluvial plains
- Abu Mena Depression
- Southern Highlands

The project site is located on the coastal plains parallel to the Mediterranean Sea (Figure 3-8), which consists of Nile deposits of silt, clay, and sabkha deposits.

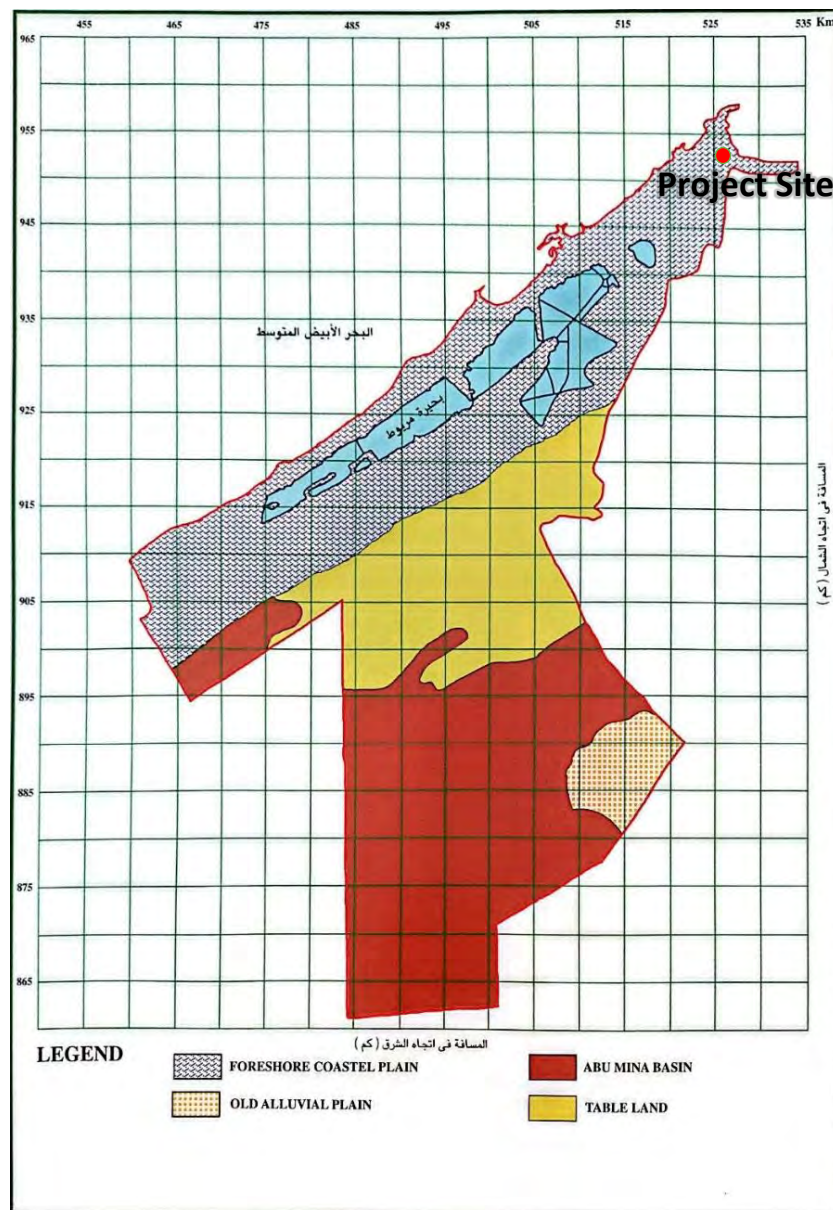


Figure 3-8: The Geomorphological map of the project site
Source: Geotechnical Encyclopedia of Egypt, 2003, Cairo University

3.1.7 Surface Water (Water Bodies)

The closest surface water resources to the project site, as illustrated in Figure 3-9, are as follows:

- Rakta canal: It is about 65 m south of project site and flows westwards and then south to the Mahmudiyya Canal.
- The Mediterranean Sea: it is about 180 m north of project site.

The water quality of both water bodies ranges from moderate to poor. According to (Ramadan, 2005)¹, the Rakta Canal suffers from significant water quality deterioration due to the direct discharge of industrial wastewater from the El-Tabia industrial Zone. Meanwhile, the water quality of the Mediterranean Sea near the project site, according to (Mohamed et al., 2021)², shows a moderate and spatially variable quality, with localized pollution hot spots exhibiting higher organic matter and heavy metal contamination near the El-Tabia outfall and the Rosetta branch discharge point.

¹ Mohamed Ramadan, 2005, Study on Industrial Wastewater Characteristics in New Borg El-Arab City, Alexandria, Egypt, Journal of King Abdulaziz University-Meteorology, Environment and Arid Land Agriculture Sciences
https://www.academia.edu/84304350/Study_on_Industrial_Wastewater_Characteristics_in_New_Borg_El_Arab_City_Alexandria_Egypt

² Mohamed, L., Salem, D., Radwan, A. (2021). "Evaluation of Heavy Metals Pollution in Seawater, Suspended Particulate Matter and Sediment from Abu-Qir Bay, Alexandria, Egypt." Egyptian Journal of Aquatic Biology and Fisheries, 25(2), 875-896. DOI: 10.21608/ejabf.2021.170057 —
https://ejabf.journals.ekb.eg/article_170057.html



Figure 3-9: Surface water resources around the project site

3.1.8 Groundwater

According to the Geotechnical Encyclopedia of Egypt, as shown in Figure 3-10, the project site is located within the Quaternary aquifer, which is regionally characterized by moderate productivity, with an indicative depth to groundwater in the range of 5 to 10 m below ground surface. The aquifer is replenished primarily by rainfall, surface water runoff, seawater intrusion, and agricultural irrigation return flow. Groundwater is discharged naturally through hydraulic connection with drainage channels and adjacent surface water bodies, as well as by upward leakage through the overlying semi-permeable layer — consistent with the site conditions.

Site-specific geotechnical investigations were subsequently carried out at the Project site, comprising eight boreholes (BH-01 to BH-08) drilled to 15 m depth between 20 and 28 April 2026 (Annex 1). Groundwater levels were recorded in each borehole at the time of drilling, as summarized in Table 3-X below.

Table 3-5: Groundwater levels recorded during borehole drilling

Borehole	Water Depth (m bgs)
BH-01	1.80
BH-02	0.76
BH-03	1.40
BH-04	1.20
BH-05	1.10
BH-06	1.84
BH-07	1.27
BH-08	0.95

The recorded groundwater depths range from approximately 0.76 m to 1.84 m below ground surface (average approximately 1.3 m), indicating a considerably shallower water table than suggested by the regional desk-based estimate cited above. Given this discrepancy, the site-specific borehole data (0.76–1.84 m bgs) should be adopted as the design basis for the Project, superseding the regional reference value.

This shallow groundwater condition is corroborated by site-specific field observations and data presented in the Hydrological Study Report prepared for the Project (Annex 1):



Figure 3-10: Effective watersheds projected on Topo Map, showing no direct intersection with the study area.

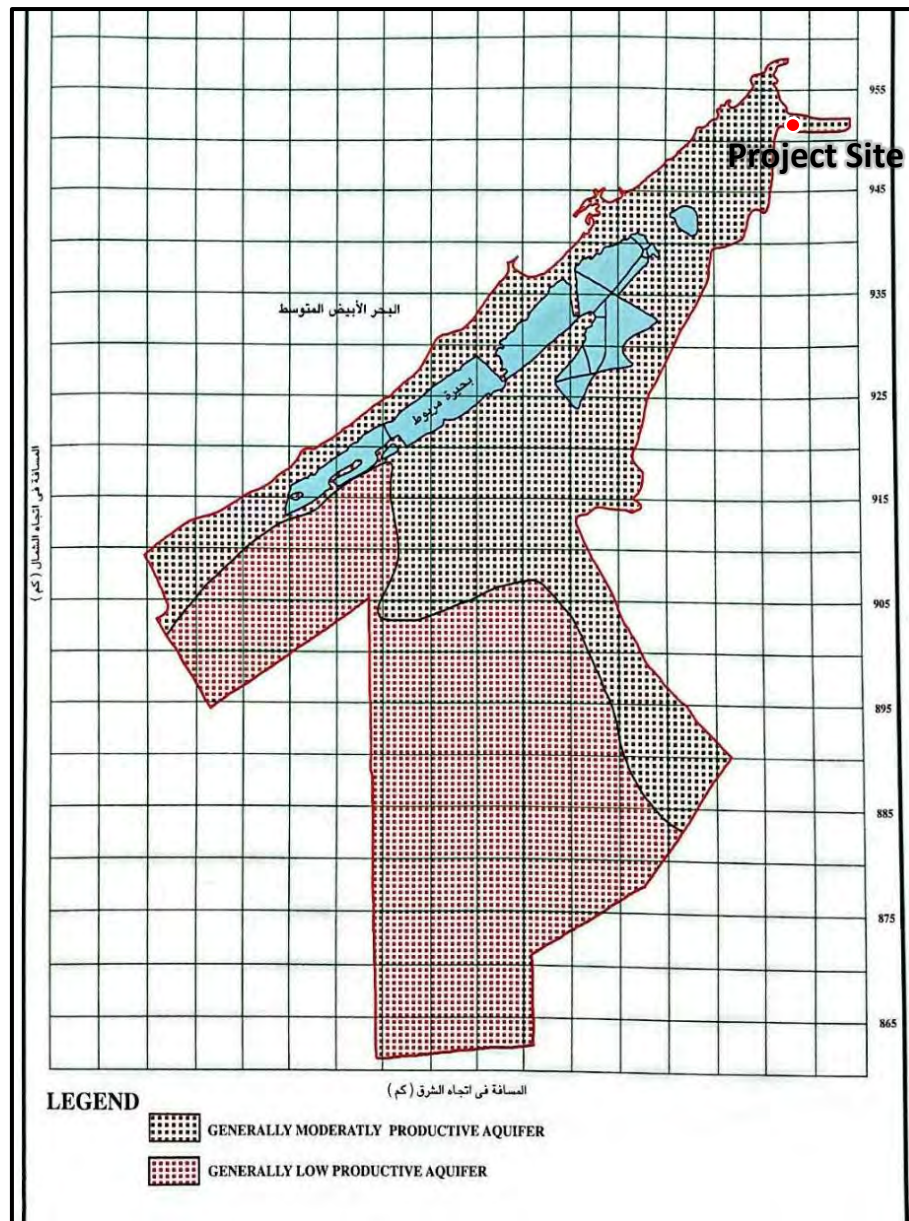


Figure 3-11: The Groundwater map of the project site

Source: Geotechnical Encyclopedia of Egypt, 2003, Cairo University

3.1.9 Natural Hazards

• Flash Flood and Surface Water Flooding Risks

In general, Alexandria Governorate is characterized by a relatively flat topography, and there are no mountains that may cause the risk of flash floods. Moreover, there are also no depressions inside or near the project site. Therefore, the Flash Flood Risks are unlikely to occur. Nevertheless, a hydrological study attached in Annex (2) has been prepared for the site to address localised flooding as result of stormwater .

The study confirmed that no natural watercourses, wadis, active drainage streams or regional flash-flood pathways intersect or discharge into the Project site. The effective watershed analysis likewise showed no direct intersection between the identified external catchments and the Project area. Existing drainage infrastructure further limits the potential for external floodwater to reach the site.

The Hydrological Study therefore recommends that the detailed design incorporate an effective internal stormwater drainage system and appropriate site grading to prevent localized ponding and safely convey rainfall runoff to designated discharge or collection points..

• Earthquakes

Seismic intensity in Egypt is generally low, except in some areas affected by relatively active faults, particularly in the Gulf of Suez, the Red Sea, and the Eastern Mediterranean. The project area lies within a low-risk seismic zone, with data from the 2022 Seismic Bulletin issued by the National Research Institute of Astronomy and Geophysics (NRIAG) indicating that the nearest seismic focus is approximately 190 km northeast of the site, with a magnitude 2-3 on the Moment Magnitude Scale – (Mw)³ as shown in Figure 3-12.

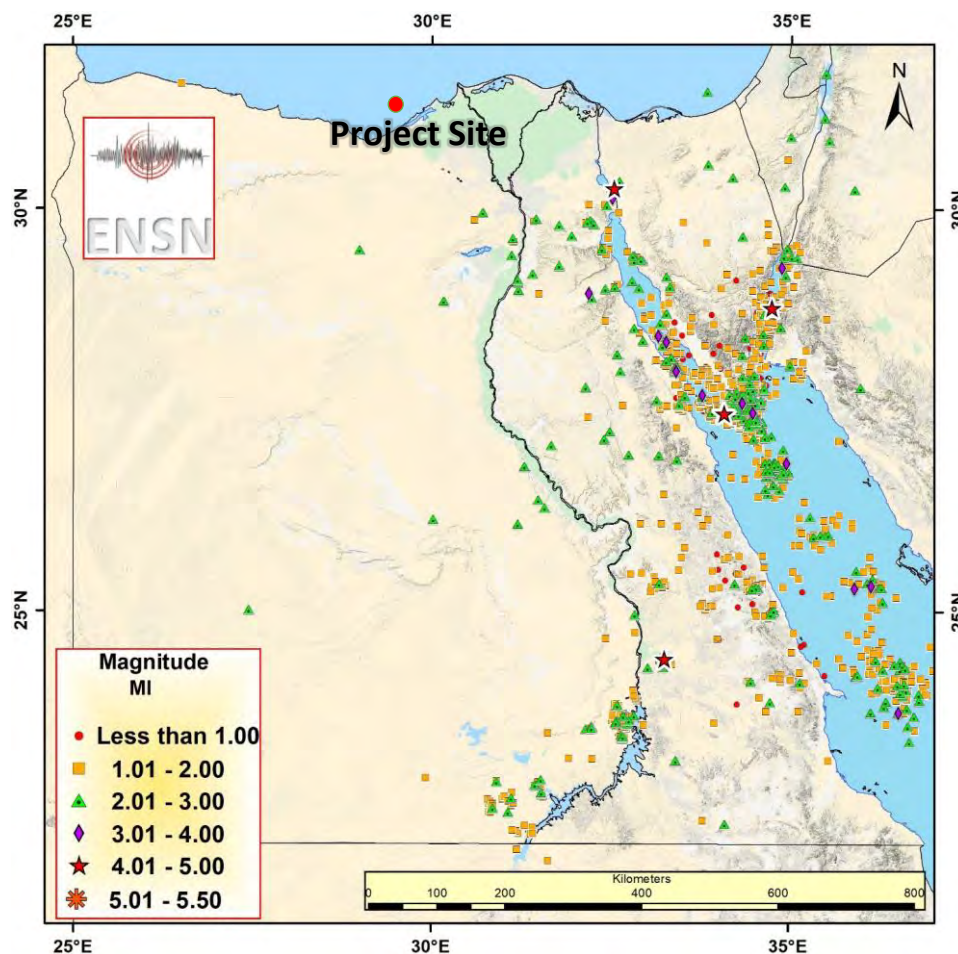


Figure 3-12: Earthquake Map of Egypt

Source: Extracted from the Annual Seismic Bulletin, Egypt (2023)

³ The Moment Magnitude Scale (Mw) is the standard scientific scale used to quantify earthquake size based on the total seismic energy released. It is derived from the seismic moment, which is calculated as the product of rock rigidity, average fault slip, and the rupture area. This scale provides more accurate and consistent measurements than the Richter scale, particularly for moderate to large earthquakes.

3.2 Biological Environment

Information and data on the species/features of the wider area⁴ that could be also present in the project's Area of Influence were gathered from direct observations, published material and previous reports, analysis of satellite images and from recent studies performed by Environics and other entities.

A site visit to the project site and its close surroundings was undertaken on the 22nd of January 2026 by three Environics team members. Characteristic features were photographed and their location recorded using a GPS. The survey included an active search to record the main species of flora and signs indicating the presence of fauna (markings, urine, scats, tracks, trails, burrows and dens, carcasses, remains of prey or direct observation of the animal). Field notes were taken, and photographic records of flora and fauna were obtained, whenever possible. The site visit report is presented in Annex (3).

3.2.1 Project Location

The Project Site is in Abu Qir City along the Tabia – Rashid Road, in a land belonging to the new Abu Qir Power Plant, at the administrative borders between Alexandria and Beheira Governorates. It is located about 160 meters away from Abu Qir Bay and about 2,200 m from Lake Idku. The closest settlement is the village of Ezbet El-Settin, located approximately 100 m east of the Project Site. The project site can be accessed via Tabia – Rashid Road. Figure 3-13 shows the project site



Figure 3-13: BESS project site and the surroundings

⁴ The wider area includes the area surrounding the project site which encompasses the same habitat and features of the project site and having a reasonable geographical extent to include all environmental and social aspects/receptors that might interact with project activities.

3.2.2 Project Wider Area

The proposed project site is located in an entirely modified habitat. Moreover, the area surrounding the Project Site includes different habitat types: marine environment (not relevant to the present project), coastal area, arable (agricultural) land, urban and industrial areas, wastelands, and the nearby wetland of Lake Idku. Each of the aforementioned habitats encompasses its own set of fauna and flora.

A brief description of the main habitats of the wider area and their characteristic biodiversity is herein provided.

- **Agricultural Lands**

Agriculture is the main activity of residents in rural areas and there are essentially two types of cultivations: open fields with crops and palm plantations. The main cultivated crops are tomato, cauliflower, cabbage, squash, clover and chards in winter. In summer, tomato, pepper, eggplant and fodder are the main crops. Date palm plantations and orchards are abundant in the area as well.

These farmlands are essentially completely modified habitats, nevertheless, they provide habitat for a variety of weeds and ruderal plants in the fields, canal and drain banks.



Figure 3-14: Palm plantations located south of the Project Site

There is a small agricultural plot (El Shazly Land) located on the eastern borders of the Project Site (Figure 3-15), with a small agricultural ditch running parallel to the eastern fence of the site (Figure 3-16).



Figure 3-15: Agricultural plot located on the eastern borders of the Project Site



Figure 3-16: Agricultural ditch running parallel to the eastern fence of the Project Site

- **Wastelands**

Wastelands with extensive flora are present on the southern borders of the project site (3-16), probably due to the relatively frequent rainfalls characterizing the area and possibly due to the presence of irrigation water from the nearby agricultural lands.



Figure 3-17: Wastelands located on the southern borders of the Project Site

- **Urban and industrial Environment**

In addition to the Abu Qir Power Plant (3-17), the coastal area is characterized by the presence of numerous other industrial facilities such as Abu Qir Fertilizers Company, GASCO, etc.



Figure 3-18: Abu Qir Power Plant

Moreover, there are urban settlements scattered throughout the farmlands, Ezbet El-Settin being the closest to the Project Site. This village is located southeast of the Project Site and extends northwards, to the east of the Project Site (Figure 3-19).



Figure 3-19: Northern extension of Ezbet El-Settin, east of the Project Site

The built environment of the area also includes irrigation canals and drains, roads and roadsides, a railway and other constructions. These habitats are home to exotic plants and trees introduced for ornamental purposes, as well as opportunistic fauna associated with human activities (e.g., feral dogs and cats, rats, mice, and several species of birds).

- **Littoral Area**

The beach at Abu Qir Bay is characterized by gravel or sand deposit although silty and muddy tidal flats are within this zone. Ancient sediments in this zone contain organisms typical of the tidal flat such as worms, crabs and clams (Shehata, 1987).

- **Lake Idku**

Lake Idku is a shallow coastal wetland located west of the Rosetta Nile branch. Three main drains discharge into the lake, while Bughaz El Maadia provides a connection with the sea. The water in the lake is mainly fresh but increases in salinity towards the Bughaz and during the summer. Most of the lake margins are covered with dense growths of *Typha* and *Phragmites*, which cover about 50% of the lake's area. Saltmarshes, salinas and high dunes, as well as some orchards, are found on the sandbar separating the lake from the Mediterranean. Lake Idku supports a fishery of moderate importance. (KBA, 2026). The lake proper (open waters) is located at a distance of about 2,200 m southeast of the Project Site. In addition, fish farms are present within the lake, extending to a distance of approximately 600 m southeast of the Project Site.

3.2.3 The Project Site

The Project Site covers an area of about 50,410 m² and is completely fenced. It is a totally man-made habitat, which was used as a fish farm approximately three years ago and then abandoned. Accordingly, the site layout was developed for this purpose. Currently, the site is divided into ponds, where the invasive reed *Phragmites australis* dominate (Figure 3-20). No buildings related to the previous project are present.

To support accurate spatial referencing of the Project Site, the coordinate system used is Africa Lambert Conformal Conic, as presented below.

Table 3-6: Coordinates of the Project Site (Africa Lambert Conformal Conic)

PointID	Easting	Northing
1	541817.1	3420210
2	541825.5	3420210
3	541851.8	3420209
4	542035.4	3420185
5	542030.2	3419915
6	541809.4	3419923



Figure 3-20: View of the reed-dominated site

Accordingly, the site is mostly low-lying, except for the walkways bordering the site fence (Figure 3-21).



Figure 3-21: Western walkway bordering the fence of the Abu Qir Power Plant

Evidence of rainwater accumulation and potential seawater intrusion was observed across the low-lying parts of the site (Figure 3-22). The existing ponds facilitate the collection and retention of rainwater and, possibly, groundwater rise, allowing to the growth of extensive reed vegetation.



Figure 3-22: Water accumulation in the low-lying parts of the Project Site

The surface soil of the walkways is mostly composed of wet clay (clayey soil), with scattered sand and gravel (Figure 3-23).



Figure 3-23: View of the topsoil of the Project Site at the eastern walkway

- **Natural and Modified Habitats**

In accordance with IFC PS6, habitat types are natural, modified and critical habitat (irrespective of whether it is natural or modified). The Project Site is located in a modified habitat with industrial and agricultural uses, and it is not considered as a critical habitat (IFC, 2012) & (EBRD, 2023). The proposed project site is located in an entirely modified habitat.

3.2.4 Biodiversity

Information on the biodiversity of the Project Site is based on the site visit carried out on the 22nd of January 2026. Information on the wider area is based on literature review and previous knowledge of the surrounding habitats.

- **Flora**

The specific site location is dominated by the invasive Common Reed (*Phragmites australis*), forming a reed swamp. Other recorded species included the Common Knotgrass (*Polygonum aviculare*), Field Wormwood (*Artemisia campestris*), Small Mallow (*Malva pusilla*), Egyptian Mallow (*Malva parviflora*), Vimba (*Pluchea dioscoridis*) and Quincy Pride (*Pluchea ovalis*).



Figure 3-24: Common Knotgrass (*Polygonum aviculare*)



Figure 3-25: Field Wormwood (*Artemisia campestris*)



Figure 3-26: Small Mallow (*Malva pusilla*)



Figure 3-27: Egyptian Mallow (*Malva parviflora*)



Figure 3-28: Vimba (*Pluchea dioscoridis*)



Figure 3-29: Quincy Pride (*Pluchea ovalis*)

- **Fauna**

Reptiles and Amphibians

Amphibians, such as the Egyptian Toad (*Sclerophrys regularis*), are common in the nearby agricultural fields and in the irrigation and drainage network of the area and are probably present among the reeds of the Project Site. The endemic Nile Delta Toad (*Sclerophrys kassasii*) is also reported from the area. It is a highly aquatic species that prefers densely vegetated microhabitats such as reed swamps, overgrown canals and waterways (Baha El Din, 2006). Therefore, *Sclerophrys kassasii* might also occur within the man-made reed swamp of the site.

Typical snakes found in the agricultural fields of the area include the African Beauty Snake (*Psammophis sibilans*), Diced Water Snake (*Natrix tessellata*), Eastern Montpellier Snake (*Malpolon insignitus*) and the highly venomous Egyptian Cobra (*Naja haje*). The presence of snakes onsite was also reported by officials from the Abu Qir Power Plant.

Avifauna

Birds recorded during the January 2026 site visit include the House Sparrow (*Passer domesticus*), Barn Swallow (*Hirundo rustica*), Hooded Crow (*Corvus cornix*) and Cattle Egret (*Bubulcus ibis*). Numerous other birds typical of agricultural areas are also present, such as the Palm Dove (*Spilopelia senegalensis*), Spur-Winged Lapwing (*Vanellus spinosus*), Black-winged Kite (*Elanus caeruleus*), Common Kestrel (*Falco tinnunculus*), Common Barn-owl (*Tyto alba*) and many others (EEAA/UNEP, 1993; A. Sarwat, personal observations, 2026).

According to the Migratory Soaring Bird Sensitivity Tool (MSBT), 13 species of migratory birds, a number of which are soaring birds, may pass over the project site as indicated in the following table (Table 3-7) (MSBT, 2026). Yet, the results of the MSBT show that no soaring bird tracks have been recorded even within a 5-km diameter buffer around the site. The reason is mainly that the MSBT takes into consideration the Low Concentration/Density of the birds, as it focuses on large-scale, high-density migration corridors. Accordingly, while soaring birds may pass over the area, they might be scattered or migrate in low numbers, which the model classifies as low sensitivity. Therefore, the sensitivity to migratory soaring birds is considered negligible (0).

Table 3-7: the migratory birds around the Project Site

Scientific name	Common name	Habitat	IUCN Category
<i>Milvus migrans</i> (Boddaert, 1783)	Black Kite	Migratory landbird	LC
<i>Elanus caeruleus</i> (Desfontaines, 1789)	Black-winged Kite or Black-shouldered Kite	Resident breeding landbird, found in cultivated lands	LC
<i>Grus grus</i> (Linnaeus, 1758)	Common Crane	Migratory waterbird	LC
<i>Falco tinnunculus</i> Linnaeus, 1758	Kestrel	Migratory & resident landbird, found in coastal, wetlands, cultivations and urban areas of New Damietta	LC
<i>Pelecanus crispus</i> Bruch, 1832	Dalmation Pelican	Migratory waterbird	NT
<i>Buteo buteo</i> (Linnaeus, 1758)	Eurasian Buzzard	Migratory landbird	LC
<i>Accipiter nisus</i> (Linnaeus, 1758)	Eurasian Sparrowhawk	Migratory landbird	LC
<i>Plegadis falcinellus</i> (Linnaeus, 1766)	Glossy Ibis	Migratory waterbird	LC
<i>Clanga clanga</i> (Pallas, 1811)	Greater Spotted Eagle	Migratory landbird	VU
<i>Circus cyaneus</i> (Linnaeus, 1766)	Hen Harrier	Migratory landbird	LC
<i>Buteo rufinus</i>	Long-legged Buzzard	Migratory landbird	LC
<i>Falco columbarius</i> Linnaeus, 1758	Merlin	Migratory landbird	LC
<i>Pandion haliaetus</i> (Linnaeus, 1758)	Osprey	Migratory landbird	LC

Source: MSBT (2026)

Mammals

Mammalian fauna of the area common in urban areas and nearby agricultural fields is mainly composed of commensal species such as the Black Rat (*Rattus rattus*), Brown Rat (*Rattus norvegicus*), House Mouse (*Mus musculus*), Egyptian Weasel (*Mustela subpalmata*) and Red Fox (*Vulpes vulpes*). The Egyptian Slit-faced Bat (*Nycteris thebaica*) and Kuhl's Pipistrelle (*Pipistrellus kuhlii*) have a wide habitat range and roost in caves, tombs, houses and old buildings. *Pipistrellus kuhlii* is found even in buildings located in busy streets (Hoath, 2009).

3.2.5 Ecological Value and Sensitivities

• Habitats

The area is an entirely modified habitat, which includes numerous coastal industrial facilities, as well as human settlements, agricultural areas and palm plantations in the close surroundings, particularly south of the Project Site. The site itself is also a modified habitat of insignificant ecological value.

• Flora

Vegetation densely covers the project area, except for walkways. However, the dominant species is the common reed (*Phragmites australis*), an invasive species of no ecological or economic importance, resulting from the former use of the site as a fish farm. Other plant species occur only sparsely and have no significant economic value. On the other hand, the adjacent agricultural lands contain crop species of expected economic importance. However, given the type and location of the project, agricultural areas are not expected to be affected by the project construction and operation activities.

• Fauna

All amphibian, reptile, and mammal species potentially present in the area are classified by the IUCN as "Least Concern" and are not considered to be of conservation priority. Avifauna around the site includes few resident bird species, as previously described, in addition to

some passing migratory birds, reflecting the relative proximity of the project site to the Important Bird Area (IBA) of Lake Idku.

According to the Migratory Soaring Bird Tool (MSBT) map, the sensitivity of the project site to migratory soaring birds is considered to be totally negligible (0 sensitivity). However, 13 non-soaring migratory bird species may pass over the project site or within a distance of less than 1 km, as mentioned earlier. Most of these species are classified by the IUCN as “Least Concern.” Only two species fall under threatened categories: the Greater Spotted Eagle (*Clanga clanga*), classified as Vulnerable, and the Dalmatian Pelican (*Pelecanus crispus*), classified as Near Threatened.

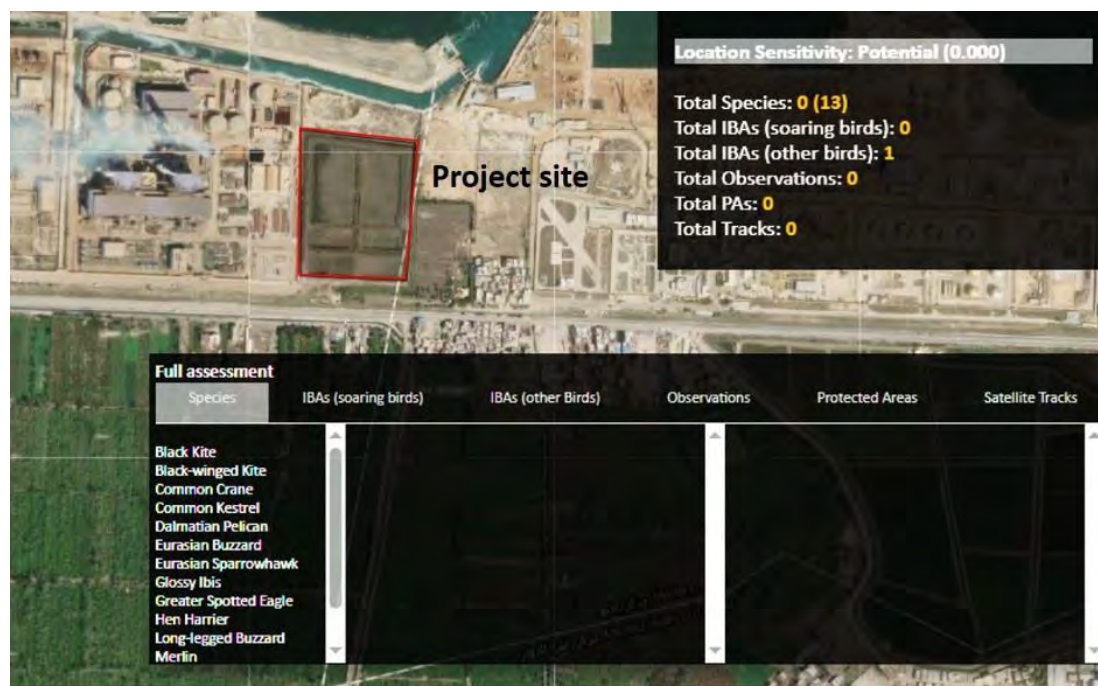


Figure 3-30: Sensitivity to soaring migratory birds map

On the other hand, due to the type and nature of the project, there will be no interaction between the Project Site and local avifauna, even in the case of birds passing over the Project Site.

In fact, a key point relevant to considering the airspace utilized by avifauna is that the airspace is “anchored” to an important terrestrial area from which avifauna could take advantage. In other words, the airspace is typically considered with respect to the ecological use of the terrestrial habitat and not “on its own” (IFC, 2023). In the present case, the Project Site is located within an industrial area, which is unattractive to avifauna and does not provide any resources in terms of food and resting areas. Accordingly, the project is not expected to affect birds passing over the area

• Key Biodiversity Areas

The Project Site does not encompass any Key Biodiversity Areas (KBAs), including Protected Areas (PAs) legally protected by the Egyptian Government, BirdLife International designated Important Bird Area (IBAs), or PlantLife International designated Important Plant Areas (IPAs).

The nearest ecologically sensitive area—an Important Bird Area (IBA)—is Lake Idku, covering an area of 18.23km². Lake Idku is of moderate importance for both wintering and breeding waterbirds. In winter 1989/90, a total of 22,549 waterbirds was counted.

The project site is located within a modified habitat inside the proposed land Energy Valley for the project in Abu Qir. Therefore, the faunal species present in the area are most likely to avoid the disturbance caused by the adjacent Abu Qir power plant. Despite the project site being located approximately 2.2 km away from Lake Idku, passing birds are expected to show negligible attraction to the site due to the absence of suitable foraging elements and the availability of water and food resources in the adjacent natural and agricultural habitats.

3.3 Economic and Social Environment

To ensure both accuracy and relevance, this report relies on multiple official data sources. The 2017 Population Census was used in sections requiring detailed and disaggregated information, particularly for education, infrastructure, economic activities, and statistics at the district and center level since it provides the most comprehensive dataset available.

Meanwhile, the 2025 Annual Population Estimates were used to reflect the most recent population figures and employment at the governorate level. This approach ensures a balance between detailed structural data and up-to-date demographic information.

The proposed project is located within the boundaries of the New Abu Qir Power Plant on land owned by the facility. The site was used as a fish farm divided into a series of abandoned ponds. The surrounding area comprises a mix of industrial, agricultural, and residential land uses in addition to transportation infrastructure, including the Abu Qir railway line and El Tabia–Rashid Road. The site is located within an existing industrial facility and is separated from nearby residential and agricultural receptors by existing infrastructure and physical features.

The surrounding area comprises a mix of industrial, agricultural, and residential land uses, in addition to transportation infrastructure, including the Abu Qir railway line and El Tabia–Rashid Road. The site is located within an existing industrial facility and is separated from nearby residential and agricultural receptors by existing infrastructure and physical features.

3.3.1 Demographic Profile

- **Population**

The total area of Alexandria Governorate is 2300 km², while the total area of Montazah II District is approximately 51 km². According to CAPMAS, 2025, The population of the governorate reached 5,618,134 capita. The total population of Montazah II District is 585,005 capita, representing 10.41% of the total population in Alexandria Governorate.

- **Employment and Unemployment rates**

According to CAPMAS (2025), the employment rate (above +15 years old) in Alexandria Governorate is approximately 5.5% (81% males, 19% females), leaving approximately 8.1% unemployed. The rates of unemployed females (19.1%) are higher than those of unemployed males (5.1%).

- **Education**

According to CAPMAS (2017), the literacy rate in Alexandria Governorate reached 82% of the total population, while the illiteracy rate reached 18% of the total population of the governorate. The literacy rate in Montazah II District reached 88% of the total population, while the illiteracy rate reached 12% of the total population of the district.

3.3.2 Economic activities

As previously mentioned, the project area is administratively affiliated to Montazah II District, which includes a variety of economic activities, where many tourists and citizens flock to this region. The Montazah II District is also considered the center of trade and economic activities in Alexandria, as it is witnessing an active commercial movement. These vital economic activities reflect the area's role as a major trade center in the city, contribute to the development of the local economy, and provide job opportunities for residents.

According to CAPMAS (2017), the most important economic activities in Montazah II District include:

- Agriculture and fishing
- Manufacturing
- Commerce
- Transportation and storage
- Services

3.3.3 Land Uses

The Project Site is located within the Abu Qir Power Plant premises on land owned by the West Delta Electricity Production Company. The site is not currently utilized for any anthropogenic purposes, However, land use types in proximity to the Project Site (Figure 3-31) include the following:

- Abu Qir Power Plant (adjacent to the western boundary of the project site)
- Storage and scrap area of Abu Qir Power Plant (adjacent to the northern boundary of the project site)
- Agricultural drain (2m east of the Project Site)
- Agricultural land (6m east of the Project Site)
- Vacant land (10m east of the Project Site)
- Abu Qir railway line (40m south of the Project Site)
- El Tabia- Rashid Road (50m south of the Project Site)
- Rakta canal (65 m south of the project site)
- Ezbet El Setin village (100m east of the project site)
- The Mediterranean Sea (180m north of the Project Site)



Figure 3-31: Land uses around the project site

3.3.4 Infrastructure and Utilities

- **Electricity**

According to CAPMAS (2017), approximately 97% of the population in Montazah II District are beneficiaries of electricity services, while around 3% are not connected to the electricity network. Abu Qir Power Plant supplies the electrical energy required to meet the demand of Montazah II District.

- **Potable Water**

According to CAPMAS (2017), approximately 96% of the population in Montazah II District are beneficiaries of potable water services, while about 4% are not connected to the public water supply network. The district's drinking water demand is met through the existing public water supply infrastructure serving the area.

- **Sanitary Sewer Network**

According to CAPMAS (2017), approximately 91% of the population in Montazah II District are connected to the public sanitary sewer network, while about 9% are not served by the system. The district's wastewater is managed through the existing public sanitation infrastructure serving the area.

- **Natural Gas Network**

According to CAPMAS (2017), approximately 35% of the population in Montazah II District are connected to the natural gas network, while around 65% are not served by the system. The district's natural gas supply is provided through the existing distribution network serving the area.

- **Railway and Road Network**

The project site is strategically located near the main transportation network, which facilitates easy accessibility. The site lies approximately 50 meters from El Tabia- Rashid Road, providing direct connection to the surrounding road network and ensuring smooth vehicular access. In addition, it is situated about 40 meters from an Abu Qir railway line, further enhancing connectivity and access to public transportation infrastructure, as shown in Figure 3-32. This advantageous location supports efficient movement of personnel, equipment, and materials, and ensures that the site can be readily accessed through established road and transport networks.



Figure 3-32: Railway and Road Network around the project site

3.3.5 Health Facilities

The Alexandria governorate boasts a total of 37 hospitals and 295 ICU beds (intensive care units). The governorate's healthcare infrastructure includes about 59 Ambulance Centers and a fleet of 121 ambulances, which are maintained by a well-equipped network of both road and highway ambulance stations (Table 15) (CAPMAS, 2026).

Furthermore, there are four healthcare facilities located in proximity to the Project Site: Al-Ma'adiya Health Center (1800 m southeast of the Project Site), Abo Qir Hospital for Health Insurance (located 9 km northwest of the Project Site), Abo Qir General Hospital (located 9 km northwest of the Project Site), and Abo Qir Hospital (located 9.5 km northwest of the Project Site), as shown in Figure 36



Figure 33: Health facilities

3.3.6 Cultural Heritage

According to the Egyptian Archaeological Map (2026), there are no registered ancient remains or cultural heritage sites within or near the project site.

However, the Egyptian archaeological map (2026), as shown in Figure 3-32, contains several registered archaeological sites located within 10 km of the project site, as shown below:

Kom El-Dahab (iii): about 5km south of the project site. This site is now under a village of the same name. It is comprised of one main mound with several outlying areas.

Roman Bath (Abu Qir), Bath of Cleopatra: about 8km west of the project site. This heavily ruined site includes a big bath built of limestone with six steps and is covered with badly preserved plaster from the inside. It includes a group of damaged buildings, maybe baths, and

a room that contains an altar for offerings. Potsherds of different sizes and types scattered on the surface of the site date it to the Roman Period.

Tabyet el-Raml: about 8km west of the project site. Tabyet El-Raml is a sandy mound that is located immediately on Abu Qir Bay. A basin with three steps for pressing grapes covered with red plaster on the inside was found at the site. Its construction suggests that it dates to the Byzantine Period.

Abu-Qir – Menouthis: about 8km west of the project site. Menouthis was a sacred Greek city located in the Canopic Region (Abu Qir Bay). This legendary city was famous for its great wealth and lifestyle and for its numerous temples. Today, the city is submerged under the sea due to the climatic and geological changes in the Nile Delta. A temple for Isis was found in Menouthis, and in the 4th century, a basilica was built near the temple.



Figure 3-34: Archeological Sites around the project site

4. Policy, Legal, and Administrative Framework

This section summarizes the environmental and social legislation and regulations relevant to the proposed Battery Energy Storage System project. The applicable requirements were identified based on the nature of the proposed activity (described in detail in chapter 2), the geographic location of the project, and the anticipated environmental and social risks and impacts.

Consideration is first given to national environmental legislation, followed by a review of international financial institution (IFI) requirements, particularly those of the International Finance Corporation (IFC), European Bank for Reconstruction and Development (EBRD) and the African Development Bank (AfDB), as well as relevant company-level sustainability, environmental, health and safety frameworks, where applicable.

4.1 National Legislation Pertaining to EIA

In accordance with Article 29 of Law of the Environment No. 4/1994, as amended by Laws No. 9/2009 and No. 105/2015, and its Executive Regulations (ERs), the project proponent is required to prepare an Environmental Impact Assessment (EIA) for new projects, as well as expansions or modifications to existing facilities.

The Egyptian Environmental Affairs Agency (EEAA) is the national authority responsible for reviewing and approving Environmental Impact Assessment (EIA) studies and monitoring compliance with applicable environmental legislation and permit conditions throughout project implementation and operation.

Pursuant to Law No. 4/1994 and its ERs, the proponent is required to submit the EIA study to the Competent Administrative Authority (CAA) or the licensing authority prior to commencement of project activities. The CAA is responsible for verifying the completeness of the submitted documentation before forwarding the study to the Egyptian Environmental Affairs Agency (EEAA) for technical review.

For the BESS project, the CAA is the New and Renewable Energy Authority (NREA).

EEAA may request the project proponent to provide additional data or clarifications once only, and if the requested information is not submitted within 15 working days, EEAA will return the study to the CAA for completion and resubmission.

EEAA will issue its opinion within 30 working days from the date of receipt of all required information.

The CAA shall notify the project proponent of EEAA's decision. The proponent retains the right to submit a written appeal within 30 days from the date of notification, after which non-response constitutes implicit approval, in accordance with the law.

Based on the EEAA projects categorization lists issued in June 2023, projects are classified into four categories according to their environmental impacts:

- Category A: Projects with minor or limited environmental impacts.

- Category B: Projects that may result in moderate environmental impacts.
- Category Scoped B: Projects with potentially significant environmental impacts due to certain components, but not the project type itself. An EIA study is required, focusing on the major component, but without public consultation.
- Category C: Projects with potentially significant environmental impacts. This category requires a full-scale EIA study, including public consultation and disclosure as a main component.

According to the initial meeting conducted with the Egyptian Environmental Affairs Agency (EEAA) on 6 January 2026, the BESS has been classified as Category Scoped-B project. In addition, according to the Lenders' categorisation, the project is a Category B project.

4.2 Applicable Egyptian Environmental Regulations pertaining to the project

4.2.1 Air Quality

Article 36 of Law 4/1994 and Article 37 of ER 1095/2011 set the maximum permissible limits for exhaust gases from engines and vehicles.

Article 35 of Law 4/1994, Article 34 of its modified ER 1741/2005, and Annex (5) of modified ER 710/2012 provide the maximum limits for ambient air pollutants. The applicable limits are summarized in the Table 4-1.

Table 4-1: Maximum Limits of Ambient Air Pollutants according to Annex (5) of the Modified ERs of Law 4/1994 as well as the EU Maximum Limits

Pollutant	Area	Maximum Allowable limits			
		1 hr	8 hrs	24 hrs	1 year
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)	Urban Areas	300	-	125	50
EU ⁵		350	-	125	20
WHO		-	-	125	-
Carbon Monoxide (mg/m^3)	Urban Areas	30	10	-	-
EU		-	10	-	-
WHO		-	-	7	-
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)	Urban Areas	300	-	150	60
EU		200	-	-	40
WHO		-	-	120	40
Total Suspended Particles ($\mu\text{g}/\text{m}^3$)	Urban Areas	-	-	230	125
EU		-	-	-	-
WHO		-	-	-	-
PM ₁₀ ($\mu\text{g}/\text{m}^3$)	Urban Areas	-	-	150	70
EU		-	-	50	40
WHO		-	-	150	70

* The specified maximum limits of ambient air pollutants outlined above apply mainly to the construction phase of the proposed project.

* In cases where discrepancies exist between the national regulations and the EU Maximum Limits, projects are required to adhere to the more stringent standards.

⁵ <https://www.europarl.europa.eu/factsheets/en/section/193/environment-policy>

This applies only during Construction phase. The BESS operations and do not generate air emissions.

4.2.2 Ambient Noise

Article 42 of Law 9/2009 and Article 44 of its modified ER (1095/2011), provide the maximum permissible limits for noise levels. Table 4-2 below provides the maximum permissible limits for noise intensity in different areas according to Annex 7 of the ER replaced by Decree 2466/2024, and the EU Environmental Noise Directive 2002/49/EC.

Table 4-2: Maximum Limit Permissible for Noise Level in the Different Zones according to Annex (7) of the Modified ERs of Law 4/1994 as well as EU Maximum Limits

Type of zone	The permissible limit for noise level, dB (A)		
	Day time 7 am – 10 pm	Night 10 pm – 7 am	
Areas on roads whose width is 12 m or more, or industrial areas which comprise light industries and other activities	70	60	
EU (Mixed commercial and industrial areas)	Day-time	Evening-time	Night-time
	68	63	58
	During Construction Activities: Up to 70 dBA during the day.		

** The specified maximum limits outlined above apply to the construction phase of the Proposed Project.*

** In cases where discrepancies exist between the national regulations and the EU Maximum Limits, projects are required to adhere to the more stringent standards.*

Noise requirements apply throughout the project lifecycle, from construction through operation and decommissioning phases.

4.2.3 Non-Hazardous Solid Wastes

Chapter 4 of Egypt's Waste Management Law 202/2020 and its ERs 722/2022 and 1113/2024 address the requirements for the solid waste management framework, including collection, transportation, storage, and disposal:

- Article 15: Waste generators must minimize waste, promote reuse, ensure recycling and safe disposal, and manage waste without harming public health or the environment.
- Article 16: Waste generators bear the cost of integrated, safe waste management.
- Article 20: Open burning of waste is prohibited.
- Article 36 of the executive regulation addresses construction waste management through contracting licensed contractors and proper storage of construction material/waste.

Additionally, Law 9/2009 and its ERs (Articles 39 and 41) address precautionary measures, ensuring proper waste handling and environmental protection.

Non-hazardous waste management requirements apply throughout the project lifecycle, from construction through operation and decommissioning phases.

4.2.4 Hazardous Materials and Wastes

Law No. 202/2020 and its ERs, Nos. 722/2022 and 1113/2024, introduced specific requirements for hazardous waste management.

Chapter Five of Law No. 202/2020 and Articles 50 to 54 of ERs No. 722/2022, delineates the protocols for hazardous waste management process, including comprehensive record-keeping and disposal methodologies.

Hazardous material management apply throughout the construction, operation phases, and decommissioning of the proposed project.

4.2.5 Registers/ Records

Environmental Register:

According to Article 22 of Law No. 9 of 2009, amending Law No. 4 of 1994, and Article 17 of its modified ER 2466/2024, all establishments are mandated to maintain comprehensive environmental registers. The specific content of these registers is outlined in Article 17 and Annex 3 of the Executive Regulation.

Hazardous Materials & Waste Register:

According to Article 56 of Law No. 202 of 2020 and Article 50 and appendix 7 of its Executive Regulations (Decree No. 722 of 2022), establishments generating hazardous waste are required to maintain a hazardous materials and waste register documenting the types and quantities generated, the methods of storage, treatment, and disposal, and the licensed entities contracted to undertake waste management activities.

4.2.6 Biodiversity Protection

Article 28 of Environmental Law No. 4 of 1994 is a key provision for biodiversity protection, as it prohibits the hunting, killing, capturing, possession, transport, trade, import, or export of wild birds, animals, plants, or their derivatives, particularly those listed in Annex 4 of the Executive Regulations as amended by Decree No. 1095 of 2011, due to their ecological importance.

The prohibition also applies to activities that may result in the destruction or alteration of natural habitats, including wetlands, natural lakes, the Nile River system, migration routes, areas important for resident and migratory birds, Ramsar sites, and natural protectorates declared under Law No. 102 of 1983, as well as their surrounding zones.

Protected flora and fauna listed under Annex 4 of the Executive Regulations of Environmental Law No. 4 of 1994 (as amended)—which reflects Egypt’s obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)—are prohibited from collection, possession, trade, transport, import, export, breeding, or cultivation except with prior authorization from the Egyptian Environmental Affairs Agency (EEAA).

Complementary protection is also provided under Law No. 102 of 1983 concerning Natural Protected Areas and Agricultural Law No. 53 of 1966 (Article 117) and its related ministerial decrees, which prohibit the hunting or destruction of birds and wild animals beneficial to agriculture and their nests.

These requirements apply to the proposed project. However, the environmental baseline presented in Chapter 4 indicates that the project site lies within the existing Abu Qir Power

Plant boundary, occupies previously disturbed land formerly used as fish farms, and does not support significant biodiversity.

4.2.7 Cultural Heritage

Law 117 of 1983 promulgating the Antiquities' Protection Law, as amended by Law 3/2010, 61/2010, 91/2018, and 20/2020, serves as the cornerstone for safeguarding archaeological and historical sites.

The Ministry of Tourism and Antiquities (MOTA) is the primary authority responsible for overseeing all archaeological activities.

This legislation provides the primary legal framework for the preservation of archaeological and historical sites.

According to Article 5 of the law, MOTA is the designated authority responsible for supervising all archaeological activities and sites within the country.

Additionally, Article 23 assigns the MOTA the responsibility for the discovery and exploration of antiquities across Egyptian territory. It mandates that any person who discovers an unregistered archaeological artifact is obligated to notify the MOTA. The artifact shall be considered state property, and the MOTA must take the necessary measures to preserve it.

Within three months, the MOTA must either remove the artifact found on private property, or take the necessary procedures to expropriate the land on which it was found, or leave it in place and register it following the provisions of this law.

These requirements do not apply to the proposed project. No cultural heritage components are expected, as the site is located on previously disturbed land. Moreover, there are no registered archeological sites, and the nearest registered archaeological sites are located at distances of approximately 4–8 km from the project location. However, chance finds plan would be developed for the construction activities.

4.2.8 Work Environment

A. Occupational health and safety

The Egyptian Labor Law 14/2025⁶, alongside Minister of Manpower and Immigration's Decree 211/2003, establish comprehensive guidelines in Egypt for occupational safety, health, and a safe work environment.

Besides, Ministerial Decree 211/2003 of the Ministry of Manpower addresses the requirements to prevent adverse physical, chemical, and mechanical hazards and dynamic electricity hazards in the workplace and requires keeping medical surveillance records for the employees.

⁶ The new labor law 14/2025 is entered into force by 1 September 2025, replacing the previous Law No. 12 of 2003. The updated executive decrees of the law are not issued yet.

B. Work Environment Health and Safety

The Egyptian Labour Law number 14/2025 organizes working conditions and management of worker relationships. The law in its different articles; addresses the individual labour contracts, terms of employment, wages and leaves, collective negotiations and collective labour agreements, and litigations as well as vocational training are addressed in sections one to four. The occupational health and safety requirements are addressed in Book Four of the Labour Law.

C. Workplace Noise

Law 4 /1994 (amended by Law 105/2015) sets the maximum permissible noise levels within the workplace (in dB) in Annex 7 of the Executive Regulation (amended by decrees 710/2012, 964/2015, and 2466/2024).

Table 4-3 provides the maximum noise levels in the workplace, as indicated in Table 1 in Annex 7 of the ER 710/2012 of Law 4/1994.

Table 4-3: Maximum Noise Levels within Workplace (dB (LAeq))

Type of Place and Activity	Exposure Period (hours)	Maximum Noise Level dB (LAeq)
Workplace (workshops and factories) (licensed starting from 2014)	8	85
Administrative offices - Workrooms for computers, typewriters, and similar equipment	--	65
Workrooms for activities requiring routine mental concentration - control rooms	--	60

If the noise level is more than 85 dB in workplaces with up to 8 working hours, the facility is obliged to reduce the exposure time by half with each increase in noise level by 3 dB with appropriate earplugs.

D. Employment organization

The Egyptian Labour Law 14/2025 organizes employment terms, working conditions, and management in Book 2 and Book 3 of the Labour Law, as follows:

Book 2 – Employment Organization:

- Definition and classification of employment contracts (fixed-term, unlimited-term)
- Conditions for employment and required contract formalities
- Work patterns including emerging/non-traditional forms (e.g., part-time, remote, job-sharing)
- Employer and employee registration obligations, data submission, and record-keeping
- Equal opportunity, non-discrimination, and prohibition of forced labour
- Employee file maintenance, electronic format recognition, retention periods
- Working hours, overtime arrangements, rest periods
- Leave entitlements (annual leave, maternity, paternity, casual)
- Health, safety, and welfare obligations of the employer toward employees
- Provisions concerning persons with disabilities or “people of determination”

Book 3 – Termination, Disputes & Special Employment Cases:

- Termination of employment contracts: notice periods, severance, end-of-service benefits
- Grounds for summary dismissal (gross misconduct) and procedural safeguards
- Resignation procedures and right of withdrawal
- Treatment of absence without justification (voluntary resignation concept)
- Recognition of work arrangements in the context of termination and rights
- Labour dispute resolution: specialized labour courts, timelines, and processes
- Employment of foreign workers: permits, terms, regulations
- Special employment categories and protections (women, minors, workers with disabilities)
- Employer obligations in organizational changes (downsizing, restructuring)
- Transitional provisions and application of the law to existing contracts

E. Child labour

According to Articles 62, 63, 64, and 65 of the Labour Law 14/2024, Chapter 4 of Book 2: Rules for the Employment and Training of Children, it is prohibited to employ children before the age of 15. However, they may be trained once they reach the age of 14, provided that this does not prevent them from continuing their education. The employment or training of children must be in accordance with a decree issued by the competent minister in coordination with the National Council for Childhood and Motherhood.

It is also prohibited to employ or train children in jobs, professions, and industries that may endanger their physical or psychological health, safety, or morals. These jobs, professions, and industries, according to different age groups, will be issued by the decree of the competent minister, in coordination with the National Council for Childhood and Motherhood. Until the updated decree is issued, Decree 215/2021 regarding the child employment and training system is implemented.

According to Article 66 of Labour Law 14/2025, It is the responsibility of the employer who employs one or more children to consider the following:

1. To post a copy of the provisions of this chapter in a visible place at the workplace.
2. To prepare a record indicating working hours and rest periods, approved by the relevant administrative authority (labour office).
3. To inform the relevant administrative authority of the names of the working children, the tasks assigned to them, and the names of the individuals responsible for monitoring their work.
4. To provide separate accommodation for children away from adults, in accordance with the regulations and provisions issued by the competent minister, and it is strictly prohibited for the child to stay overnight at the workplace.

F. Persons with Disabilities

Egyptian Law No. 10 of 2018 amended by Law 156/2021 on the Rights of Persons with Disabilities aims to ensure the rights and inclusion of persons with disabilities in society. The law mandates non-discrimination, equal opportunities equal employment opportunities based on their qualifications, and accessibility in various aspects of life, including education, employment, and public services. Key provisions of articles 21,22, and 23 from Law No. 10 of 2018, include:

- o Job Placement: The Ministry of Manpower is responsible for creating a registry of job-seeking individuals with disabilities and assisting them in finding suitable employment.

- o Employer Quotas: Employers with 20 or more employees must hire at least 5% of their workforce from people with disabilities.
- o Tax Incentives: it includes a 50% increase in the personal exemption for persons with disabilities or their caregivers. Employers who hire beyond the 5% quota receive additional tax benefits.

In addition, Article 37 of Labour Law 14/2025 requires facilities to keep a special register of persons with disabilities and dwarfism and report on their employment and wages. The facility must also notify the authority with a statement that includes the total number of employees, the number of jobs occupied by people with disabilities and dwarfism, and the wages they receive, following a template and schedule set by the minister.

G. Equal opportunities

Article 9 of the Egyptian Constitution stipulates that the country is committed to achieving equal opportunities for all citizens, without any form of discrimination.

Article 35 of Labour law 14/2025 states that it is prohibited to cluster wages based on cultural, religious, or gender.

Law 10/2018 related to the rights of people with disabilities is concerned with provision of equal rights to this group. It includes their rights to have a life insurance, social insurance, freedom in choices, chances of work opportunities that do not surpass their physical disability limit.

H. Women's Workplace Safety and Night Shifts

According to the Labour Law 14/2025:

Article 53: Applies all employment provisions to women without discrimination; mandates equal pay for equal value of work among men and women.

Article 59: Requires employers who employ one or more female workers to post the “Women’s Employment Regulations” in the workplace, which must address flexible working hours or remote work for women caring for children with disabilities or dwarfism.

In addition, Decree No. 44 of 2021 issued by Egypt’s Ministry of Manpower permits women, upon their request, to work night shifts in any establishment, provided that employers implement appropriate health, safety and transportation measures.

I. Protection from Harassment

Article 254 of Labour Law 14/2025 stipulates that facilities and their branches shall be obligated to provide a safe and non-hostile work environment, free from harassment, bullying, and violence, and to ensure the availability of effective means for prevention against such behaviours.

Anti-harassment Law No. 141/2021: This law, which modifies the 58/1937 Penal Law, strengthens legal protections against sexual harassment. It provides comprehensive safeguards for women against various forms of harassment, including unwanted sexual advances, physical or verbal conduct, online and electronic harassment, stalking behaviours, workplace harassment, and public transportation harassment. It also imposes stricter penalties on perpetrators, reflecting a growing recognition of the seriousness of this issue in Egypt.

J. GrievanceArticle 103 of the Environmental law 4/1994

Grants every citizen and organization concerned with environmental protection the right to report any violations of the provisions of this law.

Article 85 of the Egyptian Constitution

All citizens have the right to address public authorities in writing and signed, but should not address it on behalf of groups, only as juridical persons.

K. Community Investment:

According to the Egyptian Investment Law 72/2017 indicated that towards achieving the goals of the sustainable development, investors may dedicate a percentage of their annual profits for social developments in one or more of the following fields:

- Environmental protection
- Areas of healthcare, social care, or cultural care;
- Support the technical education or the funding of research, studies in cooperation with any of the universities or scientific research institutions; and
- Training and scientific research.

Where investors have undertaken/implemented any community development investments, investors are required to submit to the General Authority for Investment and Free Zones an annual report supported by documents on community development activities.

4.3 Strategic National Initiatives**▪ Egypt National Climate Change Strategy (NCCS) 2050**

Egypt launched on 19/5/2022 the National Climate Change Strategy 2050. NCCS is a comprehensive roadmap designed to guide Egypt's efforts in addressing climate change. The strategy lays out five overarching goals, encompassing mitigation, adaptation, governance, financing, and scientific research. These goals are further divided into objectives and specific directions, each with corresponding performance indicators to track progress.

The contribution of BESS projects to the Egypt's National NCCS 2050 include:

- Contribution to Renewable Energy Goals: PV and BESS projects are expected to significantly contribute to the national goal of increasing the share of renewable energy in the energy mix. The strategy aims to increase the contribution of renewable energy sources to 42% of the total electrical energy produced by 2035.
- Enhancing Climate Resilience: These projects are to integrate climate resilience into their design and operations. These would include measures to withstand extreme weather conditions, such as high temperatures and flash floods, which are common in regions like Qena governorate.
- Reducing GHG Emissions: By transitioning to renewable energy sources, PV and BESS projects contribute to reducing GHG emissions associated with fossil fuel consumption if the same amount of energy were generated from conventional power plants.
- Supporting Sustainable Development Goals: PV and BESS projects should align with Egypt's Vision 2030 and support sustainable economic growth with low-emission development.

▪ **Nationally Determined Contribution (NDC)**

After Egypt signed the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement on the 22nd of April 2016 and ratified it on the 29th of June 2017, the Intended Nationally Determined Contribution (INDC) was considered Egypt's first NDC.

Egypt's updated NDC to the UNFCCC. It outlines Egypt's commitments to reducing GHG emissions and adapting to the effects of climate change between 2020 and 2030.

The NDC highlights Egypt's national circumstances, including its vulnerability to climate change impacts, especially in the Nile Delta, and its ambitious economic development goals. It presents a series of mitigation actions, focused on energy, oil and gas, transport, industry, buildings and urban cities, waste management, and tourism, with projected emission reductions for each sector.

In June 2023, Egypt revised its NDC. As part of its second revised NDC, Egypt has committed to reducing GHG emissions in the oil and gas sector by 2030 from 2,575 GgCO₂-eq under a business-as-usual (BAU) scenario to 0,89 GgCO₂-eq under a mitigation scenario. Egypt intends to reach this target through improving access to clean fuel in households and increasing the production and use of alternative green fuels (such as biofuels).

▪ **Egypt's National Strategy for the Empowerment of Egyptian Women 2030:**

Launched in 2017, this comprehensive strategy aims to advance women's empowerment across political, economic, and social domains, aligning with national and international development goals. Key pillars include:

- Political Empowerment: Increasing women's representation in leadership and decision-making positions.
- Economic Empowerment: Expanding economic opportunities for women through improved employment prospects and support for female entrepreneurship.
- Social Empowerment: Enhancing women's access to quality education, healthcare, and social services.
- Protection and Response: Preventing and addressing violence against women through multi-stakeholder efforts.

4.4 International Conventions

4.4.1 Biodiversity

Egypt has a long-standing commitment to biodiversity conservation through participation in several international conventions, including the Convention on the Conservation of African-Eurasian Migratory Waterbirds (AEWA, 1995), the United Nations Convention on Biological Diversity (UNCBD, 1992), the Convention on the Conservation of Migratory Species of Wild Animals (CMS, 1979), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973), and the African Convention on the Conservation of Nature and Natural Resources (1968).

These agreements collectively require the protection of migratory species and wetlands, conservation of biodiversity and ecosystem services, regulation of international wildlife trade, sustainable management of natural resources, and prevention of land degradation and pollution.

4.4.2 Climate change

- **Paris Agreement for strengthening global response to climate change threats, 2016**

Brings together nations to fight climate change and adapt to it while helping developing countries to do so without ignoring their national objectives. It globally aims to keep an overall temperature rise of less than 2° C this year and to pursue more efforts to lower the increase of rise even further by 1.5 ° C. Although the agriculture sector is not mentioned explicitly in the agreement, it does mention efforts to adapt to climate change and resilience in a manner that do not hinder food production. Egypt signed the agreement on the 22nd of April 2016 and ratified it on the 29th of June 2017.

- **United Nations Framework Convention on Climate Change, 1992**

It provides an intergovernmental framework to face climate change issues. Recognizing that the climate is a common shared resource affected by anthropogenic human emissions. It recognizes the importance of marine environments as well as terrestrial ones in acting as reservoirs for Carbon and GHG. It also emphasizes the importance of scientific, economic and practical sectors in tackling climate change problems and the importance of continuous monitoring and assessment. In addition, it promotes the diffusion and transfer of technologies that reduce anthropogenic emissions of GHG in sectors including agriculture and industry. Egypt signed this convention on the 9th of June 1992 and ratified it on the 5th of December 1994. It entered into force on the 5th of March 1995.

- **Kyoto Protocol setting internationally binding emission reduction targets, 1997**

The protocol aims to commit its joined parties to specific international emission targets and aims to strengthen the global response to the temperature rise. It recognizes that currently developed countries are the main cause of the presently high emissions of GHG in the atmosphere, a result of 150 years. It provides flexibility on how the countries reach their target (e.g., increase in forests to compensate for their emissions). In addition, the protocol requires parties to promote sustainable agriculture practices while taking into consideration the climate change factor. Egypt signed this protocol on the 15th of March 1999 and ratified it on the 12th of January 2005. It entered into force on the 12th of April 2005 as an agreement to the UNFCCC convention.

4.4.3 Cultural Heritage

- **Convention for the Safeguarding of the Intangible Cultural Heritage, 2003**

The Convention for the Safeguarding of the Intangible Cultural Heritage is a United Nations Educational, Scientific and Cultural Organization UNESCO treaty adopted by the UNESCO General Conference on 17 October 2003, which entered into force in 2006. The “intangible cultural heritage” means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts, and cultural spaces associated therewith – that communities, groups, and in some cases, individuals recognize as part of their cultural heritage. The purposes of the convention are: (a) to safeguard the intangible cultural heritage; (b) to ensure respect for the intangible cultural heritage of the communities, groups, and individuals concerned; (c) to raise awareness at the local, national, and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; and (d) to provide for international cooperation and assistance. Egypt ratified the convention on 3 August 2005. Article 13 of the convention states that “to ensure the safeguarding, development, and promotion of the intangible cultural heritage present in its

territory, each State Party shall endeavor to adopt a general policy aimed at promoting the function of the intangible cultural heritage in society, and at integrating the safeguarding of such heritage into planning programs”.

- **Convention for the Protection of the World Cultural and Natural Heritage, 1972**

The General Conference of the UNESCO meeting was held in Paris from 17 October to 21 November 1972, at its seventeenth session.

- Egypt ratified the convention on the 7th of February 1974.
- The convention sets guidelines for parties to help them identify locations that can be world heritage sites and means to conserve them.
- The convention provides management guidelines and possibly financial assistance.
- Moreover, raising awareness and education is also encouraged to improve the protection of those sites.

4.4.4 International Human Rights Conventions

Egypt has a long-standing commitment to international human rights, having ratified several key United Nations conventions. These treaties establish the legal basis for protecting fundamental rights and are directly relevant to the Project's social performance and labour management.

- **International Covenant on Civil and Political Rights (ICCPR) and International Covenant on Economic, Social and Cultural Rights (ICESCR):**

Ratified by Egypt in 1982, these covenants guarantee fundamental rights such as the right to work in just and favourable conditions and protection against discrimination. The Project aligns with these by ensuring fair wages, safe working environments, and respecting the rights of the local community.

- **Convention on the Elimination of All Forms of Discrimination against Women (CEDAW):**
Egypt ratified this convention in 1981. In compliance, the Project promotes gender equality and ensures that its recruitment and operational policies protect women from discrimination and harassment, fostering an inclusive workplace.

- **Convention on the Rights of the Child (CRC):**

Ratified by Egypt in 1990, this convention prohibits the exploitation of children. The Project maintains a zero-tolerance policy towards child labour, enforcing strict age-verification protocols for all employees and contractors.

- **Convention on the Rights of Persons with Disabilities (CRPD):**

Egypt ratified this convention in 2008. The Project integrates these principles by promoting disability inclusion in its workforce and ensuring that stakeholder engagement activities and project information are accessible to persons with disabilities.

- **International Convention on the Elimination of All Forms of Racial Discrimination (ICERD):**

Ratified by Egypt in 1967, this convention commits to the elimination of all forms of racial discrimination. The Project adheres to non-discrimination principles, ensuring equal treatment regardless of race, national origin, or social status.

4.4.5 Work Environment

The ILO conventions are international standards that complement national labor laws. The following international standards are crucial in creating a safe, fair, and non-discriminatory work environment that respects and protects the rights of all workers.

Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87):

This convention guarantees workers and employers the right to form and join organizations of their choosing without prior authorization.

Right to Organise and Collective Bargaining Convention, 1949 (No. 98):

This convention provides protection against anti-union discrimination and promotes voluntary negotiations between employers and workers to determine wages and working conditions through collective bargaining.

Forced Labour Convention, 1930 (No. 29) and its 2014 Protocol:

This convention aims to suppress all forms of forced or compulsory labour. The 2014 Protocol strengthens the measures to prevent forced labour and provides protection and remedies for victims.

Abolition of Forced Labour Convention, 1957 (No. 105):

This convention calls for the immediate and complete abolition of forced or compulsory labour in all its forms, particularly for political coercion, economic development, labour discipline, or racial, social, national, or religious discrimination.

Minimum Age Convention, 1973 (No. 138):

This convention sets the minimum age for admission to employment and work, ensuring that children are not exposed to work environments that can harm their health, safety, or morals.

Worst Forms of Child Labour Convention, 1999 (No. 182):

This convention focuses on eliminating the worst forms of child labour, including slavery, forced labour, trafficking, prostitution, and any work that is likely to harm the health, safety, or morals of children.

Equal Remuneration Convention, 1951 (No. 100):

This convention mandates equal remuneration for men and women workers for work of equal value, aiming to reduce gender pay gaps and promote economic justice.

Discrimination (Employment and Occupation) Convention, 1958 (No. 111):

This convention seeks to eliminate discrimination in employment and occupation based on race, color, sex, religion, political opinion, national extraction, or social origin.

Occupational Safety and Health Convention, 1981 (No. 155):

This convention aims to ensure that occupational safety and health measures are in place to protect workers from workplace hazards and promote safe working environments.

Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187):

This convention provides a framework for continuously improving occupational safety and health systems to prevent workplace accidents and diseases, fostering a culture of prevention.

4.5 Institutional Framework

Several governmental entities have regulatory and oversight responsibilities for the project, including:

- **Egyptian Environmental Affairs Agency (EEAA):** Responsible for reviewing and approving the ESIA and monitoring environmental compliance.
- **New and Renewable Energy Authority (NREA):** Responsible for land allocation and oversight of renewable energy developments.
- **Egyptian Electricity Transmission Company (EETC):** Responsible for grid connection arrangements and electricity transmission infrastructure.
- **Ministry of Electricity and Renewable Energy (MoERE):** Provides strategic oversight of the electricity sector and renewable energy development.
- **Ministry of Labour:** Responsible for enforcement of labour and occupational health and safety requirements.
- **Minya Governorate and Local Authorities:** Responsible for local administrative coordination and permitting requirements.
- **Ministry of Tourism and Antiquities (MOTA):** Responsible for the protection of archaeological and cultural heritage resources.

4.6 International Standards and Guidelines

In addition to complying with Law 4/1994, the ESIA study has been prepared in accordance with the requirements of international financial institutions.

particularly the EBRD and the AfDB for projects seeking funding. As the Abu Qir BESS is an integral component of the broader Energy Valley Project, it is subject to the overarching risk classifications assigned by the lenders to the entire investment programme.

These lenders include the European Bank for Reconstruction and Development (EBRD), the African Development Bank (AfDB), the European Investment Bank (EIB), and Cassa Depositi e Prestiti S.p.A. (CDP). This alignment ensures that the Project meets global best practices for environmental and social sustainability, reflecting the commitment of international partners to Egypt's sustainable investment climate and the implementation of projects that deliver long-term environmental and economic benefits

Under the EBRD requirements, the overall Energy Valley Project is classified as Category A. According to the African Development Bank's (AfDB) Integrated Safeguards System (ISS), the Energy Valley Programme is classified as Category 1 (high risk) due to its scale and complexity, comprising multiple components, including a utility-scale photovoltaic (PV) power plant, overhead transmission lines, a step-down substation, and battery energy storage systems (BESS). However, this overall categorisation does not apply to the individual project components, including Abu Qir BESS, where based on its nature, size, and location it is to be under Category B projects.

In this context, the section below provides a summary of the applicable international environmental and social requirements.

4.6.1 African Development Bank Group's Operational Safeguards (AFDB OS)

The Bank has defined the E&S Operational Safeguards (OSs), as part of its Integrated Safeguards System (ISS 2023), which are designed to maximize positive impacts and to avoid, minimize, reduce, mitigate, or compensate for the adverse E&S risks and impacts of projects, including those related to climate change.

OS1: Assessment and Management of Environmental and Social Risks and Impacts

It addresses how the borrower will address the environmental and social risks and impacts of the project throughout the project life cycle to meet the requirements of the Environmental and Social Safeguards (ESSs) in a manner and within a time frame acceptable to the Bank.

This safeguard is applicable to most projects and applies to the current one.

OS2: Labor and Working Conditions

It recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Also, the importance of treating workers in the project fairly and providing safe and healthy working conditions and respect of workers' rights to promote sound worker-management relationships and enhance the development benefits of a project.

This safeguard is applicable to the proposed project during the construction and operation phases.

OS3: Resources Efficiency and Pollution Prevention and Management

It recognizes that economic activities often cause air, water, and land pollution and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels. It sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle in a manner consistent with GIIP.

This safeguard is applicable on the construction and operation phases of the project.

OS4: Community Health, Safety and Security

It recognizes that projects, activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to a project or activities. It addresses the health, safety, and security risks to and impacts on project-affected communities and the corresponding responsibility of the Borrower to avoid or minimize them.

This safeguard is applicable on the construction and operation phases of the project.

OS5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement

It recognizes that involuntary resettlement should be avoided, and where involuntary resettlement is unavoidable, it will be minimized, and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.

This safeguard does not apply to the proposed project since the activities will not involve any involuntary resettlement or change in the land use.

OS6: Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources

It recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. Also, recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support in a changing climate, and the need to consider the livelihoods of project-affected parties. Also, addresses the sustainable management of primary production and harvesting.

This safeguard is applicable to the project. However, the project components are located within a previously disturbed industrial area and are not expected to result in significant impacts on natural habitats, critical habitats, or other biodiversity-sensitive areas.

OS7: Vulnerable Groups

OS7 requires assessment and mitigation of impacts on vulnerable groups, including women, children, the elderly, and indigenous peoples. It contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being.

This safeguard is applicable on the construction and operation phases of the project.

OS8: Cultural Heritage

It sets out measures designed to protect cultural heritage throughout the project life cycle.

In case of chance finds, the procedures outlined in the Egyptian Antiquities Law No. 117 of 1983 will be followed.

Although no cultural heritage components are anticipated within the project site, the archaeological sites near the proposed project location will be addressed in the ESIA.

OS9: Financial Intermediaries

It recognizes that strong domestic capital and financial markets, and access to finance are important for economic development, growth, and poverty reduction. Also, it addresses the E&S requirements associated with intermediated financing through financial and nonfinancial institutions.

This safeguard is not applicable to the present project.

OS10: Stakeholder Engagement and Information Disclosure

It recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.

This safeguard is applicable to the Project. Stakeholder engagement activities have been undertaken as part of the Project development process, and relevant stakeholders have been

identified and engaged in accordance with the Project's level of environmental and social risks and impacts. Ongoing stakeholder engagement and information disclosure will be undertaken as required by applicable lender requirements and Good International Industry Practice (GIIP).

4.6.2 EBRD Performance Requirements

The Project will comply with the European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (2024). The project is anticipated to be classified as a Category A undertaking, due to the potential for significant environmental and social risks. Accordingly, a full ESIA, robust stakeholder engagement process, and public disclosure are required.

Below summarizes the relevance and applicability of each EBRD Environmental and Social Requirement (ESR) to the proposed project.

ESR 1: Assessment and Management of Environmental and Social Risks and Impacts

This requirement establishes the overarching framework for identifying, evaluating, and managing environmental and social risks. It mandates the development of an Environmental and Social Management System (ESMS), supported by an ESIA and Environmental and Social Management Plan (ESMP). Stakeholder engagement and application of the mitigation hierarchy are fundamental components.

This requirement is relevant to most projects and applies to the current one.

ESR 2: Labour and Working Conditions

This ESR emphasizes the relation between the economic growth and the well-being of a company in one side and establishing a relationship with the workers as a valuable asset that requires a healthy and safe work environment as well as protection for basic rights of workers. It also recognizes the need for employment creation and income generation as an approach for economic growth. It pertains to issues around labour and working conditions, occupational health and safety, migrant labour, etc.

This ESR applies to the proposed project during the different phases; more specifically regarding employment opportunities as well as ensuring the safe environment of the workplace. The PR also addresses suppliers and contractors monitoring⁷. In this respect, companies should identify the roles, impacts, and risks associated with their supply chain concerning labour issues (child and forced labour and significant occupational health and safety risks).

ESR 3: Resource Efficiency and Pollution Prevention and Control

⁷ Where the companies can reasonably exercise control, the client should collaborate with its primary suppliers to propose mitigation measures proportionate to identified risks on a case-by-case basis, while recognizing that assessing and addressing supply chain implications beyond the first or the second-tier suppliers may not be practical or meaningful to the client or the supplier. IFC Guidance Note 1, 2012

This ESR promotes pollution prevention, efficient resource use, and adherence to Good GIIP. It addresses resources consumptions including energy and water, air and water emissions, waste management, and greenhouse gas mitigation.

The requirement applies to the construction and operation phases of the project.

ESR 4: Health, Safety, and Security

This ESR recognizes that the project activities and infrastructure can increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failure, and releases of hazardous materials. Impacts may also occur from exposure to diseases and the use of safety and security personnel. Additionally, the EBRD mandates a risk assessment for gender-based violence and harassment (GBVH), recognizing its severe impact on women's health and wellbeing. This includes identifying and mitigating risks related to physical, mental, or sexual harm and ensuring safe, inclusive working conditions.

The proposed project comprises a Battery Energy Storage System located within the premises of the Abu Qir Power Plant, an existing industrial and utility area. The project will be implemented within a fenced and controlled site, with no land acquisition and no direct interaction with surrounding communities during construction or operation.

Accordingly, potential health, safety, and security risks to external communities and road users are expected to be limited, localized, and manageable through standard design, operational controls, and good international industry practice. Potential impacts during the operational phase are anticipated to be insignificant. Nevertheless, the ESIA assesses these risks and defines appropriate mitigation measures in line with national regulations and lender requirements.

ESR5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement

This ESR ensures that any displacement is minimized and that affected individuals are compensated fairly. It mandates meaningful consultation and livelihood restoration where applicable.

The provisions of this requirement do not apply to the proposed project, as the activities will not involve any involuntary resettlement or changes in land use.

ESR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This performance requirements addresses how projects⁸ can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources.

As part of the ESIA process, a screening-level biological baseline is undertaken for the project area. Preliminary information indicates that the project site is classified as a modified habitat within an existing industrial facility, with no significant ecological diversity identified. The ESIA

⁸ Where a client is purchasing primary production (especially but not exclusively food and fiber commodities) that is known to be produced in regions where there is a risk of significant conversion of natural and/or critical habitats, systems and verification practices will be adopted as part of the client's ESMS to evaluate its primary suppliers.²¹

therefore focuses on describing the general environmental context and surrounding habitats, and assesses potential project-related impacts on biodiversity where applicable.

ESR 7: Indigenous Peoples

This performance requirement aims at preventing adverse impacts of the projects on communities of Indigenous Peoples and to provide opportunities for development benefits.

Provisions of this ESR do not apply to the proposed project since there are no indigenous communities in Egypt.

ESR8: Cultural Heritage

The objective of this performance standard is to protect the cultural heritage from the adverse impacts of the project activities and support its preservation.

There are no registered antiquities or cultural heritage sites within the Project Site. However, the archaeological sites and monuments located in close proximity to the Project Site will be addressed in the ESIA.

ESR9: Financial Intermediaries

Applies to projects involving Financial Intermediaries (FIs), where financing is provided through a financial institution that subsequently finances or invests in sub-projects.

ESR9 is not applicable to the proposed Project.

ESR10: Information Disclosure and Stakeholder Engagement

Sets out the principles and requirements for meaningful stakeholder engagement throughout the lifecycle of a project. It aims to ensure transparency, inclusivity, and responsiveness by requiring the early disclosure of relevant project information, ongoing consultation with affected communities and stakeholders, and the establishment of accessible grievance mechanisms.

ESR10 is applicable to the Project. The ESIA identifies all relevant stakeholders and establishes a framework for ongoing consultation and information disclosure. An overall Stakeholder Engagement Plan (SEP) and an accessible Grievance Redress Mechanism (GRM) has been developed for the overall Energy Valley programme to manage these processes throughout the projects lifecycle..

- **European Investment Bank (EIB)**

The European Investment Bank (EIB) applies eleven Environmental and Social Standards (2023) to ensure that projects it finances are environmentally sound, socially responsible, and aligned with EU and international commitments.

Standard 1: Environmental and Social Impacts and Risks

This Standard promotes an integrated approach to impact assessment and risk management, ensuring environmental, climate, social, and human rights considerations are addressed in decision-making. It mandates the establishment of an ESMS by the promoter. The process involves: Identifying and assessing likely significant effects, including direct, indirect, secondary, cumulative, and transboundary effects. Applying the mitigation hierarchy (avoid,

prevent, reduce, and, if necessary, remedy/compensate) to manage adverse effects. Integrating human rights risks into the assessment. Ensuring consistency with the "Do Not Significant Harm" (DNSH) and "Minimum Safeguards" (MS) principles. Projects likely to have significant impacts must undergo an EIA (in the EU) or ESIA (in the rest of the world).

This standard is relevant to most projects and applies to the proposed project.

Standard 2: Stakeholder Engagement

This Standard recognizes the importance of stakeholder engagement for effective assessment, management, and monitoring of risks, enhancing project sustainability. It outlines the promoter's responsibility for transparent and continuous engagement. The core objectives are: Adopting an inclusive and systematic approach to engaging constructively with affected persons and communities. Ensuring stakeholders have timely access to information about project risks/impacts in a culturally appropriate and understandable manner. Promoting meaningful and free participation in decision-making. Providing rights-holders with effective grievance and remedy mechanisms. The nature and extent of engagement must be commensurate with the project's likely impacts and risks.

Standard 2 is applicable to the Project..

Standard 3: Resource Efficiency and Pollution Prevention

This Standard promotes the goal of zero pollution and transitioning to a circular economy. The primary responsibility is ensuring an integrated approach to resource efficiency and control of emissions (air, water, land, noise). Key areas of focus include: Assessing the effectiveness and efficiency of resource use (materials, land, soil, water, energy). Promoting waste prevention, reuse, and recycling in accordance with the waste hierarchy. Using Best Available Techniques (BAT). Establishing management systems for Emergency Prevention, Preparedness and Response to major accidents (e.g., related to dangerous substances). Ensuring the sound management of hazardous substances and materials.

The standard applies to the project during the construction and operation phases.

Standard 4: Biodiversity and Ecosystems

This Standard focuses on protecting and conserving biodiversity and maintaining ecological functions. It recognizes the link between ecosystem degradation and disproportionate impacts on vulnerable communities. The objectives are: Applying the precautionary approach to avoid irreversible impacts. Applying the mitigation hierarchy (avoid, minimize, restore, compensate) to achieve No Net Loss or a Net Positive Impact (NPI) on biodiversity where required. Promoting the use of an ecosystem-based approach. Prohibiting project-related activities in areas of critical habitat unless rigorous conditions are met, ensuring no measurable adverse impacts or net reduction in vulnerable species population.

This Standard applies to the proposed project.

Standard 5: Climate Change

This Standard addresses the urgency of combating climate change through mitigation (reducing GHG emissions) and adaptation (building resilience). It promotes alignment with the Paris Agreement goals. Promoter responsibilities include: Assessing project-related GHG emissions

and alignment with low-carbon pathways. Assessing the project's resilience to physical climate risks (acute and chronic hazards). Where a project is at risk, carrying out a Climate Risk and Vulnerability Assessment (CRVA) to identify commensurate adaptation measures. Ensuring consistency with the "Do No Significant Harm" (DNSH) principle to climate objectives.

This Standard applies to the proposed project.

Standard 6: Involuntary Resettlement

This Standard applies to displacement—both physical displacement (loss of residence) and economic displacement (loss of income/livelihood)—resulting from involuntary land acquisition or use restriction. The primary goals are: To avoid or minimize involuntary resettlement. To avoid any forced evictions (which are considered a gross violation of human rights). To improve or at least restore displaced persons' livelihoods and living standards to pre-project levels. Mandating timely compensation for loss of assets at the full replacement cost. Planning documents must be prepared, such as a Resettlement Action Plan (RAP) or Livelihood Restoration Plan (LRP).

This standard does not apply to the proposed project.

Standard 7: Vulnerable Groups, Indigenous Peoples and Gender

This Standard addresses individuals and groups who may be disproportionately affected by risks due to systematic discrimination, marginalisation, and/or exclusion based on socioeconomic characteristics (e.g., gender, age, disability, ethnicity).

The objective of this standard is to protect individuals and groups who may be disproportionately affected by project risks due to marginalisation or discrimination, and to ensure a gender-responsive approach to impact management.

Yet it does not apply with respect to indigenous people since there are no indigenous peoples in Egypt.

Standard 8: Labour Rights

This Standard establishes minimum requirements aligned with the principles of the ILO Fundamental Conventions and the European Pillar of Social Rights. It applies to direct workers, third-party workers (contractors/intermediaries), and supply chain workers. Key requirements include: Ensuring non-discrimination and equal opportunity in employment decisions. Implementing zero tolerance for forced labor and child labor. Respecting the rights to freedom of association and collective bargaining. Establishing a written employment contract for all workers. Setting up an effective, gender-responsive grievance mechanism for workplace concerns.

This standard applies to the proposed project during the different phases; more specifically regarding employment opportunities as well as ensuring the safe environment of the workplace.

Standard 9: Health, Safety and Security

This Standard covers occupational and public health, safety, and security risks arising from project activities. It requires promoters to put in place a Health and Safety Management System (HSMS). The objectives focus on: Protecting the health, safety, and security of project

workers (including third parties and considering gender-specific risks). Managing risks to project-affected people and communities (including sexual harassment, exploitation, and abuse). Ensuring the use of public or private security forces is consistent with international human rights standards (e.g., the UN Voluntary Principles on Security and Human Rights)

This Standard applies to the proposed project.

Standard 10: Cultural Heritage

This Standard emphasizes the protection and conservation of both tangible and intangible cultural heritage. The core objective is the application of a precautionary approach to managing and protecting cultural heritage. Key actions include: Avoiding significant adverse impacts on cultural heritage; if unavoidable, minimizing them and providing compensation as a last resort. Engaging professionals to compile a baseline inventory and assess cultural significance. Establishing chance finding procedures for unexpected discoveries during implementation. Ensuring equitable sharing of benefits when commercializing cultural resources used by local communities

This Standard applies to the proposed project. Although there are no registered antiquities or cultural heritage sites within the Project Site. However, the archaeological sites and monuments located in close proximity to the Project Site will be addressed in the ESIA.

Standard 11: Intermediated Finance

This Standard applies when EIB financing is channelled through Financial Intermediaries (FIs) to support smaller sub-projects. The FI's process for assessing, managing, and monitoring ECS risks must be commensurate with the sub-project's risk level. General requirements for FIs include: Respecting their own employees' labour rights and providing a safe working environment. Requiring final beneficiaries to comply with applicable national and EU legislation (or EIB ESS outside the EU). Operating processes to screen sub-projects against the EIB's excluded activities list. Ensuring rights-holders have access to stakeholder engagement and grievance mechanisms.

This standard is not applicable to the present project.

- **CDP Sustainability Framework (2020)**

CDP Sustainability Framework (Version 1.0, 2020) establishes a comprehensive environmental, social, and governance (ESG) system that applies to all projects and entities benefiting from CDP financing.

The Framework aligns with international sustainability principles and ensures that all CDP-supported activities respect human rights, prevent adverse environmental and social impacts, and contribute positively to sustainable development objectives

A. Environmental Commitments

In accordance with Sections 6.1 and 6.4 of the CDP Sustainability Framework, every financed project is subject to a Sustainable Development Assessment (SDA), which evaluates ex-ante the potential positive and negative environmental impacts across key dimensions such as climate change, resource efficiency, biodiversity, pollution prevention, and waste management.

An ex-post assessment is then conducted to verify the actual environmental and social performance of financed activities, based on annual reporting and the aggregation of new lending data across CDP's operational lines. **Funded projects are required to:**

- Comply with internationally recognized environmental standards, including:
 - IFC Performance Standards on Environmental and Social Sustainability.
 - World Bank Group Environmental, Health and Safety (EHS) Guidelines.
 - European Union environmental directives, where applicable.
- Avoid, minimize, or mitigate adverse impacts and implement corrective actions when required. CDP expects beneficiaries to manage environmental risks proactively and report any identified non-compliance or incidents.
- Promote positive environmental outcomes through initiatives that enhance sustainability performance, such as renewable energy adoption, energy efficiency improvement, low-carbon transition, climate adaptation, and conservation of natural ecosystems.
- Monitor and disclose environmental results periodically through sustainability reporting mechanisms defined under Sections 6.5 and 7 of the Framework.

B. Social Commitments

CDP's social standards are grounded in internationally recognized human rights and labor conventions and apply to all operations and relationships arising from CDP-financed projects. As stated in Section 6.4, CDP periodically evaluates the human rights implications and social risks associated with its activities, considering external contexts such as country risk, regulatory developments, and stakeholder feedback. Funded entities are expected to:

- Respect and uphold international human rights standards, in line with:
 - The Universal Declaration of Human Rights;
 - The International Covenant on Civil and Political Rights;
 - The International Covenant on Economic, Social, and Cultural Rights;
 - The ILO Fundamental Conventions (Nos. 29, 87, 98, 100, 105, 111, 138, 182).

C. Health and Safety Commitments

As outlined in Sections 6.4 and 6.5, CDP requires that all financed projects maintain high standards of occupational health and safety (OHS) and community protection, consistent with the World Bank Group Environmental, Health and Safety Guidelines and relevant EU Directives.

4.6.3 IFC E&S Performance Standards

PS1: Assessment and Management of Environmental and Social Risks and Impacts

This performance standard establishes the importance of:

- i. Integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects;
- ii. Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them;
- iii. The client's management of social and environmental performance throughout the life of the project.

This PS is relevant to the current project. The ESIA has been prepared in accordance with PS1 requirements. Given the project's industrial location, limited and site-specific impacts, and absence of direct impacts on surrounding communities, formal public consultation is not

required, and stakeholder engagement is limited to appropriate information disclosure, consistent with national regulations and IFC guidance.

PS2: Labor and Working Conditions

This performance standard emphasizes the relation between the economic growth and the well-being of a company in one side, and establishing a relationship with the workers as a valuable asset that requires a healthy and safe work environment as well as protection for basic rights of workers. It also recognizes the need for employment creation and income generation as an approach for economic growth.

This PS applies to the current project; more specifically related to the creation of job opportunities as well as ensuring the safe environment of the workplace.

PS3: Resource Efficiency and Pollution Prevention

This performance standard recognizes that industrial activities often generate increased levels of pollution to air, water, and land, which can have a potential adverse impact on the surrounding environment.

This Performance Standard is applicable to the project, as it addresses the prevention and management of potential pollution sources during construction and operation.

PS4: Community Health, Safety, and Security

This performance standard recognizes that the project activities and infrastructure can increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failure, and releases of hazardous materials. Impacts may also arise from exposure to diseases and the use of safety and security personnel.

This PS applies to the proposed project during the construction and operation phase of the project.

PS5: Land Acquisition and Involuntary Resettlement

This performance standard recognizes that the project design minimizes economic and physical displacement, balancing social, environmental, and financial costs and benefits.

This PS does not apply to the proposed project since the activities will not involve any involuntary resettlement.

PS6: Biodiversity Conservation and Sustainable Natural Resource Management

This performance standard addresses how projects can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources.

This Performance Standard is not applicable to the proposed project, as all project components are located within a previously disturbed industrial area, and no natural habitats, critical habitats, or renewable natural resources are present or affected.

PS7: Indigenous Peoples

This performance standard aims at preventing adverse impacts of the projects on communities of Indigenous peoples and to provide opportunities for development benefits.

This PS does not apply to the proposed project since there are no indigenous communities in Egypt.

PS8: Cultural Heritage

The objective of this performance standard is to protect the cultural heritage from the adverse impacts of the project activities and support its preservation.

PS8 is applicable to the Project. Although there are no registered antiquities or cultural heritage sites within the Project footprint, the standard is relevant for managing the risk of potential archaeological discoveries during construction. In this context, a Chance Find Procedure will be developed as part of the project's environmental and social management framework.

A gap analysis between the applicable Lenders E&S requirements and the relevant Egyptian environmental and social regulatory framework is presented in Annex (4).

4.6.4 World Bank EHS Guidelines

The World Bank Group members are committed to abiding by the general EHS Guidelines for different projects where they are involved. These are complemented by industry-specific guidelines for complex projects.

The EHS Guidelines are technical reference documents with general and industry-specific examples of GIIP. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines include performance measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

4.7 Scatec Corporate Sustainability, Environmental, Health, Safety and Social Requirements

In addition to applicable Egyptian legislation, permit conditions, international lender requirements, and relevant international standards and guidelines, the Project will be implemented in accordance with the applicable Scatec corporate policies, standards, procedures, and commitments.

The Scatec corporate framework provides the internal requirements for managing sustainability, environmental protection, occupational health and safety, security, labour and working conditions, human rights, ethical conduct, responsible procurement, stakeholder engagement, and grievance management. The framework will apply to the Project Company, Project employees, contractors, subcontractors, suppliers, and other parties engaged in Project activities, as relevant to their roles and responsibilities.

The applicable corporate requirements will be incorporated into the Project Environmental and Social Management System, the Project ESMP, contractor agreements, procurement requirements, construction and operation management plans, training programmes, monitoring arrangements, incident-reporting procedures, audits, and corrective-action processes

5. Analysis of Alternatives

The analysis of alternatives involves evaluating various project options during the conceptual and pre-feasibility design phases. Emphasis is placed on both the environmental and social implications, ensuring that the selected option is technically and economically viable, environmentally sound, and complies with Egyptian laws, regulations and international requirements.

5.1 No Project Alternative

The “no project” alternative assumes that the proposed Battery Energy Storage System (BESS) will not be developed. Under this alternative, the intended benefits of the BESS would not be realized, including support to the stability and reliability of the electricity grid through energy storage, enhanced system flexibility, and more efficient integration and management of electricity supply within the national grid. In addition, opportunities for local employment and procurement during the construction and operation phases would not occur.

From an environmental perspective, the “no project” alternative would avoid the localized and manageable impacts identified during the construction and operation phases. However, it would also forego the broader environmental benefits associated with improved energy system efficiency and the optimized use of existing power infrastructure.

Considering the project’s industrial location, limited footprint, and limited environmental and social impacts, as well as its role in supporting national energy system performance, *the “no project” alternative is not considered a suitable alternative for this project.*

5.2 Alternative Site Location

The proposed project is located within the premises of the Abu Qir Power Plant in Alexandria Governorate, occupying an area of approximately 50,410 m². The site is located within a previously modified area inside the existing power generation facility and in close proximity to the required electrical infrastructure for grid connection.

Therefore, alternative site location options were not considered, and the selected site is suitable for the establishment of the project.

5.3 BESS Alternatives

- **Lithium-Ion Containerized Batteries**
Lithium-ion Battery Energy Storage Systems (BESS) consist of multiple electrochemical cells assembled into modules, racks, and containerized units. Each cell contains a positive electrode (cathode), negative electrode (anode), and electrolyte, enabling the storage and release of electrical energy through reversible electrochemical reactions, as shown in Figure 5-1 below.

Several lithium-ion chemistries are commercially available for grid-scale applications, including:

- Lithium Iron Phosphate (LFP)
- Lithium Nickel Manganese Cobalt Oxide (NMC)
- Lithium Titanate (LTO)

Among these:

- LFP batteries provide high thermal stability, lower fire risk, long cycle life, and comparatively lower cost, although with lower energy density.
- NMC batteries provide higher energy density and balanced performance, but with higher thermal runaway risk and greater material criticality.
- LTO batteries provide very long cycle life and rapid charging, but significantly lower energy density and higher cost, limiting grid-scale deployment.

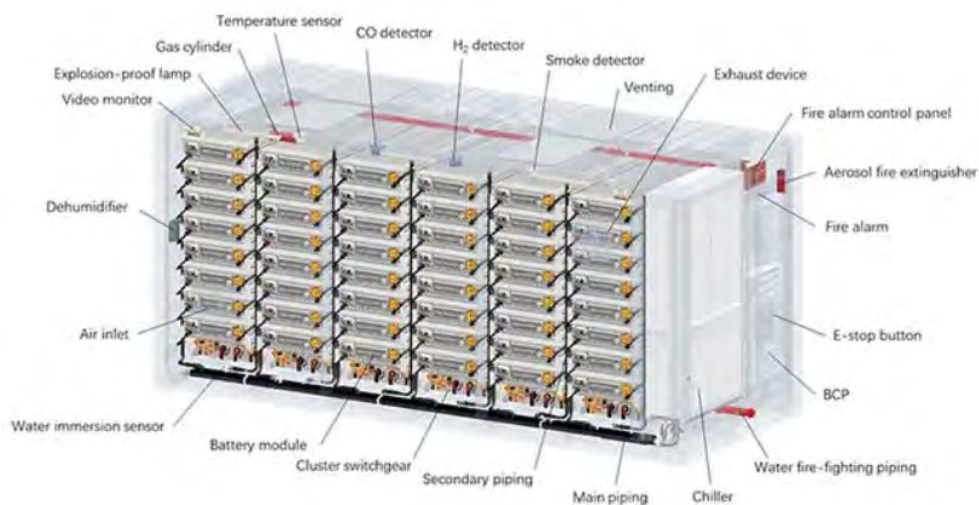


Figure 5-1: BESS systems

- **Vanadium Redox Flow Batteries (VRFB)**

Vanadium redox flow batteries store energy in liquid electrolytes contained in external tanks, requiring:

- Significantly larger land area due to low energy density
- Management of corrosive liquid electrolytes and spill risk

Given the site footprint constraints and hazardous liquid handling considerations, VRFB technology was not selected.

- **Molten Metal Batteries**

Molten metal batteries operate at elevated temperatures requiring:

- Continuous heating to maintain molten state
- Permanent auxiliary energy consumption
- Increased thermal and operational safety considerations

Due to energy inefficiency and operational complexity, this technology was not selected.

- **Sodium-Ion / High-Temperature Sodium Batteries**

High-temperature sodium-based batteries require operating temperatures of approximately 300–400 °C, necessitating:

- Continuous heating systems
- Elevated fire and safety risks
- Additional energy consumption and maintenance

Accordingly, this technology was not considered suitable for the Project.

Based on technical feasibility, safety performance, environmental risk profile, land requirements, lifecycle cost, and alignment with Good International Industry Practice, the Project has selected containerized lithium-ion Battery Energy Storage Systems using Lithium Iron Phosphate (LFP) chemistry as the preferred and implemented technology.

5.4 Cooling System Alternatives

Thermal management is a critical design element of Battery Energy Storage Systems (BESS), as battery performance, safety, and service life are strongly influenced by operating temperature. In accordance with Good International Industry Practice (GIIP), cooling system selection depends on factors such as system size, heat generation rate, ambient conditions, and operational requirements. For BESS applications, the most commonly considered cooling approaches are air cooling and liquid cooling.

- **Forced Air-Cooled Systems**

Forced air-cooled systems use fans to circulate ambient air within battery enclosures to remove heat generated by battery modules. These systems have a relatively simple design, do not require liquid coolant, and generally involve lower installation costs.

However, air cooling is less effective at maintaining uniform battery temperatures, particularly in large containerized BESS and under high ambient temperature conditions. The low thermal conductivity of air limits its ability to dissipate high heat loads, which may result in temperature gradients within battery modules. Continuous fan operation may also increase auxiliary power consumption and noise levels.

Air-cooled systems are therefore more suitable for small-scale or low heat-load applications and are not considered optimal for utility-scale BESS installations requiring reliable and consistent thermal control.

Given the site's climatic conditions and the need for reliable thermal management, air-cooled systems were not selected.

- **Open-Loop Liquid Cooling Systems**

Open-loop liquid cooling systems involve the intake of water or another liquid for cooling purposes, followed by discharge after use. Such systems are not commonly applied in containerized BESS projects and are not consistent with GIIP, as they introduce environmental

risks related to water abstraction, wastewater generation, and potential contamination, in addition to increased regulatory requirements.

- **Closed-Loop Liquid Cooling with Water-Based Heat Rejection**

This option transfers heat from the battery coolant to a secondary water circuit through liquid-to-liquid heat exchangers. While technically feasible, it requires a reliable source of clean cooling water and introduces water consumption, potential discharge, and additional permitting and operational complexity. Such systems are typically applied in industrial facilities with established cooling water infrastructure.

The cooling process will require water pre-treatment and brine discharge, increasing the project's cost. Given the project's objective to avoid process water use and discharge, this option was excluded from the project design and not retained for further consideration.

- **Closed-Loop Liquid Cooling with Air-Based Heat Rejection (dry coolers)**

In this configuration, a liquid coolant circulates in a closed loop through cooling plates or heat exchangers in direct thermal contact with the battery modules. Heat absorbed by the coolant is rejected to the ambient environment through air-assisted heat exchangers (dry coolers) equipped with fans. The cooled liquid is then recirculated back to the battery modules. This system provides uniform temperature control across battery cells, which is essential for battery performance, safety, and lifespan. The closed-loop design avoids process water consumption and wastewater generation and is widely adopted in containerized, utility-scale BESS projects.

Based on the above assessment and consistent with GIIP, the project will utilize a closed-loop liquid cooling system with air-based heat rejection using dry coolers. Other cooling alternatives were not retained for further consideration.

6. Assessment of Environmental and Social Risks/Impacts and Mitigation Measures

6.1 Methodology

The environmental assessment was carried out to cover potential impacts of the project on the environment as well as impacts of the environment on the project. The assessment was carried out in four main steps, as follows:

1. Identification and classification of impacts into irrelevant (scoped out), positive, and negative;
2. Assessment of potentially significant environmental and social impacts and risks;
3. Identifying and proposing suitable mitigation measures for minimizing the effects of negative impacts; and
4. Evaluation of residual impacts.

The main cumulative impacts have also been assessed using the same methodology utilized to assess potential negative impacts.

• **Identification and Classification of Impacts**

Interaction between the different project activities and the environmental receptors, identified through the baseline information, was carried out. Such interactions may result in negative or positive impacts. The different types of impacts were identified.

Based on the analysis of the baseline environmental conditions and the nature of the receiving environment, some aspects were found to be irrelevant to specific activities of this particular project. These are identified as "scoped out impacts".

Potentially relevant aspects were subject to a process of impact evaluation, based on the analysis of the proposed project components and activities, in order to determine the significance of the different impacts. The evaluation process takes into account the information collected in the field, available in the literature and/or based on the professional judgment of the consulting team and stakeholder engagement activities.

Aspects evaluation is based on pre-set criteria including, aspect magnitude, duration, planned mitigation measures, regulatory standards and the susceptibility of environmental receptors.

• **Assessment of Negative Impacts**

The procedure to assess the "significance" of negative impacts is outlined below. It should be noted that the significance of each potential negative impact is determined before and after implementing the mitigation measures and/or applying mitigation, management and monitoring practices (i.e. residual impacts).

The magnitude of an aspect will be determined according to the following criteria:

- The temporal scale or timeframe within which the aspect t can occur;
- The spatial scale or size of the aspect; and
- The severity scale or intensity of the aspect.

Temporal scale + spatial scale + intensity scale = Magnitude of aspect

The overall significance of the aspect will consider the magnitude of an aspect in combination with the susceptibility/vulnerability/value of the receptor or resource, in the absence of quantified standards, as shown in the following table.

Table 6-1: Assessment of the overall significance of impacts

Magnitude of aspect	susceptibility / Vulnerability / Value of Resource / Receptor		
	Low	Medium	High
Negligible	Insignificant	Insignificant	Insignificant
Small	Insignificant	Minor	Moderate
Medium	Minor	Moderate	Major
Large	Moderate	Major	Extreme

• **Mitigation Measures**

The mitigation of impacts follows a hierarchy of actions, referred to as the “Mitigation Hierarchy”, which comprises the following sequential steps:

- **Avoidance:** actions taken to fully prevent impacts, such as relocating a project or changing its spatial layout to prevent impacts in specific locations;
- **Minimization:** actions taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided;
- **Restoration:** actions taken to assist in the recovery of a feature that has been degraded, damaged, or destroyed; and
- **Offset:** measurable outcomes resulting from actions designed to compensate for significant residual adverse impacts arising from project development and persisting after appropriate avoidance, minimization, and restoration measures have been taken. These could be applied in both biodiversity conservation (e.g., restore and protect areas degraded by impacts unrelated to the planned development or avert the loss of biodiversity from impacts unrelated to the planned development) and pollution loads (e.g., by investing in pollution abatement in an adjacent industrial facility emitting pollutants in the same air shed).

Mitigation measures are either incorporated as integral part of the project design or through management and monitoring measures. By implementing mitigation measures, the residual impacts, which are those potentially, remaining after implementing the mitigation measures, should be minimal and acceptable.

Based on the impact identification and evaluation process, mitigation measures are proposed for significant impacts, while minor impacts are usually integrated within the management plans of the project. As much as possible, the avoidance and prevention of impacts is favoured over minimization, restoration or offset.

• **Residual Impacts**

Residual impacts have been evaluated, and their significance is stated in this chapter after the implementation of relevant mitigation measures.

The expanded version of the impact assessment methodology used is presented in Annex (5).

6.2 Impacts and Risks Identification

Interaction between the different activities and the environmental and social receptors, identified through the baseline information, was carried out. Such interactions may result in negative or positive impacts. The different types of risk and impacts were identified.

Based on the analysis of the baseline environmental and social conditions and the nature of the receiving environment, some aspects were found to be irrelevant to the specific activities of this particular project. These are identified as "scoped out impacts".

Potentially relevant aspect was subject to a process of impact evaluation, based on the analysis of the proposed project components and activities, to determine the significance of the different impacts. The evaluation process takes into account the information collected in the field, available in the literature, and/or based on the professional judgment of the consulting team and public consultation. Impact evaluation is based on pre-set criteria including, impact magnitude, duration, planned mitigation measures, regulatory standards, and susceptibility of environmental receptors.

• **Scoped Out Impacts**

The potential impacts of the project were identified based on the analysis of impacts of surrounding environment and social aspects. This step would facilitate eliminating and scoping out irrelevant impacts taking into consideration the following:

- Type of project
- Location
- Characteristics of the surrounding environment.
- Receptor susceptibility or importance: depends on its nature, value, scarcity, etc.

Examination of the environmental setting of the area and the operational processes has shown that the impact on the following resources/receptors is irrelevant:

Air Emissions during Operation

The BESS operates electrically and does not involve combustion processes during operation. No boilers, generators, stacks, or continuous emission sources are included in the project scope. Accordingly, no operational air emissions (including NO_x, SO_x, particulate matter, or greenhouse gases) are expected, and air emissions during operation are out of scope.

Visual Impact

The project involves the construction of a BESS comprising containerized units and associated electrical equipment. The project site is located within the premises of the Abu Qir Power Plant, an area designated for industrial and utility use, and the BESS will be constructed within a fenced plot inside the power plant property. Accordingly, visual impacts are not expected to be significant and are considered out of scope for further assessment.

Impact on land Acquisition/Resettlement

The project will be built on land belonging to the new Abu Qir Power Plant. In addition, the site has been previously rented to an investor to develop a fish farm. However, the fish farm lasted for about six months, and the site was then abandoned. The site does not currently support

residential, agricultural, or commercial activities and is already fenced. No land acquisition, displacement, or loss of livelihoods is anticipated. Accordingly, impacts on land use are considered out of scope for further assessment.

- **Positive Impacts**

Environmental Impacts

1. Support for the integration of renewable energy into the national grid.
2. Reduction of indirect greenhouse gas emissions across the electricity grid through improved energy balancing and reduced dispatch of fossil-fuel based peak generation.
3. No operational air emissions (no combustion processes).
4. avoidance of new land disturbance by locating the project within the existing Abu Qir Power Plant.
5. Reduces reliance on fossil-fuel-fired power plants during periods of high electricity demand.

Socio Economic Impacts

1. Improved grid stability and operational flexibility, by acting as a reliable emergency power source
2. during grid disruptions or blackouts, ensuring critical infrastructure remains operational.
3. Captures energy from solar and releases it when generation drops (e.g., at night or on cloudy days).
4. Storing renewable energy that would otherwise be rejected by a saturated grid
5. Temporary employment opportunities during construction. Contractors will be encouraged to maximize the inclusion of workers from local communities, targeting more than the 50% local hiring threshold established by the Project.
6. Development of technical skills and capacity in energy storage systems.
7. The Project will not directly supply electricity to specific households, industries, or essential services. Rather, the stored energy will be transferred to the national electricity grid, which serves all categories of consumers across Egypt. Accordingly, the Project's benefits are expected to be indirect and national in nature.

6.3 Assessment of Potential Negative Impacts and Proposed Mitigation Measures

6.3.1 Potential Impacts during Construction Phase

In general, mitigation measures at the construction phase of any project depend mainly on environmental management procedures, which include preventive maintenance procedures for construction equipment, and material transport trucks, proper waste management procedures, continuous monitoring, supervision and follow-up procedures.

These measures will be implemented through the Contractor's Construction Environmental and Social Management Plan (CESMP), including the Occupational Health and Safety (OHS) Management Plan.

A. Potential Risks and Impact on the Physical Environment

• **Impacts on Air Quality**

Potential impacts on air quality during the construction phase are mainly associated with exhaust emissions from construction vehicles and mobile equipment operating on-site. Exhaust emissions may include nitrogen oxides (NO_x), carbon monoxide (CO), sulphur oxides (SO₂), hydrocarbons (HC), and particulate matter. In addition, particulate emissions may occur from handling of construction materials and temporary stockpiling of imported materials. These emissions are expected to be intermittent.

Construction activities will be carried out within the BESS project footprint. The construction phase is expected to last approximately 20 months, during which temporary and localized impacts may occur.

Based on the short-term temporal scale, localized spatial extent, and slight intensity, the overall magnitude of the air quality impact is assessed as **SMALL**.

The surrounding environment is predominantly characterized by developed and modified land uses with separation distances limiting exposure beyond the immediate project boundary. Therefore, air quality in the surrounding area is considered to have **LOW** susceptibility to construction-related emissions. Accordingly, the overall significance of the impact on air quality impacts during the construction phase is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the project will implement the following mitigation measures.

- Minimize idling times of construction vehicles and machinery.
- Maintain vehicles and construction equipment in good working condition.
- Cover trucks that transporting fine or loose materials.
- Implement good housekeeping practices across the construction site.
- Construction contractors' will be requested to conduct periodic environmental measurements including air emission monitoring

Residual Impacts

No residual impacts.

• **Potential Impacts on Ambient Noise**

Surrounding land uses include industrial facilities, vacant land, agricultural land, and a residential settlement (Ezbit El-Steen) located south of the project site and physically separated by Tabya–Rasheed Road. Considering the limited spatial scale of the project, and the temporary nature of construction activities, construction-related noise levels are expected to decrease with distance and remain largely confined to the project footprint and its immediate surroundings.

Based on the short-term duration, localized spatial extent, and moderate intensity of construction noise sources, the overall magnitude of impact on ambient noise levels is assessed as **SMALL**.

Off-site receptors in the surrounding area are characterized by predominantly developed and modified land uses and are therefore considered to have **LOW** susceptibility to temporary construction noise. Accordingly, the significance of construction-phase noise impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the following mitigation measures will be included in the contracts of the construction contractors:

- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions.
- Use low-noise machinery and equipment where possible.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Provide hearing protection equipment to workers exposed to high noise levels.
- Construction noise will be controlled through the contractor's ESMP, with monitoring undertaken as part of the environmental measurements that to be requested from contractors

Residual Impacts

No residual impacts

• **Potential Impacts on Soil**

Potential impacts on soil during the construction phase are mainly associated with earthworks and excavation activities, management of domestic wastewater, construction waste handling, and the potential for accidental spills or leaks of fuels, oils, lubricants, and other chemicals from construction vehicles and equipment operating within the site.

Construction activities are expected to result in localized and temporary soil disturbance, primarily related to excavation and backfilling, compaction, and handling of excavated material. Given the controlled nature of construction activities, and the absence of long-term soil-intensive uses, the likelihood of soil contamination requiring future remediation or clean-up is considered low.

The potential impacts on soil are expected to be localized and short-term, limited to the construction phase. The intensity of the impact is considered moderate. Accordingly, the overall magnitude of the impact is assessed as **SMALL**.

The soil receptor susceptibility is considered **MODERATE**, given the previously disturbed condition of the site and its location within an industrial area. Therefore, the overall significance of construction-phase impacts on soil is assessed as **MINOR**.

Mitigation Measures

The following mitigation measures will be implemented to manage and minimize potential impacts:

- Conduct maintenance of vehicles, trucks, and construction equipment off-site where practicable, to minimize on-site spills and effluents.

- Implement spill prevention and response measures, including the availability of spill kits on-site.
- Collect and dispose of any spillages or contaminated materials through licensed and authorized waste contractors.
- Develop and implement a spill management plan as part of the site Environmental and Social Management Plan (ESMP).
- Maintain good housekeeping practices to ensure a clean and orderly construction site.
- Collect domestic wastewater in sealed tanks and transport it off-site via authorized contractors for proper disposal, preventing soil contamination.
- Collect solid waste at designated collection points and store it in appropriate containers following regulations.
- Use licensed contractors for the collection and disposal of non-hazardous waste.
- Establish marked and physically separated storage areas for hazardous waste.
- Use licensed contractors for the collection and disposal of hazardous waste.

Residual Impacts

With the implementation of the above mitigation measures, the residual impacts of construction activities on soil are expected to be **INSIGNIFICANT**.

• **Potential Impacts associated with Dewatering Activities**

Site preparation activities will include dewatering of the accumulated water within the existing ponded areas. The dewatering activity will be temporary, localized within the Project Site, and limited to the construction phase. Water generated from dewatering activities will be collected and transported to an authorized public wastewater treatment plant for treatment and disposal and will not be discharged directly to the surrounding environment.

Given the temporary nature of the activity and the proposed management measures, the magnitude of the impact is assessed as **SMALL**. The sensitivity of the potentially affected receptors is considered **slight**. Therefore, the significance of the impact is assessed as **MINOR**.

Mitigation Measures

- Collect water generated from dewatering activities and transport it to an authorized public wastewater treatment plant for treatment and disposal.
- Maintain records of wastewater transportation and disposal.

Residual Impacts

With implementation of the above mitigation measures, residual impacts are expected to be **INSIGNIFICANT**.

B. Risks and Impacts on the Biological Environment

The project will be built on a land belonging to the Abu Qir Power Plant. It is an entirely modified habitat, which was previously used as a fish farm. Except for the walkways bordering the site fence, it consists of low-lying ponds where water accumulates, thus resulting in the growth of extensive reed vegetation.

Moreover, the surrounding area is entirely composed of modified habitats, which include numerous coastal industrial facilities, as well as human settlements, agricultural areas and palm plantations in the close surroundings, particularly south of the Project Site.

- **Habitat loss and modification**

The site will turn from a vacant modified land dominated by the invasive reed *Phragmites australis*, into an industrial site. The impact is deemed permanent and irreversible and involves the *study area* but is considered *slight* given that the site has no ecological value. The magnitude is considered **SMALL**. Given the **LOW** value of the receptor (a modified site located within industrial facilities), this impact is deemed **INSIGNIFICANT**.

Mitigation Measures

Mitigation measures will focus on avoiding the degradation of offsite habitats:

- Ensure proper housekeeping onsite and offsite to avoid the degradation of surrounding areas;
- Avoid offsite areas with vegetation cover to prevent further degradation of surrounding areas;
- Provide awareness to the workers on the negative impacts of affecting flora and disturbing wild fauna.

Residual Impacts

No residual impacts.

- **Disturbance to wildlife**

During the construction phase, air emissions, noise and vibrations, and light emissions, may affect local wildlife. Increased human presence due to construction activities is deemed insignificant as the area is already largely populated. Potential wildlife receptors are mainly found in the agricultural areas located south of the Project Site (out of the reach of potential impacts). Moreover, the project site has no recorded migratory soaring bird tracks and its sensitivity to migratory soaring birds is negligible. On the other hand, 13 species of non-soaring migratory birds may pass over the project site or within less than 1 km of it (MSBT, 2026). However, non-soaring migratory avifauna is not expected to be affected as there is no correlation between the airspace utilized by avifauna and the terrestrial area of the site, which does not provide any resources in terms of resting and feeding areas.

Given the nature of the site, these impacts are *slight* in intensity, of short term and at the *study area* level. Their magnitude is considered **SMALL**. Receptors are considered of **LOW** vulnerability to these impacts as they are not confined to project sit and/or its AoI and, therefore, will be unaffected. Accordingly, the overall significance of these impacts is deemed **MINOR**.

Mitigation Measures

Mitigation measures will mainly include the following:

- Develop, implement and update a solid waste, hazardous waste and waste water management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species;

- Provide awareness to the workers on the negative impacts of disturbing wild fauna located offsite;
- Ensure proper housekeeping practice;
- Ensure the proper maintenance of construction equipment and any other equipment with high noise and vibration potential.

Residual Impacts

With the proper implementation of the mitigation and management measures the residual impacts will be **INSIGNIFICANT**.

- ***Attraction of pests and propagation of invasive species***

Solid waste and sewage wastewater mismanagement may result in the presence of water and the growth of marginal vegetation, which may in turn attract pests (such as insects and rodents), which may be disease vectors. This impact is *slight* in intensity, of short term and at the *study area* level. The magnitude is considered **SMALL** as this is not a continuous and persistent impact and with a low probability of occurrence. Given the **LOW** ecological value of the site, this impact is deemed **INSIGNIFICANT**.

Mitigation Measures

Mitigation measures will mainly include the following:

- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species;
- Ensure proper housekeeping practices; and
- Provide awareness to the workers on the negative impacts of improper solid waste and wastewater disposal.

Residual Impacts

No residual Impacts.

C. Impact on Cultural Heritage

As indicated in chapter 3 of this ESIA, the nearest registered archaeological site is Kom el-Dahab, around 5km south of the project site. No direct or indirect impact pathways (such as vibration, dust, or visual intrusion) are associated with the project.

The project site is located on previously disturbed land, and no surface indicators of archaeological remains were identified during the site visit.

Accordingly, no impacts on cultural heritage are expected; however, a Chance Find Procedure will be implemented during construction as a precautionary measure.

D. Impacts on Socio Economic Environment

- ***Worker Influx***

The construction phase will require a temporary workforce comprising both skilled and unskilled labor. The project will prioritize local employment where feasible, while specialized roles may be filled by non-local workers if necessary. No permanent workers' camps will be

established, and most workers are expected to commute daily from their existing places of residence using transportation provided by the project company. The detailed arrangements will be addressed through the contractor's Labour Management, Accommodation/Labour Influx and Traffic Management Plans.

Given the hiring of the workforce will be from the same governorate, a substantial influx of non-local workers is not anticipated and any non-local accommodation and transport will be managed through the contractor's labour and influx arrangements. Consequently, there is no pressure on local housing, water supply, food availability, and public services. The potential for social disruption, rental inflation, or strain on local infrastructure is therefore considered low. Furthermore, in-migration is also not expected since the project site is accessible from all locations within the governorate. Besides, the Project company will encourage contractors to maximize the inclusion of workers from local communities.

Risks related to Gender-Based Violence (GBV) and sexual harassment are unlikely to occur at the community level and, if any incidents arise, would be isolated rather than indicative of project-induced patterns. The GBV risks will be managed through the Labour Management Plan, Worker Code of Conduct, induction/training, and contractor monitoring.

Accordingly, the aspect is localized and short-term with a **SMALL** magnitude.

Sensitive receptors include nearby activities. Considering the limited interaction between the temporary workforce and surrounding activities, receptor susceptibility is **LOW**. Therefore, the overall significance of worker influx impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the project will implement the following mitigation measures.

- Prioritize hiring local workers where possible.
- Prohibit informal or speculative hiring ("hiring at the gate").
- Implement a Labour Management Plan and Workers' Code of Conduct and ensure that it is implemented by all contractors and sub-contractors
- Establish monitoring of social impacts;
- Raise awareness among workers regarding local customs, social norms, and appropriate behavior.
- Establish a community' grievance mechanism.

Residual Impacts

No residual impacts.

- **Impact of site security**

Security services will be provided by a licensed security company contracted to safeguard the project site. Security personnel will operate on a shift basis and will be responsible for controlling access to the fenced premises.

The presence of security personnel may result in minor interactions with nearby communities, workers and road users. If not properly managed, inappropriate behavior could potentially result in community concerns. However, the impact is expected to be localized and short-term, with a **SMALL** magnitude

Sensitive receptors include nearby communities, site workers, and road users. Given the limited nature of interactions and the controlled security arrangements, receptor susceptibility is considered **LOW**. Accordingly, the overall significance of the impact is assessed as **MINOR**.

Mitigation Measures

- Ensure security personnel are adequately trained in professional conduct and community relations.
- Require compliance with applicable national laws and human rights principles.
- Implement a grievance mechanism accessible to community members.

Residual Impacts

With the above measures, residual impacts related to site security are expected to be **INSIGNIFICANT**.

• **Construction Traffic**

Construction activities will require periodic transportation of equipment, materials, and personnel to and from the project site using existing road infrastructure, including Tabya–Rasheed Road. Traffic volumes are expected to vary over the construction period but remain limited in scale. Traffic assessment and management will be conducted through the contractor's project-specific Traffic Management Plan based on the final construction/logistics program

The impact is localized and short-term. The magnitude of traffic aspect is assessed as **MEDIUM**.

The susceptibility of receptors (road users) is **MODERATE**. Therefore, the overall significance of traffic impacts during construction is assessed as **MODERATE**.

Mitigation Measures

- Develop and implement a Traffic Management Plan.
- Coordinate material deliveries to avoid peak traffic hours where feasible.
- Ensure safe vehicle operation and speed limits within and near the site.

Residual Impacts

With mitigation measures implemented, residual traffic impacts are expected to be **MINOR**.

E. Occupational health and safety

OHS Risks

Construction activities present typical occupational health and safety risks, these include accidents involving heavy machinery during vegetation clearance, earthworks, and

foundation preparation; crushing and lifting hazards associated with the delivery and installation of prefabricated BESS containers, as well as slips, trips, and falls.

Additional risks include electrical hazards during installation, testing, and commissioning of electrical systems.

These risks are inherent to construction activities and are expected to occur within the project site boundary during the construction period. The impacts are localized, short-term, and of moderate intensity. Accordingly, the overall magnitude of occupational health and safety risk is assessed as **MEDIUM**.

Sensitive receptors include construction workers and on-site personnel. Given that the identified risks are confined to routine construction activities within a controlled work environment, receptor susceptibility is considered **MODERATE**. Therefore, the overall significance of occupational health and safety impacts is assessed as **MODERATE** prior to the implementation of mitigation and control measures.

Mitigation Measures

- Implement the Construction Environmental and Social Management Plan (CESMP), including the occupational Health and Safety (OHS) Management Plan that is to be developed prior commencement of the construction activities .
- Provide appropriate personal protective equipment (PPE).
- Conduct regular safety training and toolbox talks.
- Enforce site speed limits and equipment inspections.
- Prepare and implement approved lifting plans for installation of prefabricated BESS containers.
- Establish exclusion zones during crane and lifting operations.
- Maintain safe access routes and control slip, trip, and fall risks on wet clayey ground.
- Provide shaded rest areas, hydration, and heat stress management measures.
- Restrict access to active work zones and clearly mark excavation and dewatering areas.
- Apply lock-out/tag-out procedures and restrict electrical works to qualified electricians.

Residual Risks

With mitigation measures in place, residual occupational health and safety risks are expected to be **MINOR**.

Workplace Noise

The predominant sources of noise during the construction phase will arise from the operation of construction machinery and equipment, including excavators, loaders, backhoes, cranes, concrete works, and vehicle movement within the site. Noise may also be generated during foundation works and other civil activities associated with the installation of BESS components.

Table 6-2 shows typical noise levels, in decibels, expected at various distances from construction machinery.

Table 6-2: Average Noise Levels from Construction Equipment

Equipment Type	Distance from Noise Source (dBA)
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	10m	50m	100m
Bulldozer	74	60	54
Generator	76	62	56
Backhoe	79	65	59

These noise-generating activities will occur within the BESS project boundary, covering a limited area of approximately 0.06 km², over a short-term duration corresponding to the construction period of the BESS project. The intensity of noise impacts is considered moderate, as noise levels from heavy equipment can be noticeable within the immediate work area but will reduce significantly with distance.

Based on the combination of short-term temporal scale, localized spatial extent, and moderate intensity, the overall magnitude of construction-phase noise impacts is assessed as **SMALL**.

The primary receptors are the on-site construction workforce, whose susceptibility is considered **MODERATE**, given occupational exposure and the availability of protective measures. Accordingly, the significance of construction-phase noise impacts is assessed as **MINOR**.

Mitigation Measures

- Compliance with the requirements of Law 4/1994 regarding the exposure period to different levels of noise, whether continuous or intermittent;
- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Workers shall be provided with adequate PPE (earplugs), and ensuring that workers are always wearing PPE while working near equipment that emit high noise levels.

Residual impacts

With mitigation measures in place, residual noise impacts are expected to be **Insignificant**.

Table 6-3 shows the risk and impact assessment matrix for the construction

Table 6-3: The Impact Assessment Matrix for the Construction Phase

Impacts/Risks		Without Mitigation					Significance of Residual Impacts after Mitigation	
		Temporal scale	Spatial Scale	intensity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor		Significance of Impact before Mitigation
Construction Phase (20 months)								
Air Quality		Short term	Localized	Slight	Small	Low	Insignificant	No residual impact
Ambient Noise		Short term	Localized	Moderate	Small	Low	Insignificant	No residual impact
Soil	spill management	Short term	Localized	Moderate	Small	Moderate	Minor	Insignificant
	Waste generation							
Dewatering Activities		Short term	Localized	Moderate	Small	Moderate	Minor	Insignificant
Biological Environment	Habitat Loss and Modification	Permanent	Localized	Slight	Small	Low	Insignificant	No residual impact
	Disturbance to Wildlife	Short term	Localized	Slight	Small	Low	Minor	Insignificant
	Attraction of Pests and Propagation of Invasive Species	Short term	Localized	Slight	Small	Low	Insignificant	No residual impact
Socio economic	Worker Influx	Short term	Localized	Moderate	Small	Low	Insignificant	No residual impact
	Site security	Short term	Localized	Moderate	Small	Low	Minor	Insignificant
	Traffic	Short term	Localized	Moderate	Medium	Moderate	Moderate	Minor
Occupational Health and Safety	OHS Risks	Short term	Localized	Moderate	Medium	Moderate	Moderate	Minor
	Workplace Noise	Short term	Localized	Moderate	Small	Moderate	Minor	Insignificant

6.3.2 Potential risks and impacts during the Operation Phase

A. Potential risks and impact on the Physical Environment

Potential Impacts on Ambient Noise

During operation, the BESS and step-up substation will generate continuous, low-level operational noise associated with mechanical and electrical equipment. Typical sound power levels for these components are presented in Table 6-4 below.

Table 6-4: Typical Sound Power Levels of Main BESS Operational Noise Sources⁹

Equipment / Source	Typical Sound Power Level, LW (dB)
Power transformers	60–71
Power Conversion System – Inverter (≈3 MVA)	92.6
Cooling equipment for battery container (fans, pumps, chillers)	~73

Noise generation during operation will occur within the fenced BESS project boundary and will be localized, covering the limited project footprint. Operational activities are continuous over the long term, corresponding to the operational life of the facility.

Based on the localized spatial extent, long-term temporal scale, and slight intensity, the overall magnitude of operational noise impacts is assessed as **SMALL**.

Potential ambient noise receptors include surrounding industrial land uses and the nearest residential settlement (*Ezbit-El-Steen) located south of the project site and separated by Tabya-Rasheed Road. Given the distance to residential receptor, the susceptibility of the ambient receptors is considered **LOW**. Accordingly, the significance of operational-phase ambient noise impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

No mitigation measures are required

Residual Impacts

No residual impacts

Potential Impacts on Workplace Noise

Within the project site, operational noise exposure may occur for operation and maintenance personnel during routine inspection and periodic maintenance activities near operating equipment.

Based on the localized spatial extent, long-term temporal scale, and slight intensity, the overall magnitude of operational noise impacts is assessed as **SMALL**.

Given limited number of staff present during operation, and the controlled nature of activities, as the Power Conversion System (PCS/inverters) is remotely monitored and operates automatically mainly during charging and discharging; therefore, the susceptibility of

⁹ Similar BESS in Boa Vista Island, Cabo Verde: CABEOLICA EXPANSION PROJECT – Component 5, Boa Vista Island, Cabo Verde

workplace receptors is considered **Medium**, accordingly, the significance of operational-phase workplace noise impacts is assessed as **MINOR**.

Mitigation Measures

The following mitigation measures will be applied during the operation phase:

- Routine maintenance of cooling systems, transformers, and electrical equipment to ensure proper functioning and minimize noise emissions.
- Use of equipment installed within sound-insulated housings, designed for continuous operation in industrial environments, to reduce operational noise levels.
- Implementation of occupational health and safety procedures, including provision of hearing protection where required during maintenance activities.

Residual Impacts

With the implementation of the above measures, the residual impacts of operation-phase workplace and ambient noise associated with the BESS and step-up substation are expected to be **INSIGNIFICANT**.

Potential Impacts on Soil

During the operation phase, potential impacts on soil are very limited, as all Battery Energy Storage System (BESS) units, cooling systems, and step-up substation components are installed on engineered foundations and concrete bases, which effectively isolate the underlying soil from operational activities.

Based on the localized spatial extent, long-term temporal scale, and Slight intensity of potential soil impacts, the overall magnitude of soil impacts during operation is assessed as **SMALL**.

The susceptibility of the soil receptor is considered **LOW**. Considering the low likelihood of spills and the limited extent of maintenance activities, and the physical isolation provided by engineered foundations, the potential impact on soil remains limited, accordingly, the significance of operational-phase soil impacts is assessed as **MINOR**.

Mitigation Measures

- Implement proper storage and handling procedures for oils, and lubricants.
- Conduct maintenance activities in designated areas.
- Provide spill response materials and train staff in spill management.

Residual Impacts

With the implementation of the above measures, the residual impacts on soil during operation are expected to be **INSIGNIFICANT**.

- ***Solid Waste***

Non-hazardous waste generated during the operation phase will be limited to small quantities associated with routine site activities and the presence of operational staff. This includes domestic waste (e.g. food waste, paper, plastic) from office and control facilities, as well as minor packaging waste from spare parts and consumables used during routine maintenance.

No routine hazardous waste generation is expected during operation of the BESS or step-up substation. Hazardous waste generation is expected to be limited and intermittent, mainly associated with non-routine maintenance activities. Potentially hazardous waste streams may include used absorbent materials, contaminated rags, filters, empty chemical containers, or small quantities of waste oils.

Based on the localized spatial extent, long-term duration, and slight intensity of waste generation during operation, the overall magnitude of waste-related impacts is assessed as **SMALL**.

Considering the industrial setting of the site, the limited quantities involved, and the use of licensed waste management services, the susceptibility of receptors is considered **LOW**.

With the implementation of appropriate waste segregation, storage, and disposal measures in accordance with applicable regulations and Good International Industry Practice, the residual impacts of both hazardous and non-hazardous waste generation during operation are assessed as **INSIGNIFICANT**.

Mitigation Measures

Not required, except for routine maintenance.

Residual Impacts

No residual impacts

B. Risks and Impacts on Biological Environment

- ***Disturbance to wildlife***

Operational noise is the only source of potential impacts on local biodiversity during the Operation Phase. This impact is *slight* in intensity, of long term but highly *localized* within the project footprint. The magnitude is considered **SMALL**. Receptors are considered of Low vulnerability to these impact as they are not confined to project sit and/or its AoI and, therefore, will be unaffected. Accordingly, the overall significance of these impacts is deemed **INSIGNIFICANT**.

Mitigation Measures

Not required, except for routine maintenance.

Residual Impacts

No Residual impact

- ***Attraction of pests and propagation of invasive species***

Domestic and other waste may attract pests (such as insects and rodents), which are potential disease vectors. This impact is *slight* in intensity, of long term and localized to areas of potential improper waste disposal. The magnitude is considered **SMALL** as this is not a continuous and persistent impact. Overall, impact is deemed **INSIGNIFICANT**.

Mitigation Measures

Mitigation measures will mainly include the following:

- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species;
- Ensure proper housekeeping practices; and
- Provide awareness to the workers on the negative impacts of improper solid waste disposal.

Residual Impacts

No residual impacts.

C. Risks and Impacts on Social Environment

Impact of site security

For security measures, the project will assign an annually contracted security company to provide security services for the site premises. Security guards will be stationed on site and will operate on a shift basis to control access and protect project assets and personnel.

Security activities are Localized to the project footprint and will continue throughout the long-term operational period the intensity is considered Slight; therefore, the magnitude of site security impacts is assessed as **SMALL**.

Sensitive receptors include onsite workers and nearby communities. Given the controlled nature of security arrangements and the limited interaction with external receptors, susceptibility is considered **LOW**. Therefore, the overall significance of site security impacts is assessed as **Insignificant**.

Mitigation measures

The security personnel will be adequately trained, have appropriate conduct toward workers and community and to act within the applicable law. Furthermore, a grievance mechanism will be developed to allow the potentially affected community to express concerns about the security arrangements and acts of security personnel .

Residual impacts

No residual impacts

Operation-phase Traffic

During the operational phase, the BESS will be monitored and maintained by a very limited number of personnel, with no regular delivery of materials or heavy vehicle movements expected.

Traffic effects are confined to the study area, comprising the project area and its immediate surroundings, and persist throughout the long-term operational period. Due to the absence of regular vehicle movements and the very low level of traffic activity, the proposed development is not expected to adversely affect the surrounding system or parties; therefore, the impact intensity is considered to have no effect, and the magnitude of operational traffic impacts is assessed as **SMALL**.

Sensitive receptors include onsite workers and nearby communities. Receptor susceptibility is considered **LOW**. Therefore, the overall significance of operational traffic impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

No mitigation measures are required

Residual Impacts

No residual impacts

D. Occupational Health and Safety

Impacts on workplace during operation are primarily associated with electrical hazards and maintenance activities, including inspection or replacement of modules, converters, and transformers etc. However, the probability of replacement of these units is considered as minor due to their expected lifetime.

These aspects are confined to the project site and occur throughout the long-term operational period. The impact intensity is considered Moderate; therefore, the magnitude of operational occupational health and safety impacts is assessed as **Medium**.

Sensitive receptors include operation and maintenance personnel working within the facility. Given the controlled working environment and medium susceptibility of exposed personnel, the overall significance of occupational health and safety impacts during operation is assessed as **Moderate**.

Mitigation measures

- A health and safety policy will be applied;
- Abide by all national occupational health and safety regulations; Labour Law 14/2025; and
- Provision of suitable PPE.

Residual impacts

By implementing the above mitigation measures, the residual impacts are **Minor**.

Table 6-5 shows the impact assessment matrix for the operation phase.

E. Potential Fire and Thermal Runaway Risks

During operation of the BESS facility, there is a potential risk of fire resulting from battery system failure, including thermal runaway events. Thermal runaway refers to a rapid and uncontrolled increase in battery temperature that may result in the release of heat, smoke, and gases, and in extreme cases may lead to fire.

The likelihood of such events is considered low due to the incorporation of battery management systems, continuous monitoring systems, fire detection systems, fire suppression systems, and emergency response procedures as part of the Project design and operation. In addition, the BESS will be designed and operated in accordance with applicable international industry standards and manufacturer requirements.

Potential consequences of a severe BESS failure/thermal-runaway event will be addressed through the detailed BESS safety design and emergency preparedness arrangements. A specific Operational HSSE/Emergency Preparedness and Response Plan will be developed prior to the O&M phase, based on the final BESS technology and OEM requirements

The impact is expected to be localized and limited to emergency situations. The intensity of the impact is considered Slight due to the low likelihood of occurrence and the incorporation of multiple preventive and protective measures. Accordingly, the magnitude of the impact is assessed as **SMALL**.

The sensitivity of nearby receptors is considered **Medium**. Therefore, the significance of the impact is assessed as **MINOR**.

Mitigation Measures

- Implement battery management and monitoring systems.
- Maintain fire detection and suppression systems in accordance with manufacturer requirements.
- Develop and implement emergency preparedness and response procedures.
- Conduct periodic inspection and maintenance of battery systems and associated safety equipment.

Residual Impacts

With implementation of the above mitigation measures, residual impacts are expected to be **INSIGNIFICANT**.

6.3.3 Potential Impacts during decommissioning

The anticipated impacts during the decommissioning phase are similar to the impacts assessed during the construction phase particularly with respect to:

- Soil and surface water, due to potential risks associated with improper handling of waste streams;
- Air quality and noise, resulting from dismantling activities and equipment movement;
- Occupational health and safety, related to electrical isolation, dismantling of equipment, and handling of batteries and substation components.

Decommissioning activities will involve removal of battery containers, electrical equipment, and substation infrastructure, including end-of-life batteries and transformer components, which may generate hazardous and non-hazardous waste streams.

The mitigation measures for the potential impacts during decommissioning are also similar specifically related to proper management and disposal of non-hazardous and the hazardous waste. Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase in particular without the need to reiterate.

Table 6-5: impact assessment matrix for the operation phase

Impacts/Riks		Without Mitigation						Level of Residual Impacts after Mitigation
		Temporal scale	Spatial Scale	intensity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor	Level of Impact Before Mitigation	
Operation Phase								
Work place Noise		Long term	Localized	Slight	Small	Medium	Minor	Insignificant
Ambient Noise		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Soil	Potential spills	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Minor</i>	<i>Insignificant</i>
	Solid waste	<u>Long term</u>	Localized	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Biological Environment	Disturbance to wildlife	<u>Long term</u>	Localized	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
	Attraction of pets and propagation of invasive species	<u>Long term</u>	Localized	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Social Environment	Traffic	<u>Long term</u>	Study Area	No Effect	Small	Low	Insignificant	<i>No residual Impact</i>
	Site Security	<u>Long term</u>	<i>Localized</i>	Slight	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Occupational Health and Safety		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>	<i>Insignificant</i>
Potential Fire and Thermal Runaway Risks		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>	<i>Insignificant</i>

6.4 Risks and Impacts of the Environment on the project

- **Impacts of Climate change**

Alexandria is periodically affected by severe winter weather events (Nawat), characterized by intense rainfall, strong winds, and elevated humidity levels. Although the project site is located approximately 180 m inland from the Mediterranean coastline, direct inundation by seawater during storm events is considered unlikely. However, the project may still be exposed to indirect impacts associated with Nawat, including temporary surface water accumulation due to heavy rainfall, wind-driven rain, salt-laden air, and increased corrosion potential. Considering the project type (BESS) and the proposed engineering design measures, the overall risk posed by extreme weather events to the project is assessed as low to moderate. These risks would be expected to magnified due to climate change effects and will also be taken into account in the project engineering design.

Mitigation measures:

To mitigate these potential impacts, the project design will incorporate appropriate drainage systems, elevated equipment foundations, waterproof and corrosion-resistant enclosures, and adherence to relevant international standards for electrical safety. In addition, routine inspection and maintenance procedures will be implemented to ensure system integrity and operational reliability under adverse weather conditions.

6.5 Cumulative Impacts

The IFC Performance Standard 1 emphasises addressing the cumulative impacts that are generally recognized as important on the basis of scientific concerns and/or concerns from affected communities. The methodology used to assess cumulative impacts is the same utilized to assess negative impacts.

According to the IFC “Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets”, examples of cumulative impacts may include:

- Incremental contribution of gaseous emissions to an airshed;
- Reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed;
- Interference with migratory routes or wildlife movement; or
- More traffic congestion and accidents due to increases in vehicular traffic on community roadways.
- Influx of workers

In this context, it is important to point out that BESS projects generally do not pose environmental adverse impacts during operation activities, and the potential impacts during construction are localized and short term and their residual impacts are insignificant.

7. Stakeholders Engagement

Engagement with the community and stakeholders is an important element in the ESIA process. The current chapter presents the details of the individual consultations carried out during preparation of the ESIA.

The consultation methodology followed for the proposed project complies with both national requirements, as outlined in the ESIA Procedures Guidelines issued by the Egyptian Environmental Affairs Agency (EEAA) in January 2010, and international best practices, particularly the European Bank for Reconstruction and Development (EBRD) Performance Requirement 10: Information Disclosure and Stakeholder Engagement.

In accordance with these guidelines and standards, the consultation process included:

- Early identification of stakeholders during the scoping phase of the ESIA;
- Ongoing consultation throughout the preparation of the ESIA to ensure stakeholder concerns were adequately addressed;
- Transparent information disclosure tailored to the local context, ensuring accessibility and meaningful participation.

7.1 E&S Scoping activities

The stakeholders scoping meetings with different stakeholders categories took place at the E&S scoping phase to support the process of assessing the effects of the different projects' aspects on the environmental and social attributes within the project Area of Influence (AoI) and the determination of the irrelevant impacts (scoped out) and relevant impacts (scoped in) to be further considered in the project's detailed ESIA.

The Project's Area of Influence (AoI), associated infrastructure, the extent of the anticipated impacts, and the areas potentially affected by the induced and cumulative impacts of the Project were considered to identify stakeholders at this scoping stage. Stakeholder groups can broadly be divided into stakeholders who:

- May be directly and/or indirectly affected by the project.
- May have an interest in the project or the areas that may be affected.
- Have the potential to influence project outcomes or operations.

Scoping consultation meetings took place with stakeholders during the period May and June 2026 with the purpose of scoping the ESIA activities and identifying potential additional stakeholders.

The scoping meetings took place via a coordination call with Alexandria Vice Governor Assistant and a physical meeting with Abu Qir Power Plant. Moreover, additional Stakeholders meetings took place during the preparation and finalization of the ESIA with the following stakeholders:

- Public Relations Administration, Local Administration Secretary, and Rural Development Officer
- Neighbouring facilities: Abu Qir Power Plant and PETROJET Facility

- Local Communities: Elstein Village community leader representatives

The meetings aimed to present the project components, clarify the employment procedures, define the required support from the Local Administration, and introduce the grievance channel.

The representative of the neighboring facilities expressed a positive attitude toward the project and confirmed their readiness to support and cooperate in future activities as needed.

The meeting with the nearest neighbouring community to the project, Elstein Village, site during July 2026 was attended by four representatives of community leaders. During the meeting, the E&S Manager represented the project and highlighted its commitment to meaningful community engagement, transparent employment procedures, and prioritizing qualified candidates from neighboring communities where possible. Contact information was also shared to ensure proper communication channels for any future inquiries or grievances.

7.1.1 Key Discussion Points:

All discussions with the stakeholders were conducted in Arabic and all stakeholders had the opportunity to ask questions and express their view regarding the project.

The key message received that stakeholders were supporting the national efforts taken to enhance the infrastructure that would secure the national energy supply to meet the domestic and industrial growing needs. Meeting this growing demand with energy generated from renewable sources was specifically welcome as it cleaner and more reliable. Stakeholders also supported the project as it will provide work opportunities to the community members.

The topics raised during discussions can be summarized as follows:

- Hiring procedures and employment strategy, where the commitment to prioritize local workforce engagement and ensure transparent, inclusive recruitment processes was emphasized. The project's approach to maximizing employment opportunities for residents of neighboring communities was highlighted.
- The project's grievance mechanism and complaint resolution framework where the GRM was presented in detail, establishing a clear pathway for addressing community concerns and worker-related issues throughout the project lifecycle.
- The Vice Governor Assistant demonstrated high potential for cooperation and support. During the call, he requested that the project team prepare a comprehensive proposal containing project recommendations for stakeholder engagement strategies to be formally presented to the Governor for review and endorsement.
- The Vice Governor Assistant promised to arrange and facilitate a physical meeting with the full project team to further discuss, review, and confirm both the hiring procedures and the grievance mechanism, ensuring full alignment and gubernatorial support for project implementation.
- Possible assistance that could be provided by the Abou Qir Power Plant, as they the owner of the land and leased the land to Energy Valley project through usufruct agreement through the West Delta Electricity company.

- Proposed other neighboring stakeholders that need to be considered within the stakeholders engagement plan, including:
 - o Abou Qir Petroleum
 - o Abou Qir Gas (Gasco)
 - o Petrojet

7.2 GRM

Minimizing grievances is realized through managing impacts and through pre-emptive stakeholder engagement designed to anticipate and address potential issues before they become grievances.

A grievance is defined as an issue, concern, problem or claim (perceived or actual) that an individual or community group wants a company or contractor to address and resolve. In alignment with the EBRD ESRs (2019), the Grievance Mechanism (GM) will “seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue of concern¹⁰. The mechanism will also allow for anonymous complaints to be raised and addressed.

The process covers all components and activities of the Project, including those activities undertaken by contractors and subcontractors on behalf of the Project. A detailed Stakeholders engagement plan including details of the GRM has been prepared for the overall Energy Valley project.

Figure 7-1 shows the proposed project's grievance mechanism system.

¹⁰ IFC PS 2012, para. 35 (Grievance Mechanism for Affected Communities)

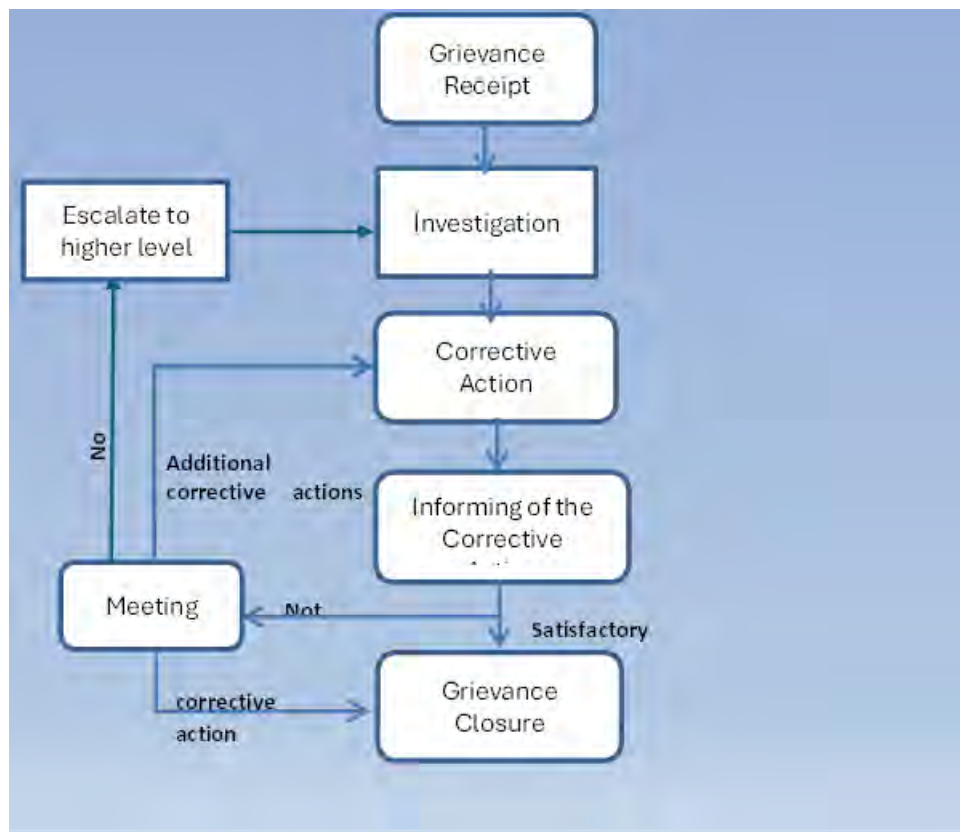


Figure 7-1: Proposed grievance mechanism system

- Grievances can be lodged in writing or verbally, as appropriate.
- Grievances may also be lodged anonymously.
- A Grievance form will be disclosed at key locations as well as on the company website. The Grievance form will inform the communities on how and where to submit a grievance.
- Women will be offered the opportunity to report grievances to and receive feedback from a female representative.
- Grievances may be submitted anonymously through multiple channels. For workers, a grievance box will be installed at the construction site and other designated project locations to allow submission of written complaints. For surrounding communities, grievances may be submitted through the project website and/or other established communication channels to ensure accessible and transparent grievance handling.
- All grievances will be recorded in the grievance register, indicating details of the grievant, status and address of the person, type of stakeholder, the date on which the grievance happened and was recorded, a brief description of the grievance, detail on whether the grievance is a once-off or ongoing / repeated matter, and the outcome that is being sought;
- Grievance investigation will be recorded.
- After the grievance has been resolved, the resolution will be communicated to the grievant. The date on which the matter was resolved and a summary of the resolution will be recorded in the grievance register. Should the complainant still be dissatisfied, the complainant may appeal.
- The GRM will be communicated to all stakeholders.
- All grievances received will be recorded in a Grievance Register and assigned a unique reference number. The register will include details of the complainant (where disclosed),

stakeholder category, date received, nature of the grievance, actions taken, current status, and resolution outcome.

- On a monthly basis, the grievance register will be reviewed to ensure all grievances are captured, and responded to. Implementation of the measures proposed to address the grievance should be checked and the close-out of the grievance monitored.

7.2.1 Grievance Handling Process

The grievance management process will include the following steps:

Step	Responsibility	Timeframe
Receipt and registration of grievance	CLO ¹¹ / Site HSE Officer	Within 2 working days
Acknowledgement of receipt to the complainant	CLO	Within 5 working days
Assessment, investigation, and assignment of responsibility	Contractor and Project E&S Team	Within 10 working days
Development and communication of the proposed resolution	Project E&S Manager	Within 30 calendar days
Implementation of corrective actions	Responsible Department / Contractor	As agreed during the resolution process
Close-out and documentation	Project E&S Team	Following the complainant's acceptance
Appeal and escalation (if required)	Project Management	Within 15 working days of appeal submission

Where a grievance cannot be resolved within the specified timeframe, the complainant will be informed of the reasons for the delay and provided with an updated timeframe for resolution.

If the complainant is not satisfied with the proposed resolution, an appeal may be submitted and reviewed by Project Management. Stakeholders retain the right to seek resolution through available administrative or judicial mechanisms at any stage.

7.2.2 Monitoring

The GRM will be monitored through regular stakeholder engagement meetings. During these meetings, community members will be asked for feedback on the stakeholder engagement program. The indicators that will be used to monitor the implementation of the GRM will include, but not be limited to the following:

- Issues raised by NGOs and other Stakeholders, actions agreed and status of those actions
- Number of grievances received from affected people and from external stakeholders
- Number of community grievances (i) open, (ii) open during more than 30 days, (iii) resolved, (iv) closed, and (v) number of responses that satisfied the complainants, during the reporting period disaggregated by category of grievance, gender, age and location of complainant.
- Categorization of grievances (by topic – e.g. noise/ safety), disaggregated by complainant's gender

¹¹ The Community Liaison Officer (CLO) will serve as the primary focal point for receiving, recording, and communicating grievances.

- Number of grievances raised by workers, disaggregated by gender of workers and worksite
- Number of workers grievances (i) opened, (ii) open during more than 30 days, (iii) resolved, (iv) closed, and (v) number of responses that satisfied the workers, during the reporting period disaggregated by category of grievance, gender, age of workers and worksite.

8. Environmental and Social Management Plan

This ESMP has been developed in accordance with national laws and international standards for the proposed BESS project.

The project's ESMP consists of a set of mitigation and monitoring measures that will be considered during the construction, operation phases and decommissioning to ensure the sound environmental and social performance of the project. The plan also includes the actions needed to be taken to implement these measures.

Decommissioning considerations are integrated into the overall environmental and social management framework, ensuring that potential impacts are minimized throughout the project lifecycle, from initial construction to final site restoration.

The purpose of the project's ESMP is to:

- Ensure continuing compliance with the relevant legislation and laws;
- Outline the ways in which the potential impacts identified in this ESIA report will be managed;
- Provide assurance to regulators and other stakeholders that the local requirements with respect to environmental and social performance are being met;
- Ensure that appropriate monitoring is undertaken, including the establishment of a monitoring plan; and
- Provide a framework for the compliance auditing programs that ensures the efficient environmental and social performance of the Project.

In general, the project's ESMP consists of the following components:

- **Summary of Impacts and Mitigation Measures** as identified in Chapter (6) of the ESIA.
- **Environmental and Social Organizational Arrangements** identify the components of the Environmental and Social Management System (ESMS), as well as the roles and responsibilities for its implementation.
- **Environmental and Social Management Plans** to ensure environmental protection and maintain efficient environmental and social performance and compliance with the relevant legislation, laws and international E&S standards.
- **Environmental Monitoring Plan** during project implementation to provide information of the key environmental aspects of the project.

8.1 Summary of Risks and Impacts, and Mitigation Measures

Table 8-1 below summarizes the social and environmental aspects, mitigation measures, and residual impacts as assessed for the different project phases.

Table 8-1: Summary of the social and Environmental Aspects, Mitigation Measures, and Residual risks and Impacts

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Construction phase			
Air quality			
Exhaust emissions from construction vehicles and mobile equipment operating on-site	Insignificant	- Minimize idling times of construction vehicles and machinery. - Maintain vehicles and construction equipment in good working condition. - Cover trucks that transporting fine or loose materials. - Implement good housekeeping practices across the construction site.	No Residual Impact
Ambient noise			
- Equipment and machinery - Vehicle Movement - Power Generators	Insignificant	- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions. - Use low-noise machinery and equipment where possible. - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels. - Provide hearing protection equipment to workers exposed to high noise levels.	No Residual Impact
Soil			
- Earthworks - excavation activities - management of domestic wastewater - construction waste handling	Minor	- Off-site maintenance to minimize spills and effluents. - Spill prevention measures and on-site spill kits. - Proper collection/disposal of spills via licensed contractors. - Implement Spill Management Plan (within ESMP). - Good housekeeping practices on-site. - Domestic wastewater collected in sealed tanks and off-site disposal. - Solid waste collected at designated points. - Licensed contractors for non-hazardous waste disposal.	Insignificant
Dewatering activities	Minor	- Collect water generated from dewatering activities and transport it to an authorized public wastewater treatment plant for treatment and disposal. - Maintain records of wastewater transportation and disposal.	Insignificant
Biological Environment			
Habitat loss and modification	Insignificant	- Ensure proper housekeeping onsite and offsite to avoid the degradation of surrounding areas; - Avoid offsite areas with vegetation cover to prevent further degradation of surrounding areas;	No residual Impacts.

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		Provide awareness to the workers on the negative impacts of affecting flora and disturbing wild fauna.	
Disturbance to wildlife	Minor	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Provide awareness to the workers on the negative impacts of disturbing wild fauna located offsite; - Ensure proper housekeeping practice; - Ensure the proper maintenance of construction equipment and any other equipment with high noise and vibration potential.	Insignificant
Attraction of pests and propagation of invasive species	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Ensure proper housekeeping practices; and - Provide awareness to the workers on the negative impacts of improper solid waste and wastewater disposal.	No residual Impacts.
Socio Economic Environment			
Worker Influx	Insignificant	- Prioritize hiring local workers where possible. - Prohibit informal or speculative hiring ("hiring at the gate"). - Implement a Labour Management Plan and Workers' Code of Conduct. - Raise awareness among workers regarding local customs, social norms, and appropriate behavior. - Establish a community' grievance mechanism.	No Residual Impact
Site security	Minor	Ensure security personnel are adequately trained in professional conduct and community relations.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Require compliance with applicable national laws and human rights principles. - Implement a grievance mechanism accessible to community members.	
Construction Traffic	Moderate	- Develop and implement a Traffic Management Plan. - Coordinate material deliveries to avoid peak traffic hours where feasible. - Ensure safe vehicle operation and speed limits within and near the site.	Minor
Occupational health and safety			
OHS risks	Moderate	- Implement OHS Management Plan. - Provide appropriate PPE. - Conduct safety training and toolbox talks. - Enforce speed limits and equipment inspections. - Approved lifting plans for BESS installation. - Establish crane/lifting exclusion zones. - Maintain safe access and control slip/trip risks. - Provide shaded rest areas and heat stress measures. - Restrict access to work zones; mark excavations.	Minor
Workplace Noise	Minor	- Comply with Law 4/1994 on noise exposure limits. - Regular maintenance of equipment to reduce noise. - Schedule high-noise activities to avoid overlap. - Provide and enforce use of hearing PPE (earplugs).	Insignificant
Operation phase			
Ambient noise			
- BESS - step-up substation	Insignificant	No mitigation measures are required	No Residual Impact
Workplace noise			
- Operations - routine inspection and periodic maintenance	Minor	- Routine maintenance of cooling systems, transformers, and electrical equipment to ensure proper functioning and reduce noise emissions. - Use of equipment with sound-insulated housings, specifically designed for continuous industrial operation, to lower operational noise levels. - Implementation of occupational health and safety procedures, including provision of hearing protection during maintenance activities.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Soil			
- Potential spills - Solid Waste	Minor	- Implement proper storage and handling procedures for oils, and lubricants. - Conduct maintenance activities in designated areas. - Provide spill response materials and train staff in spill management.	Insignificant
Solid waste	Insignificant	Not required, except for routine maintenance.	No residual impacts
Biological Environment			
Disturbance to wildlife	Insignificant	Not required, except for routine maintenance.	No residual impacts
Attraction of pets and propagation of invasive species	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Ensure proper housekeeping practices; and - Provide awareness to the workers on the negative impacts of improper solid waste disposal.	No residual impacts
Social environment			
Site security	Insignificant	- Trained security personnel with proper conduct toward workers and community, operating within the law. - Grievance mechanism for the community to report concerns about security arrangements and personnel actions.	No residual impacts
Operation-phase Traffic	Insignificant	No mitigation measures are required	No residual impacts
Occupational Health and Safety			
- Electrical hazards - Maintenance activities	Minor	- A health and safety policy will be applied. - Abide by all national occupational health and safety regulations; Labour Law 14/2025. - Provision of suitable PPE.	Insignificant
Potential fire and thermal runaway risks	Minor	- Implement battery management and monitoring systems. - Maintain fire detection and suppression systems in accordance with manufacturer requirements. - Develop and implement emergency preparedness and response procedures. - Conduct periodic inspection and maintenance of battery systems and associated safety equipment.	Insignificant

8.2 Environmental and Social Organizational Arrangements

8.2.1 Environmental and social management system and HSSE responsibilities

Energy Valley has an established Environmental and Social Management System (ESMS) that applies to all Energy Valley employees and projects. The ESMS is aligned with international good practice and incorporates corporate-level environmental and social policies that define Energy Valley's commitments to environmental protection, social responsibility, and risk management. The ESMS provides a structured framework for identifying, assessing, managing, and monitoring potential environmental and social risks and impacts, with the objective of avoiding, minimizing, mitigating, and, where feasible, enhancing positive impacts .

For the BESS Project, Energy Valley will implement the ESMS, according to the nature and scale of the Project, throughout the project lifecycle, including the construction, operation, and decommissioning phases .

During the construction phase, the EPC contractor will be required to establish, implement, and maintain a construction-phase ESMP that is consistent with international Requirements and aligned with Energy Valley's corporate ESMS .

During the operation and maintenance (O&M) phase, Energy Valley will implement and maintain its corporate ESMS, adapted as necessary to address Project-specific risks and impacts. The ESMS will comprise, at a minimum: (i) environmental and social policies; (ii) procedures for the identification and assessment of environmental and social risks and impacts; (iii) management plans and operational controls; (iv) organizational capacity and defined roles and responsibilities; (v) training and competency requirements; (vi) grievance management mechanisms; (vii) emergency preparedness and response; and (viii) monitoring, reporting, and corrective action processes.

International standards require a clear definition of roles and responsibilities for the implementation and oversight of the Project's ESMS. According to the nature and scale of the project, an HSSE supervisor will be appointed for the project.

The HSSE personnel will be responsible for daily safety work (walks-over) at the site, for inspecting safety, housekeeping, personal protection, controlling unsafe practices/conditions, updating the environmental register, and assessing the environmental performance of the facility. When construction and operation work pose a high risk that threatens the workers' safety and health, the HS officer has the right to end the activity in order to prevent a potential hazard. The HSEE Officer will also be responsible for follow-up on compliance with labour issues as part of their role regarding contractors' monitoring and management.

The Project Company will be responsible for preparing, reviewing, and submitting periodic Environmental and Social (E&S) performance reports to the lenders, including the AfDB, in accordance with the applicable financing requirements and agreed reporting arrangements.

8.2.2 Environmental and Social Reporting to Lenders

Energy Valley shall establish and implement a periodic Environmental and Social (E&S) reporting mechanism throughout the construction and operation phases of the Project. The reporting process shall document the implementation status of mitigation measures, environmental and social monitoring results, stakeholder engagement activities, grievance management, occupational health and safety performance, incidents and accidents, corrective actions, and compliance with applicable national requirements and lender standards.

E&S Team of Energy Valley shall be responsible for the preparation of the reports, while the E&S Manager shall review and approve the reports prior to submission.

Periodic E&S performance reports shall be submitted to Lenders (including EBRD, AfDB, EIB, and CDP) in accordance with the reporting requirements specified in the Financing Agreement and applicable AfDB requirements. In addition, any significant environmental, social, health and safety incidents shall be reported to AfDB promptly in accordance with lender notification requirements.

8.2.3 Environmental and Social Policy

An overarching policy will be developed defining the environmental and social (E&S) objectives and principles to achieve a sound E&S performance. The E&S policy may include environmental and social commitments of the project, such as compliance with international protocols or industry-specific codes of practice.

In this context, the outline of the E&S policy requirements is summarized as follows:

- Ensuring that all HS personnel responsible are properly trained and competent to fulfill their respective duties.
- Ensuring the availability of adequate resources and continuous support from top management.
- Communicating E&S policy to all employees and other relevant stakeholders.
- Ensuring the provision of safe working conditions for all employees.
- Evaluating HS risks and taking appropriate action to minimize potential risks.
- Setting up objectives with the aim of reducing and eliminating HS related incidents.
- Ensuring that all labor rights stipulated in Egyptian laws, as well as the ILO requirements and the international PSs are fulfilled for all employees. This, in addition to implementing a grievance mechanism for all workers.
- Ensuring the continuous monitoring and assessment of HS performance, both internally and through third-party external audits/monitoring.

8.2.4 Risk assessment and hazard identification

The Contractor and the Subcontractors performing construction work shall carry out risk assessments prior to the commencement and during the construction works.

The risk assessments shall form part of the HS plan to be implemented on the site and shall include at least:

1. The identification of the risks and hazards to which workers may be exposed;
2. The analysis and evaluation of the risks and hazards identified;
3. A documented plan of safe work procedure to mitigate, reduce, or control the risks and hazards that have been identified;

4. A monitoring plan.

Hazards shall be eliminated when possible and can be minimized through awareness training, engineering controls, the use of personal protective equipment, and/or monitoring devices.

Workers shall be familiar with the risk assessment, use the existing controls and preventive measures while performing the tasks, and provide input to their supervisors to ensure that the risk assessment procedures reflect all hazards identified.

A pre-task risk assessment must be completed prior to the start of any job/task by those involved in the task.

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8.3 Environmental and Social Management Plans (EMPs)

Within its commitment to ensure environmental protection and maintain efficient environmental performance as well as social integrity, the company will develop various environmental and social management plans addressing the different E&S aspects and impacts of the project during its construction, operation and decommissioning phases.

Decommissioning considerations are integrated into the overall E&S management framework, ensuring that potential impacts are minimized throughout the project lifecycle, from initial construction to final site restoration.

In accordance with Law No. 4/1994 and its Executive Regulations, as amended, the Project will be subject to routine and ad hoc environmental inspections by the Egyptian Environmental Affairs Agency (EEAA) and relevant competent authorities to ensure compliance with the environmental permit conditions and applicable national environmental regulations during all project phases.

In this regard, the ESMPs to be developed will address:

8.3.1 EMPs During the Construction Phase

The main objectives of the Construction Environmental and Social Management Plan (CESMP) are to:

- Address environmental, cultural and social issues identified as part of the present ESIA study and any additional issues considered to be important;
- Minimize the residual environmental impacts of construction activities;
- Prepare an achievable environmental management plan for implementation;
- Detail management and monitoring tasks to be completed;
- State the timing for implementation of each task;
- Provide details of reporting requirements;
- Identify roles and responsibilities for ensuring that relevant tasks are completed;
- Provide contingency plans that can be followed in an event of non-compliance or complaint; and
- Detail registers and standards reporting forms for documenting complaints, non-compliances, unplanned exceedances and discharges etc.

For each plan the following structure will be followed:

- Scope and objective of the ESMP.
- Compliance Requirements and regulatory requirements.
- Roles and Responsibilities.
- Communication, training and awareness.
- Record Keeping.
- Monitoring.
- Reporting.

8.3.1.1 OHS Management Plan

A comprehensive OHS Management Plan will be developed and implemented for the construction phase by the Contractor, based on detailed task-specific risk assessments. This plan will be separate from, but aligned with, the Construction Environmental and Social Management Plan (CESMP), which focuses on broader environmental and social mitigation measures.

The OHS Management Plan will provide a structured framework to ensure the health and safety of all workers and will address, inter alia:

- Identification, assessment, and control of construction-related occupational health and safety risks;
- Definition and enforcement of OHS requirements applicable to contractors and subcontractors;
- Workforce health and safety arrangements, including training, supervision, and provision of appropriate PPE;
- Safe management of activities undertaken in close proximity to workers, including the storage, handling, and use of hazardous substances and materials; and
- Emergency preparedness and response procedures for construction-related incidents.

All contractors and subcontractors will be informed of, and required to comply with, the provisions of the OHS Management Plan. The Project HSE Manager will be responsible for overseeing contractor compliance, monitoring OHS performance, and ensuring that construction activities are conducted in a safe and environmentally sound manner. Contractors will also be required to regularly report on OHS performance as part of the periodic construction progress reporting process, enabling continuous monitoring and improvement throughout the construction phase.

8.3.1.2 Air management

- Restrict unnecessary idling of construction vehicles and mobile equipment through site rules and supervision.
- Ensure all construction vehicles and machinery are regularly inspected and maintained in accordance with manufacturers' specifications to minimize exhaust emissions.
- Use well-maintained, low-emission equipment that complies with applicable national air quality and emission standards.
- Cover trucks transporting fine, loose, or friable materials to prevent dust dispersion during transport.
- Implement effective material handling and storage practices, including minimizing drop heights and limiting the size and duration of temporary stockpiles.

- Apply good housekeeping measures across the site, including regular cleaning of work areas and prompt removal of excess materials and waste.
- Limit vehicle speeds within the construction site to reduce dust generation.
- Conduct periodic visual inspections to identify excessive exhaust emissions or dust generation and implement corrective actions as required.

8.3.1.3 Noise Management

- Compliance with the requirements of Law 4/1994 regarding the exposure period to different levels of noise, whether continuous or intermittent.
- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Workers shall be provided with adequate PPE (earplugs), and ensuring that workers are always wearing PPE while working near equipment that emit high noise levels.

8.3.1.4 Solid waste management

Construction waste will be collected in a separate onsite location and periodically disposed of off-site by the contractor and will be safely transported to officially designated sites. Recyclable waste will be reused by the contractor.

Solid waste management will be conducted in accordance with the requirements of laws 4/1994 and 202/2020.

8.3.1.5 Hazardous waste management

The following briefs the management plan concerning hazardous waste (HW) of the proposed project.

HW generation

Potential hazardous waste generated during the construction phase may include solvents, paints, and other chemicals associated with construction activities.

HW segregation and on-site storage

HW will be separated from other types of non-hazardous waste. Proper identification of hazardous waste forms a basis for waste segregation. It is therefore essential that all personnel are familiar with waste identification.

HW will be stored in the storage area in a specifically categorized zone (e.g. labelled HW zone, providing secondary containment where necessary), which would be provided with suitable fire extinguishers and other safety equipment. Furthermore, each HW type will have color-coding and will be labelled with the container's content and the required precaution instructions.

HW disposal

The HW will be transported to a WMRA/EEAA licensed facility, such as El Nassreya HW landfill in Alexandria, via a certified contractor.

8.3.1.6 Spill Prevention Management Plan

The Spill Prevention Management Plan will address spill prevention, preparedness, and response requirements to ensure the safe and effective management of accidental spills, leaks, or releases of fuels, lubricants, and other hazardous substances associated with diesel generators and construction equipment during the construction phase. The Plan aims to prevent spills where possible and, in the event of an incident, to promptly contain and remediate releases in order to minimize adverse environmental impacts and protect workers' health and safety.

8.3.1.7 Wastewater Management

Where temporary dewatering is required during site preparation activities, accumulated water will be collected and transported to an authorized public wastewater treatment plant for treatment and disposal. The Contractor will maintain records of transportation and disposal and ensure compliance with applicable regulatory requirements.

8.3.1.8 Emergency Response Plan

The contractors will have a written Emergency Response Plan to respond to and mitigate any incident to minimize its impact on employees, community, and environment. Employees will be trained on the implementation of the plan and on response activities that could be required in the event of an emergency.

The project company will ensure that the contractors have developed preparedness program to respond to and mitigate any emergency situation to minimize the impact on employees, community, and environment according to national laws and the international EHS guidelines.

The contractor will be committed to the following:

- A knowledgeable, highly trained, and motivated employee group;
- A safety and accident record;
- Preparation and training for emergency response and mitigation measures; and
- Awareness among the workforce through education and training.

In addition, the written emergency plan will be prepared to address the following phases:

- Preparedness: the activities that are communicated for rescuing and minimizing damage.
- Response: the actions necessary to minimize loss of life and property damage and provide emergency assistance.
- Recovery: short- and long-term activities which restore the construction activities and help return it to its normal state.
- Mitigation: the activities that eliminate or reduce the probability of disaster.

8.3.1.9 Chance Find Procedure

As indicated in chapter 4 above, there are no registered antiquities or cultural heritage sites within the project site based on the Egyptian Archeological Map (2022) and the UNESCO World Heritage List of Egypt. However, Although the site is located on previously disturbed land, chance find procedures will be developed to address potential cases of encountering cultural heritage components during the project's construction activities.

The chance find procedure defines the actions to be taken in case of any finds during the construction activity excavations. Such finds could include Non-archaeological/Natural/Cultural Find, Insignificant Chance Finds, Potentially Significant Archaeological Finds or Human remains and/or Burial-related Material.

In general, the Ministry of Tourism and Antiquities (MOTA) has the responsibility for the discovery and exploration of antiquities across Egyptian territory. According to Law No. 117 of 1983, as amended by Law No. 3 of 2010, any person who discovers an unregistered archaeological artifact is obligated to notify the MOTA. The artifact shall be considered state property, and the MOTA must take the necessary measures to preserve it. Within three months, the MOTA must either remove the artifact found on private property or take the necessary procedures to expropriate the land on which it was found, or leave it in place and register it following the provisions of this law.

8.3.1.10 Staff Training and Awareness

Construction workers will be trained and educated according to their respective responsibilities and assigned tasks. A workers' training program will include training on the safe handling of equipment, wastes, and on the use of equipment. Moreover, they will be trained on the safe operation of equipment and spill clean-up. They will also be trained on the use of fire hose reels and fire extinguishers. The training program will also tend to increase workers' awareness of the potential environmental impacts of various construction activities. Awareness will also include issues related to GBVH / SEAH, and measures for reporting such cases need to be established.

The project will undertake an induction program to advise contractors and site visitors of basic health, safety, and emergency procedures, such as emergency signals and evacuation routes. Contractors and vendors on short-term assignments that do not have safety and emergency response training will work under the supervision of the Company staff.

8.3.2 Environmental Management Plans During the Operation Phase

The company will be responsible for the preparation, implementation, and monitoring of the environmental management plan during the operation phase. The management plan will also comply with the world Bank E&S "General Environmental, Health, and Safety Guidelines".

The following shows the minimum set of environmental management procedures that the facility operator will establish and follow.

- **Environmental Register**

During the operation phase, an Environmental Register will be developed for the project activities and the compliance status. The Environmental Register and the Hazardous Materials and Waste Register will be prepared in accordance with the requirements of Annex 3 of the ERs of Law 4/1994 and its amendments, as relevant to the project nature and activities.

- **OHS Management Plan**

During the operation phase, the company will implement an OHS Management Plan to ensure the health and safety of all employees, contractors, and visitors. The plan will be aligned with the international Standards, and applicable national legislation.

The OHS Management Plan will be based on hazard identification and risk assessment for operational activities, including electrical works, routine and non-routine maintenance, waste handling, battery-related hazards (including thermal runaway events), and emergency situations. It will define safe operating procedures, permit-to-work systems where required, and the mandatory use of task-specific PPE.

The plan will also include OHS training and induction, incident and near-miss reporting, emergency preparedness coordination, and periodic inspections to monitor compliance. Overall responsibility for implementation and monitoring will rest with project's designated OHS/HSE Officer.

- **Hazardous Wastes (HW) Management**

Hazardous waste generated from maintenance activities of the proposed project will be collected by an authorized contractor to be disposed of in designated safe disposal sites. HW will be stored in a specific storage area until safe disposal.

HW will be recorded in the hazardous wastes register in accordance with the legal requirements stipulated in Article 33 of the Environment Law 4/1994.

- **Solid Wastes Management**

solid waste generation will be limited and mainly associated with routine site activities. This includes small quantities of domestic waste generated by operational staff, as well as packaging waste such as cardboard, plastic wrapping, and wooden pallets arising from the delivery of spare parts and routine maintenance materials.

- **Preventive and corrective maintenance**

The main objective of maintenance is to maximize the utilization of the equipment in its proper operating conditions.

Planned maintenance

Maintenance will be carried out in accordance with:

- Equipment manufacturers' suggested requirements.
- Scheduled inspections according to good maintenance practices.
- Maintenance programs and procedures developed by the company.

Preventive Maintenance

The preventive maintenance guidelines are based on:

- A general maintenance plan according to which all maintenance activities are scheduled.
- Regular visual inspections will be conducted for the BESS modules, transformer switchgear, the electric system, the monitoring system, and the security system to detect existing and potential defects. It is particularly important to inspect all plant equipment exposed to the weather.

Corrective Maintenance Plan and Response Times

Preventive maintenance reduces the frequency of breakdowns but cannot avoid them. Unplanned maintenance involves corrective maintenance and emergency repairs resulting from equipment problems, required as a result of equipment breakdowns or deficiencies. Once a problem occurs, the plant maintenance staff is trained enough to carry out the repairs

in a quick response time to return to normal operation levels. Corrective maintenance may involve the participation of specialized maintenance contractors.

- **Spill Prevention Management Plan**

The plan will address the spill prevention, preparedness, and response requirements to support the safe response to accidental spills, leaks, or releases of both hazardous and non-hazardous materials to the environment to eliminate or minimize the adverse effects should a spill occur and to protect the health and safety of employees.

- **Training and Capacity Building**

To ensure the competence of the project's employees in undertaking the environmental management procedures and plans, training will be delivered by the HSSE supervisor to the maintenance personnel according to their particular responsibilities.

A workers' training program will cover key thematic areas such as occupational health and safety (OHS), safe handling of equipment and material, waste management, emergency preparedness and response, fire safety (including the use of fire hose reels and fire extinguishers), and environmental awareness related to project operations. Workers will also be informed of potential health and safety risks associated with project activities.

Moreover, Training plans will include the following minimum requirements::

- Ensure that all visitors and site personnel undergo a site-specific HSE Induction training session; and
- Ensure that all records of attendance are kept on file.
- Ensure that all visitors and personnel are issued with an access card as proof of site induction.
- Provide a list of site-specific hazards identified.
- Ensure that Sub-Contractors will conduct their own task-specific risk assessments and keep records in the Health and Safety file.

- **Emergency response plans**

Identify specific risks

The identification of risks includes potential risks related to equipment, devices, materials, buildings, and operation procedures. Risk identification is carried out to estimate the type, quantity, and magnitude of risks that could induce fire, personnel fatality, or building collapse. The Project also includes a utility-scale Battery Energy Storage System (BESS). Under abnormal operating conditions, lithium-ion batteries may experience thermal runaway, which could result in localized fire events and the release of smoke and combustion gases. However, such events are expected to be rare due to the incorporation of battery management systems, thermal monitoring systems, fire detection and suppression systems, and compliance with recognized international standards for battery system safety and fire protection. Thermal runaway is therefore considered a potential operational risk requiring specific emergency preparedness and response measures rather than a routine source of GHG emissions.

These risks include the following:

- Activities that may pose risks to the workers.
- Quantities and types of hazardous materials/waste used or stored.
- Potential failure of the safety measures and procedures, including battery-related incidents such as thermal runaway events, fire, smoke generation, and the release of hazardous gases.

Preparedness

Identify human, administrative, and organizational resources, as well as equipment and sites needed to combat risks. The following activities will be carried out:

- Identify the required training for staff and implementation schedule;
- Identify the essential tools/procedures for the protection of individuals and groups, and also determine the requirements for rescue and medical treatment;
- Prepare maps and detailed plans that include gathering points and escape routes, and evacuation plans in case of emergency, and determine the timeline for implementation;
- Identify the affected parties and stakeholders, provide the emergency support and services, and determine the type of assistance needed; and
- Determine fire prevention and control requirements.

Implementation

The plan should include the level of implementation carried out by individuals or groups according to the following steps:

Warning and alarm plan

The selected warning method should be effective in terms of communicating the warning message to all employees of the site and making sure that they are aware of the nature of the risk and provide them with the opportunity to confront or escape from it. The alarm must be visible and audible to reach all employees on the site.

Response

Responses are carried out according to the type, rate of spread, damages and consequences of the hazard through trained personnel, either directly or manually, using smart devices or through offsite control.

Medical assistance and services

A communication line for access to ambulances shall be available to provide medical care for the potential injured workers and transfer them immediately to hospitals, if needed.

Documentation

A record/report including time, duration of implementation, cost, expenditure, efficiency, effectiveness, and responsible personnel of each of the above measures shall be maintained. The company will develop a reporting system for accidents, including injuries, damage to property, and environmental damage. The information and records mentioned will be used to improve response procedures and to decrease and control potential hazards. General information to be recorded is as follows:

- Date, place of incident or emergency;
- The affected individual or groups;
- Description of the situation and conditions surrounding the site;
- Identify and assess the magnitude of injury, loss, damage or pollution;
- Actions taken to reduce the severity and degree of the situation; and
- Record the treatment or cleaning procedures that have been carried out.

Follow-up procedures

Once the hazard is managed, a throughout survey of the affected site must be carried out to ensure that the hazard is eliminated, and that the situation is restored to its original state.

Follow-up procedures include the following:

- Identify the causes of the emergency.
- Assess the efficiency of emergency response procedures;
- Propose corrective action and remedial measures necessary to prevent recurrence of such incidents; and
- Identify the level of need to implement any treatment and/or monitor procedures to restore the site to its original state;

Update the emergency response plan and staff training program

The emergency plan will be updated every year or at the event that needs improvement of the plan and the staff training program.

8.3.3 Social Management Plan During Construction and Operation Phases

a. Labour and Working Conditions

Recruitment procedures for the Energy Valley project will be implemented by contractors in accordance with principles of equal opportunity, transparency, and non-discrimination, promoting local employment and female inclusion where feasible. During Construction, the Project will ensure that contractors apply appropriate occupational health and safety measures and fully prohibit forced, compulsory, and child labour during construction. During operation, labour and workplace health and safety practices will comply with Egyptian Labour Law No. 14/2025 and relevant international occupational health and safety guidelines.

b. Site Security Management

Site security during the construction phase will be provided by a licensed contractor-appointed security company under the supervision of the Energy Valley, while responsibility during operation will rest with Energy Valley through an annually contracted licensed security provider. Security personnel will control access to the fenced premises and operate on a shift basis. Although interactions with workers, nearby communities, and road users are expected to be limited and localized, inappropriate conduct could create community concerns if not properly managed. Accordingly, all security personnel will receive training on professional conduct, community relations, applicable national laws, and relevant human rights principles consistent with GIIP.

c. Ongoing Consultation

Scatec has already undertaken various activities to communicate and engage with key stakeholders and is willing to continue its engagement activities.

As part of their CSR commitment, Scatec has an ongoing CSR programme that aims at supporting the community with specific focus on vulnerable groups.

d. Information Disclosure

Information regarding the Project shall be publicly available on an ongoing basis and updated semi-annually at a minimum. Information will be at an appropriate level of details and presented in an accessible mean (e.g., in Arabic with infographics used where beneficial).

This information is expected to include, but not be limited to, project progress updates; proposed future engagement and grievance mechanism; information about project activities; key contacts for the project; and other information, as needed.

e. Grievance Management

Minimizing grievances is realized through managing impacts and through pre-emptive stakeholder engagement designed to anticipate and address potential issues before they become grievances. The Procedures in details described in Section 8 .

8.3.4 Project Decommissioning Plans

Decommissioning is defined as the close down of operations, the removal of process equipment, buildings, and structures, and the carrying out of site cleanup and remediation, if required. The expected lifetime of the project ranges between 25 to 30 years, which will be renewable as long as the proper predictive maintenance measures are taken, and all the necessary revamps and upgrades are done.

Prior to commencement of decommissioning activities, Energy Valley will prepare and implement a detailed Decommissioning Plan in accordance with applicable Egyptian regulations, lender requirements, equipment supplier recommendations, and Good International Industry Practice (GIIP). The Decommissioning Plan will define the decommissioning methodology, health and safety requirements, waste management procedures, recycling and disposal arrangements, transportation requirements, and site restoration measures applicable at the time of decommissioning.

The following are the main issues addressed by the facility's decommissioning plan:

- Development of the decommissioning plan according to international and best practices guidelines.
- Removal procedures for all above-ground structures, equipment, and infrastructure associated with the BESS facility.
- Disassemble of project components, including battery containers, electrical equipment, and auxiliary systems.
- Reuse and recycled (where possible) or disposed of in accordance with regulatory requirements.
- Final site clean-up to ensure that no residual contamination or safety hazard remains.

8.3.5 Summary of ESMP

Below provides a comprehensive overview of the project management plan, including potential environmental aspects identified in the ESIA for both the construction and operation phases of the project, as well as the proposed mitigation measures designed to minimize these impacts.

Table 8-2: Overview of ESMP Plans During Construction

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Construction Phase						
Ambient Air Quality	Dust emissions and gaseous pollutants from construction activities and vehicle machinery.	- Restrict unnecessary idling of vehicles and equipment. - Maintain construction machinery and vehicles in good working condition. - Cover trucks transporting friable materials. - Apply speed restrictions and good housekeeping measures - Conduct regular ambient air quality monitoring (PM10, PM2.5, NO2, SO2, CO)	Construction contractor	- Ambient air quality monitoring reports - Maintenance logs	10,000 – 25,000/ year	Throughout the construction phase period
Noise	Noise generated from construction equipment and vehicles	- Maintain equipment regularly. - Schedule high-noise activities appropriately. - Provide workers with suitable hearing protection.	Construction contractor	Compliance with applicable noise limits; PPE usage Noise measurements and Maintenance logs	10,000 – 5,000 / year	Throughout the construction phase period
	Provision of PPEs	- Providing necessary PPE for workers	Construction contractor		20,000 – 10,000 (PPE supply - total project period)	
Soil	Soil disturbance and potential contamination	- Implement Spill Prevention Management Plan. - Maintain good housekeeping practices. - Store fuels and chemicals appropriately. - Collect and dispose of contaminated materials through licensed contractors.	Construction contractor Energy Valley (include provisions in the construction contracts. Energy Valley s to ensure contractors' compliance)	- Waste management plans - Solid/hazardous waste - No significant spills; contract - Contractor follow-up documents - Contracts with authorized waste contractors	6,000 – 20,000 (depends on waste volume)	Throughout the construction phase period

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Construction Phase						
Surface Water and Dewatering	Dewatering activities and wastewater management	- Collect dewatering water and transport it to an authorized public wastewater treatment plant. - Prevent uncontrolled discharge to surrounding receptors.		Records of wastewater collection and disposal	5,000 – 15,000	
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing OHS plan and HSE procedures according to national requirements and international standards	Contractor	OHS plan and procedures HSE provisions in the construction contracts	20,000 – 40,000	Before construction activities
Emergency Response plans	Site Staff and Workplace Safety	- Develop procedures for emergency control	Contractor	Emergency response plan	10,000 – 25,000	Before project commissioning
Waste management	Worker's health	- Developing a solid and hazardous waste management plans in line with the WBG General EHS Guidelines." - Developing OHS plans - Different types of waste to be stored in designated waste areas, and transported by licensed contractors	Construction contractor	Solid waste management contract with authorized contractors Waste manifest OHS plan	10,000 – 30,000	Throughout the construction phase period
Social Environment	Workers Influx Management	- Prioritize hiring local workers from nearby communities . - Implement and maintain a community grievance mechanism to address any concerns related to the workforce; - Develop HR policies including Code of Conduct, GBV and SEAH plans	Energy Valley /Construction contractors	– Workforce demographic reports (showing number and % of local vs. non-local workers). – Records of workers' places of origin and commuting status. – Labour management plan, - Community grievance logs and resolution record	15,000 – 40,000/ year	Throughout the construction phase period

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Construction Phase							
		Community health, safety and security Risks from road traffic accidents, increased traffic volume,	- Develop and implement Traffic Management Plan (TMP) and associated procedures. - Designate specific transport routes to avoid sensitive areas. - Conduct defensive driving and TMP safety training for all drivers.	Construction contractors	- Traffic Management Plan (TMP). - Traffic safety logs (records of accidents and near-misses). - Driver training records and vehicle inspection checklists. - Community grievance logs related to traffic issues.	10,000 – 25,000	Throughout the construction phase period
		Cultural heritage	- develop chance find procedure	Energy Valley /Construction contractors	- Developed procedures	2,000 – 5,000	Before construction activities
		Stakeholder Engagement and Grievance Management	- Implement the overall Energy Valley SEP - Conduct regular consultation meetings. - Maintain an accessible Grievance Redress Mechanism (GRM) for both communities and workers to receive, track, and resolve concerns.	Energy Valley / Construction Contractor	- SEP Implementation Reports including: - Number of engagement activities conducted. - Total number of stakeholders engaged. - Gender-disaggregated data (number of men and women participants). - Grievance Logs and resolution records - Information disclosure records	10,000 – 20,000 / year	Throughout the construction phase period
Total Estimated Cost	(USD)		-			≈ 110,000 – 270,000 USD	
	(EGP)					≈ 5,500,000 – 13,500,000 EGP	

Table 8-3: Overview of ESMP Plans During Operation

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
Operation Phase						
Noise	Transformers and cooling equipment	- Provide workers at noise generating machinery and equipment will be provided with suitable (PPEs). - Maintain equipment is good operation conditions - A grievance mechanism will be adopted for assessing complaints,	Project Company	Noise measurements	5,000 – 10,000	Periodically throughout the operation stage
Hazard waste management	Hazard waste generated from maintenance activities	- Store hazardous waste in designated areas. - Dispose of hazardous waste through licensed contractors.	Project Company	Hazard waste register, waste manifest	5,000 – 10,000 USD/year	Periodically throughout the operation stage
Spill Prevention	Accidental releases of oils and hazard materials	- Implement Spill Prevention Management Plan. - Maintain spill response equipment and procedures.	Project Company	Number of spills and corrective actions implemented	2,000 – 5,000 USD/year	Periodically throughout the operation stage
Labour rights and welfare	working conditions	Develop Human Resources policy	Project Company	Contracts (with workers)	Included in OPEX (negligible direct ESMP cost)	Throughout the project lifetime
Training and Awareness	competence of the project personnel	training for the personnel according to their responsibilities	Project Company	Training plans	5,000 – 10,000/ year	Throughout the project lifetime
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing HSE procedures - Implement OHS Management Plan. - Conduct periodic training and refresher programs. - Maintain incident reporting procedures	Project Company	Development of HSE policies OHS inspections and audits	8,000 – 15,000/ year	Throughout the project lifetime
Emergency Preparedness and Response; and Fire and Thermal Runway	Operational risk management	- Adopt a probabilistic risk assessment framework - Implement battery safety procedures.	Project Company	Emergency response plan	3,000 – 10,000/ year	Throughout the project lifetime

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
			- Maintain fire detection and suppression systems. - Conduct emergency drills and response training				
Stakeholder Engagement and Grievance Management		- Stakeholder concerns, complaints and grievances	- Maintain the project grievance mechanism - Periodically review grievances trends and response	Project Company	- Number of grievances received, resolved and pending; response times	10,000 – 20,000/ year	Throughout the project lifetime
Total Estimated Cost	(USD)					≈ 38,000 – 80,000 USD / year	
	(EGP)					≈ 1,900,000 – 4,000,000 EGP / year	

Table 8-4: Overview of ESMP Plans During Decommissioning

Aspect	Issues of Concern	Actions	Party Implementing the Action	Indicator of Completion	Estimated Cost (USD)	Required Completion Date
Decommissioning Planning	Inadequate planning and coordination	Prepare and implement a Decommissioning Plan in accordance with Egyptian regulations, lender requirements, and GIIP.	(EETC/Energy Valley)	Approved Decommissioning Plan	10,000 – 20,000	Prior to decommissioning
Ambient Air Quality	Dust and air emissions from dismantling and demolition	Apply dust suppression measures and follow approved dismantling procedures.	Decommissioning Contractor	No significant dust complaints; monitoring records	5,000 – 10,000	Throughout decommissioning
Noise	Noise from demolition and equipment removal	Limit noisy activities, maintain equipment in a good working conditions , and provide PPE where required.	Decommissioning Contractor	Compliance with applicable noise requirements	3,000 – 8,000	Throughout decommissioning
Waste Management	Generation of hazardous and non-hazardous waste	Segregate, reuse/recycle where feasible, and dispose of wastes through licensed facilities.	Decommissioning Contractor	-Solid/hazardous waste and wastewater management contract -Contractor follow-up documents Contracts with authorized waste contractors	20,000 – 60,000 (depends largely on hazardous waste quantities and disposal requirements)	Throughout decommissioning
Occupational Health and Safety	Worker injuries during dismantling and demolition	Implement OHS procedures, provide PPE, training, and emergency preparedness.	Decommissioning Contractor	No major incidents; OHS inspection records	15,000 – 35,000	Throughout decommissioning
Site Restoration	Residual contamination and disturbed land	Remove remaining structures, clean up the site, remediate if required, and restore the site where feasible.	Decommissioning Contractor / Project Proponent	Site restoration completed and approved	20,000 – 50,000 (excluding major demolition or remediation works if required)	Before project closure
Monitoring and Reporting	Non-compliance with environmental and social requirements	Conduct regular inspections, monitoring, and reporting to verify implementation of the Decommissioning Plan.	Energy Valley / Supervising Engineer	Monitoring reports and close-out report	8,000 – 20,000	Throughout decommissioning and prior to project closure

8.4 Environmental and Social Monitoring Plan

Environmental and Social (E&S) monitoring will be undertaken throughout the construction and operation phases to verify compliance with applicable environmental and social requirements, assess the effectiveness of mitigation measures, and support the continual improvement of Project performance. Monitoring activities will cover environmental, occupational health and safety, labour and working conditions, emergency preparedness and response, stakeholder engagement, grievance management, and other relevant environmental and social aspects identified in this ESIA.

Monitoring results and the implementation status of the ESMP will be documented and incorporated into periodic Environmental and Social (E&S) reports. These reports will be prepared by the Project Company's HSSE team, reviewed by Project Management, and submitted to the lenders, including the AfDB, in accordance with the agreed reporting arrangements and reporting frequency. The reports will include, as applicable, monitoring results, implementation status of mitigation measures, incidents and accidents, grievances received and resolved, stakeholder engagement activities, corrective actions, and compliance status with applicable environmental and social requirements.

In accordance with Law No. 4/1994 and its Executive Regulations, the Project Company will maintain the environmental registers required under Egyptian legislation and update them periodically throughout the operational phase. In addition, a detailed monitoring programme will be developed prior to the commencement of operation and updated, as necessary, based on monitoring results, operational experience, and any changes to Project activities or applicable requirements.

The Project Company will also monitor and maintain records of worker and stakeholder grievances, including response times, corrective actions, and resolution status, as well as key occupational health and safety indicators, emergency preparedness and response performance, and stakeholder engagement activities.

In addition to routine monitoring activities, an annual independent Environmental and Social Performance Audit will be undertaken by a qualified external consultant or auditing firm. The audit will assess compliance with applicable legal requirements, lender requirements, ESMP commitments, and the effectiveness of the implemented mitigation measures and management systems. Audit findings and corrective actions will be tracked and incorporated into the Project's environmental and social management processes, as appropriate.

The following Table 8-4 provides the proposed Environmental and Social Monitoring Plan for the construction and operation phases

Table 8-4: Environmental Monitoring Plan

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Construction phase								
Workplace	Noise measurements	Project site	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD ESR4; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	All contractors and subcontractors, supervised by Energy valley	Third party (research entity or certified lab)	~10,000 EGP
	Ambient Air Quality and Dust	Project boundary	Compliance with air emission standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD ESR3; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	All contractors and subcontractors, supervised by Energy valley	Third party (research entity or certified lab)	~ 35,000 EGP
	Spills	Fuel, oil and chemicals storage areas	Number of spill incidents, response actions and corrective measures	EHS Guidelines	Monthly and after incident	All contractors and subcontractors, supervised by Energy valley	contractors' EHS personnel	Included in salaries
	Waste management	Project site and waste storage areas	Proper management of the different types of waste	Waste Management Law No. 202/2020; Law No. 4/1994; IFC PS3; EBRD ESR3; AfDB OS4; EIB ESS3	Monthly	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contractors EHS personnel	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)
	Wastewater management	Dewatering collection and storage location	Records of wastewater collection and disposal through authorized facilities		Throughout dewatering activities	All contractors and sub-contractors, supervised by Energy Valley company	contractor under Energy Valley Company supervision	10,000–30,000 USD

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Social management	Workers influx	Project site	- Number of community grievance - Percentage and number of local vs. non-local workers - Records of workers' places of origin and commuting status.	Egyptian Labour Law No. 14/2025; IFC PS2; EBRD ESR2; AfDB OS5; EIB ESS8	Regular	All contractors and sub-contractors, supervised by the Energy Valley company	Energy Valley Company and contractors' EHS personnel	USD 2,000–5,000/year
	Traffic management	Project site and Vicinity (Aol)	- No road accidents - Grievances related to traffic - Driver training records; vehicle inspection checklists; compliance with designated routes and speed limits".			Traffic management	Project site and Vicinity (Aol)	-
Stakeholders and nearby receptors	Stakeholder engagement and grievances monitoring	Project site	- Number of stakeholders engagement activities by category - Grievances received, resolved and pending response time - Gender-disaggregated data (tracking number of men and women engaged).	IFC PS1; EBRD ESR10; AfDB OS10	Ongoing	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contractors EHS/HR personnel	Included in salaries

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
workers	OHS	Construction site	Number of incidents , near misses, RIRs, training records	Labour law 14/2025; IFC/WBG EHS Guidelines; EBRD ESR2; AfDB OS2	Monthly	All contractors and sub-contractors, supervised by Energy Valley company	contactors EHS/HR personnel	Included in salaries
Operation phase								
Workplace	Noise measurements	Site boundary and near major noise-generation equipment's	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD ESR4; AfDB OS4; EIB ESS3	Annually	Energy Valley company	Third party (research entity or certified lab)	~10,000 EGP
workers	OHS	Project site	Number of incidents , near misses, RIRs, training records	Labour law 14/2025; IFC/WBG EHS Guidelines; EBRD ESR2; AfDB OS2	Monthly	Energy Valley company	HSSE personnel	Included in salaries
Emergency and BESS operation	Emergency preparedness and response monitoring	Project site	Emergency drills conducted, emergency response readiness, incidents and corrective actions	IFC/WBG EHS Guidelines; EBRDES4; AfDB OS4	Annually and following emergency events	Energy Valley company	HSSE personnel	Included in salaries
Stakeholders and nearby receptors	GM monitoring	AOI	– Grievance management plan developed for internal and external grievances. – Compliance with EBRD good practice for GBV and SEAH grievances.	IFC PS1; EBRD ESR10; AfDBOS10	Quarterly	Energy Valley company	HSSE personnel	Included in salaries

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
	Stakeholder engagement monitoring	AOI	- Publicly available information. - Semi-annual updates provided. - Information in Arabic with infographics where beneficial.	IFC PS1; EBRD ESR10; AfDB OS10	Annual	Energy Valley company	HSSE personnel	Included in salaries
Overall Project E&S Performance	Independent Environmental and Social Performance Audit	Project site and associated facilities	- Compliance with ESMP commitments. - ESMS requirements. - lender requirements. - corrective actions. - stakeholder engagement. - Grievance management. - OHS performance. - incident management and applicable legal requirements	AfDB Integrated Safeguards System (ISS); AfDB OSs; IFC Performance Standards; EBRD ESRs; Applicable National Legislation	Annually	Energy Valley company	Independent external E&S consultant/auditing firm	USD 10,000–20,000 per audit
Decommissioning								
Air quality (dust from demolition and dismantling)	Visual inspections and dust monitoring (if required)	Active decommissioning areas, access roads, nearby sensitive receptors	No excessive dust emissions or dust-related complaints; implementation of dust suppression measures	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD ESR3; AfDB OS4; EIB ESS3	Weekly and following complaints	Energy Valley	Decommissioning Contractor	2,000–5,000
Noise from dismantling activities	Noise monitoring and site inspections	Site boundary and nearest sensitive receptors (where applicable)	Compliance with applicable noise limits; no justified complaints	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD ESR3; AfDB OS4; EIB ESS3	Monthly and following complaints	Energy Valley	Qualified Environmental Consultant / Contractor	2,000–5,000

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Hazardous and non-hazardous waste	Waste management inspections and documentation review	Waste storage areas and disposal/recycling facilities	– Proper segregation, storage, transport, recycling, and disposal; waste manifests maintained	Waste Management Law No. 202/2020; Law No. 4/1994; IFC PS3; EBRD ESR3; AfDB OS4; EIB ESS3	Weekly	Energy Valley	Decommissioning Contractor	3,000–8,000
Soil contamination from waste, fuels, oils, or transformer components	Site inspections and spill monitoring	Fuel storage areas, dismantling areas, transformer removal locations	– No evidence of spills or contamination; spill response records available	Law No. 4/1994 and law 202/2020 / IFC/WBG General EHS Guidelines; EBRD ESR3; AfDB OS4; EIB ESS3	Weekly and after any spill	Energy Valley	Decommissioning Contractor	2,000–5,000
Occupational Health and Safety (OHS)	OHS inspections and incident reporting	Entire project site	– PPE compliance; work permits; training records; number of incidents/LTIs	Egyptian Labour Law No. 14/2025; IFC PS2; IFC PS4; EBRD ESR2 & ESR4; AfDB OS5; EIB ESS9	Daily inspections; monthly reporting	Energy Valley	Decommissioning Contractor	Included in contractor's HSE budget
Community Health and Safety	Inspection of traffic management, access control, and public safety measures	Site entrances, access roads, surrounding communities	– No unauthorized access; effective traffic management; no community incidents	IFC PS4; EBRD ESR4; AfDB OS4; EIB ESS9	Weekly	Energy Valley	Decommissioning Contractor	Included in contractor's ESMP implementation
Site restoration	Visual inspection and site verification	Entire project footprint	– Removal of infrastructure completed; site restored; no residual contamination or safety hazards	Law 4/1994 and Waste Management law 202/2020; IFC/WBG General	Upon completion of decommissioning and before site handover	Energy Valley	Decommissioning Contractor	5,000–10,000 (final inspection and verification, including any sampling if required)

Receptors / Source of impact/risk		Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
					EHS Guidelines; AfDB ISS; EIB ESS3				
Consolidated Estimated Annual Environmental and Social Monitoring Budget									
		Construction Phase		Decommissioning		Operation Phase			
Estimated Total Annual Cost*	(USD)	≈ USD 15,000–35,000				Approx. ≈ USD 10,000–20,000			
	(EGP)	Approx. ≈ EGP 750,000–1,750,000				Approx. ≈ EGP 500,000–1,000,000			

*The above costs are indicative estimates intended to provide an order-of-magnitude assessment of environmental and social monitoring expenditures at the current stage of project development.

9. Conclusion

The Energy Valley Battery Storage Project represents a strategic contribution to Egypt's national objectives for energy diversification, security of supply, and increased penetration of renewable energy resources, thereby reducing reliance on imported fossil fuels. In this context, the No-Project Alternative is not considered a viable option, as it would forego significant environmental and socio-economic benefits associated with the development.

The Environmental and Social Impact Assessment has identified and evaluated the potential environmental and social impacts associated with the Project across its construction, operation, and decommissioning phases. Appropriate mitigation and management measures have been defined in line with national legislation and applicable international standards to ensure that these impacts are effectively avoided, minimized, or controlled.

To ensure environmental and social sustainability during construction, the Project will implement comprehensive mitigation measures, including dust and noise control, waste and wastewater management, spill prevention, traffic management, occupational health and safety procedures, biodiversity protection, and labour and community management through stakeholder engagement and grievance mechanisms.

Operational risks will be mitigated through the implementation of OHS procedures, battery safety measures, continuous fire detection and suppression systems, emergency preparedness and response arrangements, spill prevention measures, and proper hazardous waste management. Social performance is supported through the implementation of a Human Resources Policy, personnel training and awareness programs, and a transparent stakeholder engagement and grievance mechanism to address concerns and complaints throughout project operation.

To support the effective implementation of all Environmental and Social (E&S) mitigation, monitoring, management, and reporting measures identified in the Environmental and Social Management Plan (ESMP), the Project has allocated adequate financial resources. The estimated ESMP implementation budget is approximately USD 175,000 during the construction phase and approximately USD 60,000 per year during the operation phase, covering environmental monitoring, occupational health and safety, waste management, biodiversity conservation, stakeholder engagement, emergency preparedness, training, and other environmental and social management requirements.

With the implementation of the proposed Environmental and Social Management Plans (ESMPs), monitoring frameworks, and mitigation measures, the residual impacts are expected to remain within acceptable limits.

The Project is therefore considered environmentally and socially feasible, provided that all ESIA commitments are fully implemented and continuously monitored throughout its lifecycle.

10. References

- Baha El Din, S. (2006) A Guide to the Reptiles and Amphibians of Egypt. Oxford University Press.
- Benda, Petr; Lučan, Radek; M. Shohdi, Wael; Porteš, Michal and Horacek, Ivan. (2015) Microbats of the Western Oases of Egypt, Libyan Desert. *Vespertilio*. 17. 45–58
- BirdLife International (2023) Important Bird Area factsheet: Ain Sukhna.
- BirdLife International (2023) Migratory Soaring Birds Project Solar Energy Guidance v.1 for Energy Valley s and consultants.
- Bubenzer, O., Embabi, N. S., & Ashour, M. M. (2020). Sand Seas and dune fields of Egypt. *Geosciences*, 10(3), 101 <https://doi.org/10.3390/geosciences10030101>
- CAPMAS, 2020. Statistical Yearbook - Geography & Climate. Central Agency for Public Mobilization and Statistics.
- CAPMAS (2016a) Annual Bulletin of Births & Deaths of 2016
- CAPMAS (2016b) Annual Bulletin for labor force research of 2016
- CAPMAS (2016c) Bulletin: Drinking water and drainage statistics 2015/2016
- EEAA (2003) Habitat Diversity Egypt. Publications of the National Biodiversity Unit, 1, EEAA, Cairo: 302 pp.
- Egyptian Ministry of Planning and Economic Development <https://mped.gov.eg/>
- Egyptian State Information Services <https://sis.gov.eg/en>
- El-Sharif et al. (2009) *Economic Potentialities Achieve Self-Sufficiency from Egyptian Sugar under the International Variables*
- Environics (2023). Sand Storms Frequency and Wind Regime
- Environics (2022a) Scoping Study (Ecology Study) for Energy Wealth Initiative.
- Environics (2022b) ESIA for Green Ammonia Production Project, SC Zone, Sokhna (Draft Report). Egypt Green Hydrogen SAE
- ERM (2018) Environmental and Social Health Impact Assessment (ESHIA); Solar Farm Project and 20-kV Transmission Line in Pringgabaya, Selong and Sengkol—Nusa Tenggara Barat Province, Indonesia.
- IUCN (2022) The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>. Accessed on 30-08-2023.
- Geotechnical Encyclopedia of Egypt (2003). Part Three: Suez Governorate Chapter. The Soil Mechanics and Foundations Research Laboratory, Faculty of Engineering, Cairo University.

- Habibah, A.A.; Dahab, K.; Shabana, A.; Kamh, S. and Ibrahim, H. (2022) Assessment of the hydrogeochemical characteristics of groundwater resources at some wadis in the east of El Minia Governorate, Eastern Desert, Egypt. *Acta Geologica Sinica - English Edition*, 96(3), 1082–1097. <https://doi.org/10.1111/1755-6724.14654>
- Hammad, M.A. (1975) Soil association map of Egypt. Soil Survey Institute, Wageningen, Netherlands
- Hoath, R. (2009): A field guide to the mammals of Egypt. American University Press. Cairo. New York. 236 p.
- IFC (2019) International Finance Corporation's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, International Finance Corporation, World Bank Group, January 1, 2012 (updated June 27, 2019)
- IFC (2012) Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources, International Finance Corporation, World Bank Group, January 1, 2012
- Integrated Biodiversity Assessment Tool (IBAT). (n.d.). <https://www.ibat-alliance.org/>
- JV Lahmeyer International GmbH & Ecoda Environmental Consultants, & New and Renewable Energy Authority. (n.d.). Strategic Environmental and Social Assessment of Solar Energy Projects in the East Nile Region (Arab Republic of Egypt). New and Renewable Energy Authority (NREA) Ministry of Electricity and Renewable Energy.
- Kwok, R., & Peters, M. (2020, July 6). Archaeological atlas of published excavations. Harvard Dataverse
- Land cover. Land Cover | Copernicus Global Land Service (2021, September 8). <https://land.copernicus.eu/global/products/lc>
- Masdar (2022) Zarafshan Wind Farm. Final Environmental & Social Impact Assessment
- Meteorological data, Suez Meteorological Station, Environment Report (Geography and Climate Chapter) 2021, CAPMAS
- Michaelaschludecker (2023, August 28). Simulated historical climate & weather data Minya, Meteoblue
- https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/minya_egypt_360686
- Michaelaschludecker. (2023, August 28). Simulated historical climate & weather data for Jabal Ghanimah, Meteoblue
- https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/jabal-ghan%c4%abmah_egypt_356701
- Michaelaschludecker. (2023a, August 28). Simulated historical climate & weather data Suez, Meteoblue

- https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/suez_egypt_359796
- Moneim, A.; Fernández-Álvarez, J.; Abu El Ella, E. and Masoud, A. (2016) Groundwater Management at West El-Minia Desert Area, Egypt Using Numerical Modeling. *Journal of Geoscience and Environment Protection*, 4, 66-76. doi: 10.4236/gep.2016.47008.
- Newton, C. (2005). Upper Egypt: Vegetation at the beginning of the third millennium BC inferred from charcoal analysis at Adaïma and Elkab. *Journal of Archaeological Science*, 32(3), 355–367. <https://doi.org/10.1016/j.jas.2004.10.006>
- Ramadan, E. M., Badr, A. M., Abdelradi, F., Negm, A., & Nosair, A. M. (2023). Detection of groundwater quality changes in Minia Governorate, West Nile River. *Sustainability*, 15(5), 4076. <https://doi.org/10.3390/su15054076>
- RCREEE, (2017) Strategic and Cumulative Environmental and Social Assessment Active Turbine Management Program (ATMP) for Wind Power Projects in the Gulf of Suez
- Resolution No. 458 of 2007 defining maximum limits for criteria and requirements necessary for drinking water and domestic use. FAO.org : (n.d.)
- Shalby, A.; Emara, S.R.; Metwally, M.I.; Armanuos, A.M.; El-Agha, D.E.; Negm, A.M. and Gado, T.A. (2023) Satellite-based estimates of groundwater storage depletion over Egypt. *Environmental Monitoring and Assessment*, 195(5). <https://doi.org/10.1007/s10661-023-11171-3>
- Sullivan, Robert G., L. Kirchler, Tom Lahti, Sherry Roché, Kevin Beckman, Brian Cantwell, and Pamela Richmond (2012). "Wind turbine visibility and visual impact threshold distances in western landscapes." In National Association of Environmental Professionals 37th Annual Conference, May, pp. 21-24
- World Health Organization (2003). Total dissolved solids in drinking-water. https://cdn.who.int/media/docs/default-source/wash-documents/wash-chemicals/tds.pdf?sfvrsn=3e6d651e_4.
- Zahran, M.A. and Willis, A.J. (2008) *The Vegetation of Egypt*, 2nd edition. Springer, Germany.

Annex 1: Borehole logs

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-01**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.80**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/21/2026**

UTM COORDINATES : N: **3462966.827**

E: **228400.343**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay and gravel)			29.9					
2			2-2-3 (5)		Dark gray to brown, soft to medium stiff, silty CLAY with ironoxides	CH	0.8	35.9					
3								42.7	78	29	49		
4			2-2-2 (4)					47.2					
5		5.0	2-2-1 (3)					36.5					
6		6.0			Gray, sandy clayey SILT	ML		37.7	37	32	5		59
7			3-9-5 (14)		Gray, medium to very dense, silty SAND	SM							
8			8-10-15 (25)										
9			25-31-33 (64)										
10													14

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-01**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.80**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/21/2026**

UTM COORDINATES : N: **3462966.827**

E: **228400.343**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S O S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11			20-25-31 (56)		Gray, medium to very dense, silty SAND <i>(continued)</i>	SM							14
12			14-17-23 (40)										
13			14-20-33 (53)										
14			23-29-44 (73)										
15		15.0											

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-02**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **0.76**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/28/2026**

UTM COORDINATES : N: **3462940.694**

E: **228583.855**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1					Fill (Gray, silty clay and gravel)			36.1					
2		1.3	5-4-4 (8)		Gray, soft to medium stiff, silty CLAY with ironoxides			51.2					
3													
4			1-1-1 (2)					35.1					
5		4.5			Gray, sandy clayey SILT								
6		5.0	7-9-10 (19)		Gray, loose to medium dense, silty SAND								
7			4-3-4 (7)										
8		7.0			Gray, dense to very dense, silty SAND								
9			11-14-18 (32)										
10			14-16-17 (33)										

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-02**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **0.76**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/28/2026**

UTM COORDINATES : N: **3462940.694**

E: **228583.855**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11													
12			13-20-23 (43)										
13			12-22-25 (47)										
14													
15		15.0	17-25-32 (57)										

Gray, dense to very dense, silty
SAND *(continued)*

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-03**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.40**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/29/2026**

UTM COORDINATES : N: **3462876.519**

E: **228488.285**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Gray, silty clay, plant roots, and gravel)			31.8					
2			3-3-4 (7)		Gray, medium stiff to stiff, silty CLAY with ironoxides			42.1					
3		3.0	4-5-5 (10)					47.5					
4					Gray, sandy clayey SILT								
5		4.5	8-13-15 (28)										
6			7-11-16 (27)		Gray, medium dense to dense, silty SAND								
7			11-15-17 (32)										
8			15-14-17 (31)										
9													
10													

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-03**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.40**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/29/2026**

UTM COORDINATES : N: **3462876.519**

E: **228488.285**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11			13-16-18 (34)		Gray, medium dense to dense, silty SAND <i>(continued)</i>								
12			13-13-12 (25)										
13			12-15-18 (33)										
14			10-14-19 (33)										
15		15.0											

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-04**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.20**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/22/2026**

UTM COORDINATES : N: **3462847.481**

E: **228393.409**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, gravel, and roots)			27.8					
2			1-2-2 (4)		Dark gray, soft, sandy silty CLAY with ironoxides and organic matter			39.0					
3		3.0											
4			2-2-2 (4)		Gray, sandy clayey SILT	MH		43.9	58	35	23		
5		4.2						46.2					61
6			4-6-7 (13)		<<<<< with shell fragments Gray, medium to very dense, silty SAND <<<<< with shell fragments	SM							31
7			19-29-32 (61)										
8			14-36-50 (86)										
9			11-17-17 (34)										
10						SM							20

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-04**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.20**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/22/2026**

UTM COORDINATES : N: **3462847.481**

E: **228393.409**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11			10-15-18 (33)		----- with shell fragments								
12			20-32-26 (58)		Gray, medium to very dense, silty SAND <i>(continued)</i>								
13													
14													
15		15.0	10-25-23 (48)			SM							14

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-05**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.10**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/28/2026**

UTM COORDINATES : N: **3462828.896**

E: **228579.05**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	SCSC	POCKET PEN. (kg/cm ²)	Results of Lab. tests								
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)			
1		2.0			Fill (Dark brown, silty clay, plant roots, and gravel)	CL		29.2								
2																
3		2-2-2 (4)		Gray, soft, silty CLAY with ironoxides	64.7			47						27	20	
4																
5		3-3-5 (8)		Gray, sandy clayey SILT	36.8											
6				Gray, medium to very dense, silty SAND												
7		8-10-11 (21)														
8		10-18-22 (40)														
9		12-24-25 (49)														
10																

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-05**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.10**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/28/2026**

UTM COORDINATES : N: **3462828.896**

E: **228579.05**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11			13-24-28 (52)		Gray, medium to very dense, silty SAND <i>(continued)</i>								
12			13-22-26 (48)										
13													
14													
15		15.0	12-19-25 (44)										

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-06**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.84**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/23/2026**

UTM COORDINATES : N: **3462799.266**

E: **228484.853**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1					Fill (dark brown, silty clay, gravel, and roots)			20.5					
2		1.5	4-4-5 (9)				0.7	29.0					
3			2-1-2 (3)		Dark gray, very soft to medium stiff, silty CLAY with ironoxides			41.1					
4													
5		5.0	1/45 cm			CH		46.6	61	30	31		
6					Gray, sandy clayey SILT	ML		44.6	48	29	19		
7		6.4	15-8-5 (13)										
8					Gray, medium dense, silty SAND								
9		8.0	24-34-32 (66)										
10					Gray, dense to very dense, poorly graded SAND with silt								
			29-26-24 (50)			SP-SM							8

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-06**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.84**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/23/2026**

UTM COORDINATES : N: **3462799.266**

E: **228484.853**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11													
12			21-38-34 (72)			SM							14
13			20-31-30 (61)		Gray, very dense, silty SAND								
14													
15		15.0	17-27-30 (57)										

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-07**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.27**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/20/2026**

UTM COORDINATES : N: **3462727.836**

E: **228386.574**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1					Fill (Brown, silty clay, gravel, and roots)			33.4					
2		1.5	1-1-2 (3)		Brown, medium stiff, silty CLAY with ironoxides		0.9	50.6					
3		3.5											
4						SM							34
5			3-5-8 (13)										
6			3-5-12 (17)		Gray, medium dense to dense, silty SAND	SM							22
7													
8			15-20-20 (40)										
9		9.0											
10			12-20-40 (60)		Gray, very dense, poorly graded SAND with silt								

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-07**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **1.27**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/20/2026**

UTM COORDINATES : N: **3462727.836**

E: **228386.574**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S O S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11													
12			13-22-36 (58)		Gray, very dense, poorly graded SAND with silt <i>(continued)</i>	SP-SM							7
13			10-12-8 (20)		<<<<< medium dense								
14		13.5			Dark gray, medium stiff, silty CLAY	CH	0.8	65.2	111	41	70		
15		15.0											

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-08**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **0.95**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/26/2026**

UTM COORDINATES : N: **3462717**

E: **228574.074**

PAGE 1 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (dark brown, silty clay and gravel)			26.6					
		1.5	4-4-5 (9)		Fill (dark gray, silty clay and root)			48.7					
2					Dark gray, soft to medium, silty CLAY		0.9						
3			1-1-1 (2)				0.3	41.1					
4		4.0						39.2					
5		5.0	5-6-7 (13)		Gray, sandy clayey SILT								
6			18-25-26 (51)		Gray, dense to very dense, silty SAND intercalated with shell fragments								
7													
8			15-20-22 (42)										
9			9-13-17 (30)										
10													

(Continued Next Page)

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BH-08**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **0.95**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/26/2026**

UTM COORDINATES : N: **3462717**

E: **228574.074**

PAGE 2 OF 2

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
11			18-25-30 (55)		Gray, dense to very dense, silty SAND intercalated with shell fragments <i>(continued)</i>								
12			23-25-43 (68)										
13													
14													
15		15.0	30-33-38 (71)										

Bottom of borehole at 15.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-1**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462960.356**

E: **228446.243**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, plant roots, and decomposing matter)			19.4					
2								44.5					
3		3.0			Dark gray, silty CLAY								

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-2**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462947.214**

E: **228538.041**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, and plant roots)			17.2					
2					Brown, silty CLAY			35.7					
3		3.0						41.3					
								35.2					

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-3**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/28/2026**

UTM COORDINATES : N: **3462914.929**

E: **228490.745**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, and plant roots)			34.6					
2					Brown, silty CLAY			38.3					
3		3.0						40.6					
								42.9					

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-4**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462907.36**

E: **228396.786**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S O S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		0.7			Fill (Brown, silty clay, and plant roots)	CH		35.8					
2					Dark gray, silty CLAY			35.1	111	38	73		
3		3.0											

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-5**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462884.569**

E: **228581.345**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, and plant roots)	CL		13.9					
2					Dark gray, silty CLAY with sand pockets			31.0					
3		3.0			<<<<< with pockets of sand			36.6	46	25	21		
								31.3					

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-6**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/22/2026**

UTM COORDINATES : N: **3462787.521**

E: **228389.869**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, plant roots, organic material, and crushed red bricks)			31.8					
2					Brown, silty CLAY with sand pockets			39.6					
3		3.0				CH		55.2					
								36.6	59	23	36		

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-7**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462772.873**

E: **228576.605**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		0.7			Fill (Brown, silty clay, and plant roots)			16.7					
2					Dark gray, silty CLAY			42.4					
3		3.0											

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-8**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462760.951**

E: **228483.143**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		1.0			Fill (Brown, silty clay, and plant roots)			26.1					
2					Brown, silty CLAY	CH		45.3					
3		3.0						47.6	87	29	58		

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-9**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462725.115**

E: **228433.395**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		0.7			Fill (Brown, silty clay, and plant roots)			32.2					
					Brown, silty CLAY with pockets of sand			31.4					
2		2.0						36.9					
3		3.0			Gray, sandy clayey SILT								

Bottom of borehole at 3.0 meters

PROJECT: **ABU QIR BESS FACILITY**

BH No. **BHS-10**

CLIENT: **Scatec**

GROUND ELEVATION (m): **Ground surface**

CONTRACTOR: **Horema Ltd**

CASING: **NA**

WATER DEPTH (m): **NA**

DRILLING METHOD: **Rotary Drilling**

DRILLING DIAMETER: **76mm**

DATE: **4/25/2026**

UTM COORDINATES : N: **3462719.746**

E: **228527.313**

PAGE 1 OF 1

Depth (m)	Sample Type	Layer Depth (m)	No. of blows (N VALUE)	Legend	Description	S C S C	POCKET PEN. (kg/cm ²)	Results of Lab. tests					
								MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	Free Swelling (%)	FINES (%)
1		0.7			Fill (Brown, silty clay, and plant roots)	CL		22.7					
					Dark gray, silty CLAY with pockets of sand			45.9					
2		2.0							46	25	21		
3		3.0			Gray, sandy clayey SILT			43.6					

Bottom of borehole at 3.0 meters

Annex 2: Hydrological Study Report – Abu Qir BESS Site

SCATAC

**Abu Qir BESS Facility,
Alexendria, EGYPT**

Scatec

Hydrological Study Report

Rev. 05

16 April 2026



**ACE CONSULTING ENGINEERS
MOHARRAM.BAKHOUM**

TABLE OF CONTENTS

1	INTRODUCTION.....	7
1.1	Project Location.....	7
1.2	Scope of work	8
2	Data Collection	9
2.1	Site Visit	9
2.1.1	Overview	9
2.1.2	Field Observations	9
2.1.3	Photographic Documentation	10
2.2	Topographic Data.....	12
2.2.1	Digital Elevation Models (DEM).....	12
2.2.2	Topo Maps.....	13
2.3	Soil information.....	14
3	Principles and design criteria	14
3.1	Standards and Codes.....	14
3.2	Computer Models and Software Packages.....	15
3.3	Rainfall-runoff calculations.....	15
3.3.1	SCS Unit Hydrograph Method	15
3.3.2	Rational Method.....	17
3.4	The Design Return Period	19
3.5	Aggradation and Degradation Analysis (Scour calculation)	20
4	ANALYTICAL STUDIES	22
4.1	Meteorological Analysis	22
4.1.1	IDF curves.....	31
4.2	MORPHOLOGICAL ANALYSIS	34
4.3	HYDROLOGICAL ASSESSMENT AND STORM DRAINAGE.....	37
4.3.1	External flood Hazard	37
4.3.2	Internal Storm Drainage	38
5	COSTAL STUDY.....	41
5.1	Data collection.....	41
5.1.1	Met ocean data	41
5.1.2	Wave data.....	42
5.1.3	Wind data	42
5.1.4	Tidal data.....	43
5.2	Climate Change Impact.....	45

5.3	Coastal Assessment	45
6	CONCLUSION & RECOMMENDATION.....	49
6.1	Hydrological Study.....	49
6.2	Coastal Study	49

LIST OF TABLES

Table 3-1: Limitations for the rainfall-runoff calculation methods	15
Table 3-2: Recommended Values of the runoff coefficient (C) (Source: MOT Design Manual).....	17
Table 3-3: Design Return Period for Different Protection Elements	19
Table 4-1: Rainfall Statistical Analysis Results for AL Nozha airport Rainfall Station.....	27
Table 4-1: Rainfall Statistical Analysis Results for AboQir Rainfall Station.	29
Table 4-2: Rainfall Statistical Analysis Results with Climate change impact.	30
Table 4-3: Bell's Ratio	31
Table 4-4: Tabulated IDF Values for baseline Curves – AlNozha Station	31
Table 4-5: Tabulated IDF Values for Modified Curves with climate impact - AlNozha Station	32
Table 4-4: Tabulated IDF Values for baseline Curves – AboQir Station	32
Table 4-5: Tabulated IDF Values for Modified Curves with climate impact - AboQir Station	32
Table 5-1: Raw met-ocean data, from (ERA5).....	41

LIST OF FIGURES

Figure 1-1: project location	7
Figure 2-1: Cooling water discharge channel leading to the sea.....	10
Figure 2-2: Existing open channel located in front of the study area (south of the site).	11
Figure 2-3: General interior view of the Abu Qir BESS facility area.	12
Figure 2-4: Digital Elevation Model (DEM) of the ALOS data for the study area.	13
Figure 2-5: Topographic maps of the study area.....	13
Figure 2-6: Geological map of the study area.	14
Figure 3-1: Definition Sketch of Sediment Continuity Concept.	20
Figure 4-1: Distribution of average annual rainfall depth values over Egypt.....	22
Figure 4-2: Rainfall station around the study area.	23
Figure 4-3: Maximum daily Rainfall records for different sations.....	23
Figure 4-4: Correlation between the rainfall gauges for the period between 1999 and 2016	24
Figure 4-5: AlNozha max. annual Rainfallrecords	25
Figure 4-6: Comparison of probability distributions for rainfall frequency analysis for Al Nozha station.	26
Figure 4-7: Rainfall frequency curve for Al Nozha rainfall station using the Gumbel distribution.	26
Figure 4-8: Gumbel Distribution results for Al Nozha rainfall station.	27
Figure 4-9: Abo Qir max. annual Rainfallrecords	28
Figure 4-10: Comparison of probability distributions for rainfall frequency analysis for Abo Qir Station.....	28
Figure 4-11: Rainfall frequency curve for Abo Qir rainfall station using the Lognormal distribution.	29
Figure 4-12: Lognormal Distribution results for AboQir rainfall station.	29
Figure 4-13: Baseline IDF curves – derived using Bell ratios and historical rainfall data - AlNozha Station.....	33
Figure 4-14: Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths - AlNozha Station	33
Figure 4-13: Baseline IDF curves – derived using Bell ratios and historical rainfall data - AboQir Station	34
Figure 4-14: Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths – AboQir Station.....	34
Figure 4-15: Regional stream network over DEM showing no direct impact on study area.	36
Figure 4-16: Effective watersheds projected on a satellite image, showing no direct intersection with the study area.	36
Figure 4-17: Effective watersheds projected on Topo Map, showing no direct intersection with the study area.	37
Figure 4-18: existing features around the site.....	40
Figure 4-19: levels of the site with the surrounding features.....	40
Figure 5-1: Wave rose for SWH, from (ERA5).	42
Figure 5-2: Wind rose, From (ERA5).....	43
Figure 5-3: Frequency distribution of the hourly sea and surge levels at Rosetta	44

<i>Figure 5-4: Monthly mean sea (MSL), low low water (LLWL), high high water (HHWL) levels and monthly range (cm) at Rosetta Sea (stn.1) and Estuary (stn.2) stations during 1982, from (SEA-LEVEL-CHANGES-AT-ROSETTA-PROMONTORY-EGYPT) paper.....</i>	<i>45</i>
<i>Figure 5-5: Climate change impact, from (NASA Tools).....</i>	<i>45</i>
<i>Figure 5-6: Projected Sea Level Rise values for project life time (30 years after construction)</i>	<i>47</i>
<i>Figure 5-7: Existing site conditions and levels with respect to Sea level.....</i>	<i>48</i>

1 INTRODUCTION

This report presents a comprehensive hydrologic assessment of a 50,368 m² area located in North of Egypt. This assessment aims to provide a detailed analysis of the hydrological characteristics and dynamics within the specified region, which is crucial for informed land development and management.

Abu Qir BESS Facility Project, Alexandria, situated in the North part of Egypt, is classified as a Mediterranean climate (CSA) according to the Koppen-Geiger climate classification, characterized by hot dry summers and mild wet winters, which significantly influences the hydrologic patterns and water resource availability. The assessment includes an evaluation of precipitation patterns, surface runoff, groundwater recharge, and potential flood risks. It also considers the impact of existing and planned developments on the hydrological regime.

Through the integration of field data, remote sensing, and hydrological modeling, this report aims to offer actionable insights and recommendations to support sustainable development practices in the area.

1.1 Project Location

The study area is geographically positioned on the North side of Egypt in Abu Qir – Alex. Between 31.269°, 31.267° Lat and 30.148°, 30.148° Long.

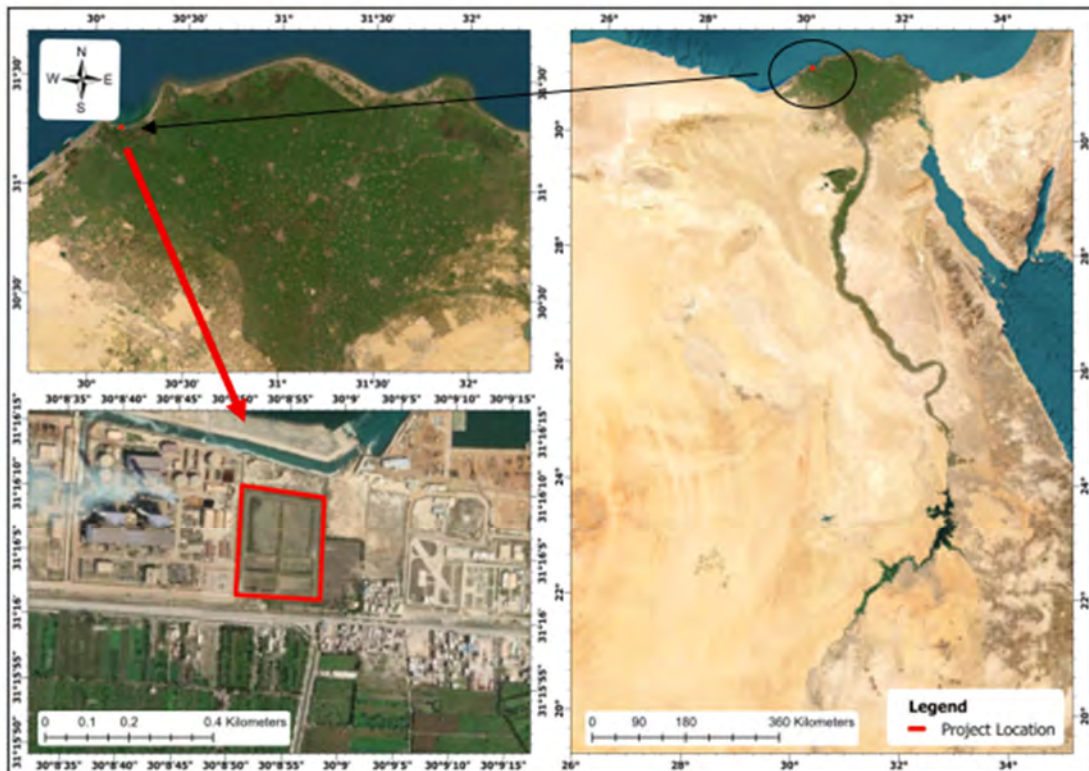


Figure 1-1: project location

1.2 Scope of work

The scope of work for the project will include the Hydrology assessment study for the project Location. The deliverable of the above-mentioned scope shall be a final design report (the document at hand) which includes.

- Design guidelines & methodology (hydraulic and hydrologic design criteria).
- Collected data for the project.
- The existing conditions are based on site information.
- Analytical studies and assessment of the collected data.
- Runoff peak flow estimation for effective watersheds.
- The Final results and models' outputs.
- Risk assessment

2 Data Collection

This section presents the study area location and description, besides the data collected such as topographic maps, satellite images and rainfall data. In addition, the principles and design criteria used in the hydrological study of the project are also provided.

All data and information on the study were collected from official bodies. The following is a list of the most important information and data collected for analysis and used in the hydrological study of the project:

- Site investigation.
- Project boundary.
- Satellite images.
- Digital Elevation Model (DEM) ALOS 30*30 meters.
- Topographic maps of the study area.
- Soil and Land formation maps for the study area.
- Rainfall station data affecting the study area from Egyptian Meteorological Authority.

2.1 Site Visit

2.1.1 Overview

A technical field visit was conducted on to the proposed Abu Qir BESS facility site. The primary objective of the visit was to verify the topographical features, identify existing drainage elements, and validate the results of the hydrological modeling (HEC-HMS).

2.1.2 Field Observations

During the site investigation, the following observations were recorded:

- **Topography and Surface Conditions:** The site is characterized by [flat / gently sloping] terrain. No natural depressions or significant gullies were observed within the project boundaries.
- **Existing Watercourses:** In alignment with the digital stream delineation, no active natural streams or flash flood channels were identified crossing or threatening the site. The surrounding area shows no signs of historical erosion or major sediment transport caused by surface runoff.
- **Existing Drainage Infrastructure (Hydrological Barrier):** A significant open water channel was observed running along the front of the project site from the south. This channel acts as a physical interceptor, diverting any potential surface runoff or small streams away from the site. Its presence further ensures that the study area is effectively shielded from any direct upstream hydrological threats.
- **Cooling Water Discharge:** Additionally, an existing discharge channel was identified, which is utilized for conveying cooling water from the existing power plant directly to the sea.

2.1.3 Photographic Documentation



Figure 2-1: Cooling water discharge channel leading to the sea.



Figure 2-2: Existing open channel located in front of the study area (south of the site).



Figure 2-3: General interior view of the Abu Qir BESS facility area.

2.2 Topographic Data

2.2.1 Digital Elevation Models (DEM)

Digital Elevation Models (DEM) for the whole study area were collected and obtained from the freely available ALOS satellite imaging results - satellites for imaging and Earth observation - and the model is a grid matrix image in the horizontal projection at a resolution of 30 meters. The ALOS data are widely used in the identification of drainage basins for hydrological analysis work in many research and advisory bodies. Figure 2-4: Digital Elevation Model (DEM) of the ALOS data for the study area. presents the Study Area on the digital elevation model of the ALOS data

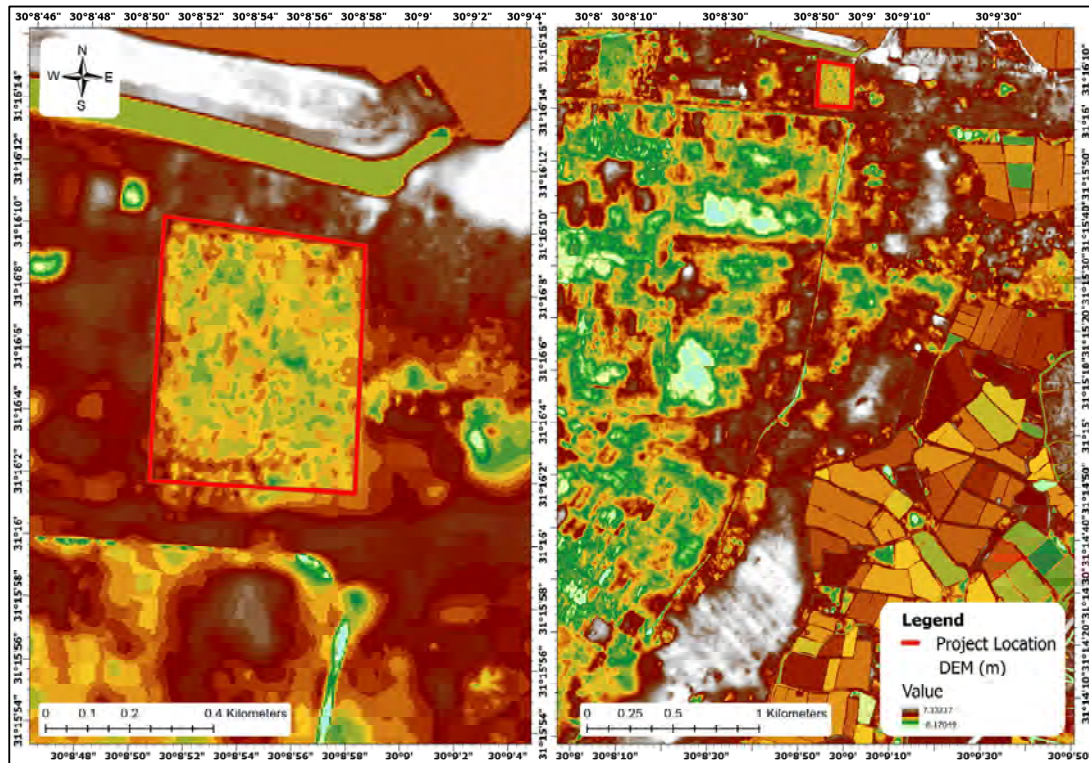


Figure 2-4: Digital Elevation Model (DEM) of the ALOS data for the study area.

2.2.2 Topo Maps

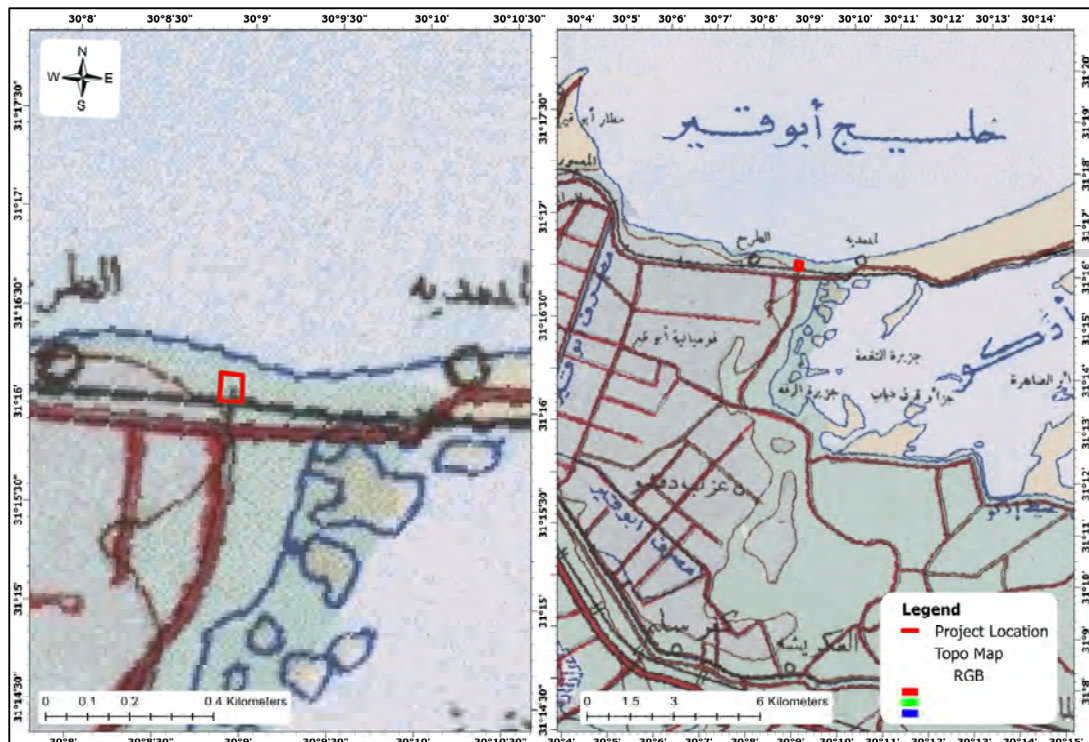


Figure 2-5: Topographic maps of the study area.

2.3 Soil information

Figure 2-6: Geological map of the study area.

demonstrate the prevailing geological conditions around the study area from information collected from the Egyptian Geological Survey and Mining Authority with a scale of 1:2000000

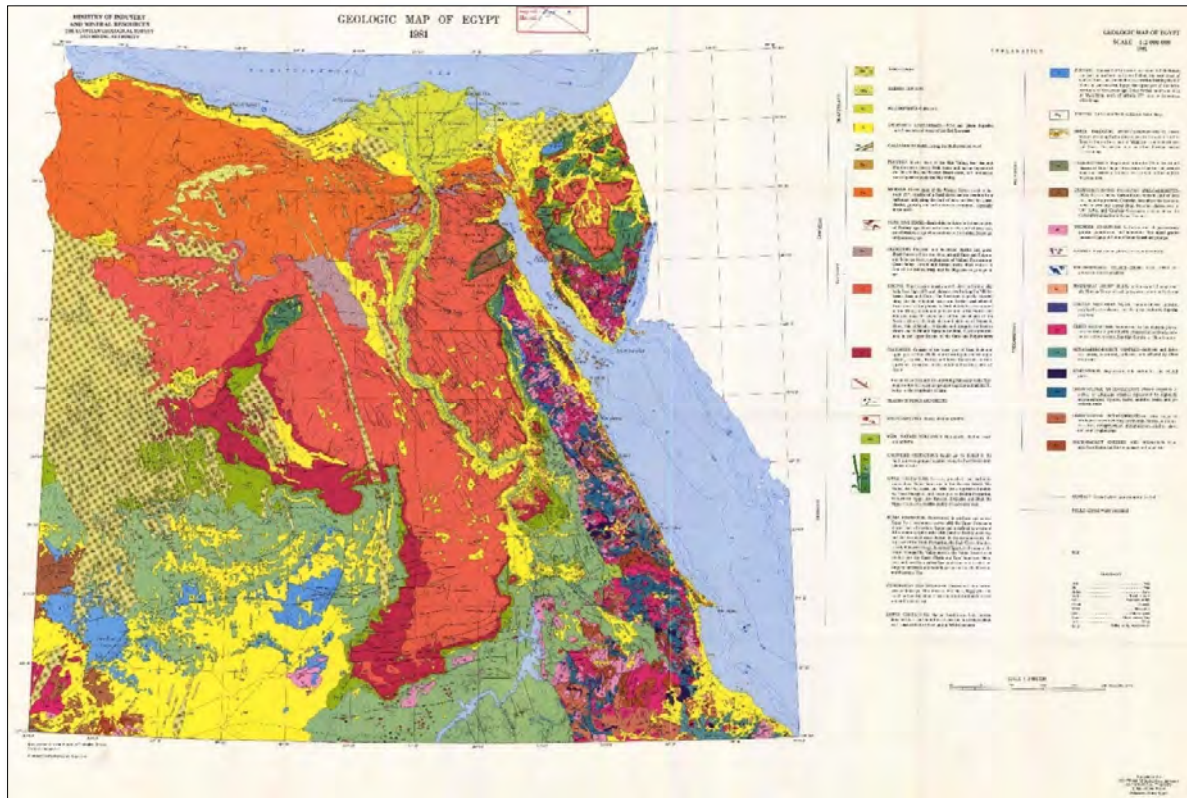


Figure 2-6: Geological map of the study area.

3 Principles and design criteria

This chapter outlines the principles and design criteria that guided the hydrological analysis conducted for this project. It details the specific methodologies and approaches employed to assess the flood risk and proposed mitigations. In addition, the chapter provides an overview of the software tools utilized to perform the necessary calculations and simulations.

3.1 Standards and Codes

In general, hydrologic study is based on the design criteria conforming to the following professional standards and codes:

- Highway Drainage Guidelines, 4th ed., AASHTO, USA, 2007.
- DEFRA, E. (2006). R&D outputs: Flood risks to people. Phase 2. FD2321/TR1 The flood risks to people methodology. Department for Environment Food and Rural Affairs and the Environment Agency, London.

- Hydraulic Engineering Circular (HEC) no. 22, Third edition, Urban Drainage Design Manual, Federal Highway Administration, U.S. Department of Transportation, 2009.
- Urban Hydrology for Small Watershed, Technical Release 55, TR55, NRCS, 1986.
- United States Dept. of Agriculture (USDA) (1986) Urban Hydrology for Small Watersheds Technical Release TR 55, Washington, DC.

3.2 Computer Models and Software Packages

The most advanced programs and numerical models were used in the calculation and hydrological and hydraulic analysis of catchment areas and proposed protection work. The following are the main programs and models that are usually used:

- GIS Environment (Arc-Hydro Tools, Spatial Analyst, etc.): to delineate the watersheds, estimate watershed characteristics and develop runoff coefficient maps.
- HEC-SSP software was used to conduct a frequency analysis for the collected rainfall data records.
- HEC-HMS (by USACE) and some developed in-house spreadsheets (MS Excel) are used to estimate the peak flow and to estimate the other hydrologic parameters whenever needed.
- MS Excel.

3.3 Rainfall-runoff calculations

There are several methods for estimating and calculating the peak flows and runoff hydrographs resulting from the catchment areas affecting the project boundary. The most common methods used are (Rational Method) and (SCS Unit Hydrograph). Table 3-1 shows the limitations of using these methods according to the area of the catchment affecting the proposed project location. The following sections give a brief explanation of both methods, and how they are applied to estimate peak flows and runoff hydrographs for catchment areas affecting the project boundary.

Table 3-1: Limitations for the rainfall-runoff calculation methods

Catchments Area	Proposed Equation
$A \geq 80 \text{ Ha.}$	SCS Method
$A < 80 \text{ Ha.}$	Rational Method

3.3.1 SCS Unit Hydrograph Method

The United States Soil Conservation Service (SCS – now the Natural Resource Conservation Service "NRCS") method estimates runoff using in addition to rainfall, catchment characteristics such as antecedent soil moisture conditions, types of soil, initial abstraction of rainfall, slope, length of the longest channel, and surface treatment and land cover. These characteristics are reflected by a Curve Number (CN) value. This number typically ranges from 35 (for low runoff depressions) to 98 (for paved impervious areas).

The maximum loss or storage that may occur in the soil of drainage basin (S) as well as the initial abstraction value (Ia) expected to occur in the drainage basin are typically

related using an initial abstraction of $0.2S$, where S is a maximum soil storage depth (in mm) and CN = Curve Number. The soil storage is calculated from the equation below (other values may be used).

$$S = \left(\frac{1000}{CN} - 10 \right) * 25.4$$

Whereas:

S - Maximum soil storage depth, mm.

CN - Curve number according to the nature of the drainage basin.

I_a - Initial abstraction (at the beginning of rainstorm) mm.

As mentioned in Table 3-1, this method will only be utilized for catchments equal to or more than 80 ha (or 0.8 km²).

This method can account for the following hydrological processes of the design storm:

- Storm distribution over time (Hyetograph).
- Initial abstraction losses of rainfall and initial storage of the drainage basins (I_a) related to the quantity of water stored in ponds and low areas of the basin as well as those depleted in the process of initial saturation of the surface of the basin.
- Infiltration Rate, which gradually decreases with time from the beginning of the storm until it reaches a fixed value that depends mostly on the physical properties of the soil and its structural formation and the proportion of organic matter in it.

The values of the curve number are estimated according to the geological maps and the aerial photographs and according to Tables mentioned in Technical Release No. 55 (TR-55) issued by The U.S. Department of Agriculture (USDA).

Runoff Depth (R), which is expected to occur on a unit area of the drainage basin (mm), is calculated using the following equation:

$$R = \frac{(P - I_a)^2}{(P + 0.8S)}$$

Whereas:

P - Maximum daily rainfall rate corresponding to design return period, mm.

The runoff hydrograph resulting from (the SCS-Unit hydrograph method) depends on the area of the drainage basin and the Lag time (T_{lag}).

Lag Time: It is the time between the center of mass of the storm ordinate and the peak discharge or it can be defined also as the time from the start of the excess runoff until the inflection point (the point between the falling limb on the hydrograph and the recession limb), and it can be estimated as follows:

$$TL (min.) = 0.6 T_c (min.)$$

The shape of the SCS flood hydrograph is standard and depends on the watershed area and the lag time of the basin. The peak flow for one unit of rainfall excess is given by:

$$Q_{peak} = \frac{2.08 \times A}{T_R}$$

Where:

Q_{peak} : the unit peak discharge in (m³/s/mm);

A: the drainage area in (km²)

TR: the time of the rise of the flood hydrograph, which equals the lag time plus one-half of the storm duration in (hours). The SCS flood hydrograph calculations are performed by the available computer software such as HEC-HMS.

3.3.2 Rational Method

This method is one of the best-known and most widely used for the determination of peak flows from small catchments (area less than 80 ha). Further information can be derived from Highway Hydrology, Hydraulic Design Series No. 2 (HDS-2) NHI-02-001. The peak flow is obtained from the following peak flow formula:

$$Q = \frac{CIA}{3.6}$$

Where;

Q	=	peak flow (m ³ /s)
C	=	runoff coefficient
I	=	average rainfall intensity over catchment (mm/h)
A	=	effective area of the catchment (km ²)
3.6	=	conversion factor

The application of the formula is based on the following:

- (1) The rainfall has a uniform area distribution across the catchment.
- (2) The rainfall has a uniform time distribution during the time of concentration.
- (3) The peak discharge occurs at the end of the time of concentration.
- (4) The runoff coefficient C remains constant throughout the duration of the storm.
- (5) The return period of the peak flow is the same as that of the rainfall intensity.

The Terms of the Peak Flow Formula:

Runoff coefficient (C): It represents the many factors influencing the rainfall/runoff relationship. It is a measure of that part of the storm rainfall contributing to the peak flood runoff at the point of discharge of the catchment. There is no theoretical method for determining the runoff coefficient (C); experience and engineering judgement plays an important part in the successful application of the method.

In an industrial area with a high proportion of impermeable surfaces such as roads and paving the runoff coefficient could be as high as 0.95, while in a flat rural area, well-treed with a permeable sandy formation the runoff coefficient may be 0.10. Recommended values of the runoff factor for use in the rational formula are provided in Table 3-2, (as per MOT standards).

Table 3-2: Recommended Values of the runoff coefficient (C) (Source: MOT Design Manual)

Watershed Characteristics			
A Relief	B Soil Infiltration	C Vegetal Cover	D Surface Storage
0.40	0.20	0.20	0.20

Watershed Characteristics			
A Relief	B Soil Infiltration	C Vegetal Cover	D Surface Storage
Steep rugged terrain; average slopes greater than 30%	No effective soil cover; either rock or thin soil mantle negligible infiltration capacity	No effective plant cover; bare or very sparse soil cover	Negligible; Surface depression few and shallow; drainage ways steep and small no ponds or Marshall
0.30 Hilly with average slopes of 10 to 30%	0.15 Slow to take up water; clay, or other soil of low infiltration capacity such as heavy gumbo	0.15 Poor to fair; clean cultivated crops or poor natural cover; less than 10% of the area under good cover	0.15 Low; well-defined system of small drainage ways, no ponds of marches.
0.20 Rolling with average slopes of 5 to 10%	0.10 Normal, deep loam	0.10 Fair to good; about 50% of the area is in good grassland, woodland or equivalent cover.	0.10 Normal; considerable surface depression storage; typical of prairie lands; lakes ponds, and marshes less than 20% of the area.
0.10 Relatively flat land average slopes 0 to 5%	0.05 High, deep sand or other soil that takes up water readily and rapidly.	0.05 Good to excellent; about 50% of the area is in good land; woodland or equivalent cover.	0.05 High; surface depression storage high; drainage system not sharply defined, large flood plain storage; a large number of ponds and marshes.

In the case of variable-type areas then the average areal runoff coefficient is calculated as follows:

$$C = \frac{C_1A_1 + C_2A_2 + \dots + C_nA_n}{A_1 + A_2 + \dots + A_n}$$

Whereas: $C_1, \dots, C_n$ are the runoff coefficients for the sub-catchment areas $A_1, \dots, A_n$ respectively.

Rainfall Intensity, I: The intensity of a design storm increases as the return period increases and as the duration of the storm decreases. To obtain the largest possible peak flow for a given return period, using the rational method, the storm rainfall must have a duration equal to the time of concentration. If the storm lasts longer than the time of concentration it will have a low intensity, IDF curves will be developed for the rainfall stations in the vicinity of the study area.

Time of Concentration, T_c : The time of concentration is the time required for running off from the most distant point of the catchment to contribute to the peak discharge. In the context of the Rational Method, the duration of storm rainfall must be equal to the time of concentration.

Watershed Lag Method

The SCS method for watershed lag was developed by Mockus in 1961. It spans a broad set of conditions ranging from heavily forested watersheds with steep channels and a high percent of runoff resulting from subsurface flow to meadows providing a high retardance to surface runoff, to smooth land surfaces and large paved areas.

Various researchers (Mockus 1957; Simas 1996) found that for average natural watershed conditions and approximately uniform distribution of runoff: $Tlag = 0.6 Tc$

$$Tc = 0.01944 L^{0.77} S^{-0.385}$$

T_c → Time of concentration (min.).

L → Longest Flow Path (m) Flow length can be measured using aerial photographs, quadrangle sheets, or GIS techniques.

S → average watershed land slope.

The hydraulic design aims to provide a drainage structure of adequate capacity that can safely convey the design flow without significant damages or inconveniences. The hydraulic design process consists of establishing design criteria, developing alternatives, and selecting the alternative that best satisfies the design criteria.

3.4 The Design Return Period

The frequency of storms within a specified period and the frequency of the storm reflects the degree of flood risks. The choice of return period depends on the importance and location of the proposed protection structure. Table 3-3 shows the adopted design return period for the different elements of flood protection that can be used for the project.

Table 3-3: Design Return Period for Different Protection Elements

Drainage Element	Design Storm RP (1: Yrs.)
Dams	200/100
Wadi Bridges	100
Crossing Culverts	100
Diversion Channel	100
Dikes	100
Side Slope Protection works	100

Design Concept:

During the planning and design phase of this project, floodwater drainage problems will be carefully considered. Every possible effort will be implemented to define the natural water courses, preserve their integrity, and maintain the natural drainage paths.

Flood protection works will be provided to prevent any possible attack of the Solar Project by external watersheds according to the velocity of flows. Flood protection structures in this project may include the following elements:

- Raised Roadway to act as a dike.
- Open channel

3.5 Aggradation and Degradation Analysis (Scour calculation)

Aggradation and degradation are the vertical raising and lowering, respectively, of the streambed over relatively long distances and time frames. Such changes can be the result of both natural and man-induced changes in the watershed. The sediment continuity concept is the primary principle applied in both qualitative and quantitative analyses of bed elevation changes. After an introduction to the concept of sediment continuity, some factors causing a bed elevation change are reviewed. Figure 3-1 shows Definition Sketch of Sediment Continuity Concept.

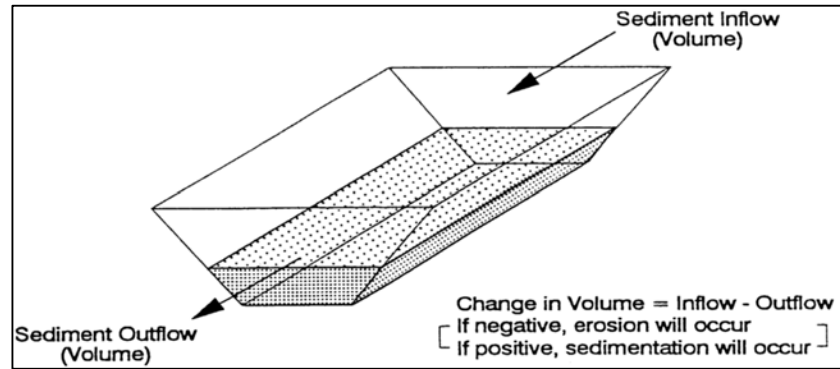


Figure 3-1: Definition Sketch of Sediment Continuity Concept.

Inception motion

Incipient motion is the condition where the hydraulic forces acting on a sediment particle are equal to the forces resisting motion. The particle is at a critical condition where a slight increase in the hydraulic forces will cause the particle to move.

Incipient motion conditions can be analyzed using the Shields diagram or by the following equation developed from the diagram: (HEC-20)

$$D_c = \frac{\tau_0}{k_s (\gamma_s - \gamma)}$$

Where.

D_c → Diameter of the sediment particle at the critical condition, ft

τ_0 → Boundary shear stress lb/ft^2

γ → Specific weight of Water lb/ft^3

γ_s → Specific weight of sediment lb/ft^3

k_s → Dimensionless coefficient often referred to as the Shields parameter

The Shields parameter can range from 0.03 to 0.10 for natural sediments based on particle shape, angularity, gradation and imbrication. (0.05 for and sizes provides reasonable results, 0.03 for gravel and cobble sizes).

$$\tau_0 = \frac{\gamma n^2 v^2}{1.486^2 R^{1/3}}$$

Where.

n → Manning roughness coefficient

v → Average channel velocity, ft/s

R → Hydraulic radius, ft (approximately equal to the flow depth (y) for many natural channels.)

Armoring occurs when the hydraulic forces are sufficient to move a portion of the bed material but insufficient to move the larger sizes. Under these conditions, the smaller material is transported and removed from the bed leaving the coarse material or an armor layer. Armor layers often form in gravel bed rivers during the recession of floods. These armor layers may be disturbed during the next major flood and re-form during the flood recession.

The incipient motion equation can be used to determine the critical size of material that can resist a particular hydraulic condition. If at least five percent of the material is larger than the critical size (D95 or smaller), armoring can occur.

$$y_s = y_a \left(\frac{1}{P_c} - 1 \right)$$

y_s → Depth of degradation or scour required to form the armor layer, ft

y_a → Thickness of the armor layer, ft

P_c → Percent of material coarser than the critical particle size expressed as a decimal fraction

The thickness of the armor layer ranges from one to three times the critical size (D_c) determined from the Shields incipient motion relation. A minimum of two times the critical size is required for a relatively stable armor layer.

4 ANALYTICAL STUDIES

The statistical analysis of rainfall data is one of the most important analytical studies to be carried out in any flood protection and storm drainage project, where rainfall is the main element causing the flow in streams, and this is why this study was given maximum priority from the compilation of data, study and detailed analysis, conducting a series of statistical tests on them using the best means to deduce the design storms, and developing the IDF curves, for which design flows will be calculated. Figure 4-1 shows the average distribution of the maximum daily rainfall depth values in Egypt.

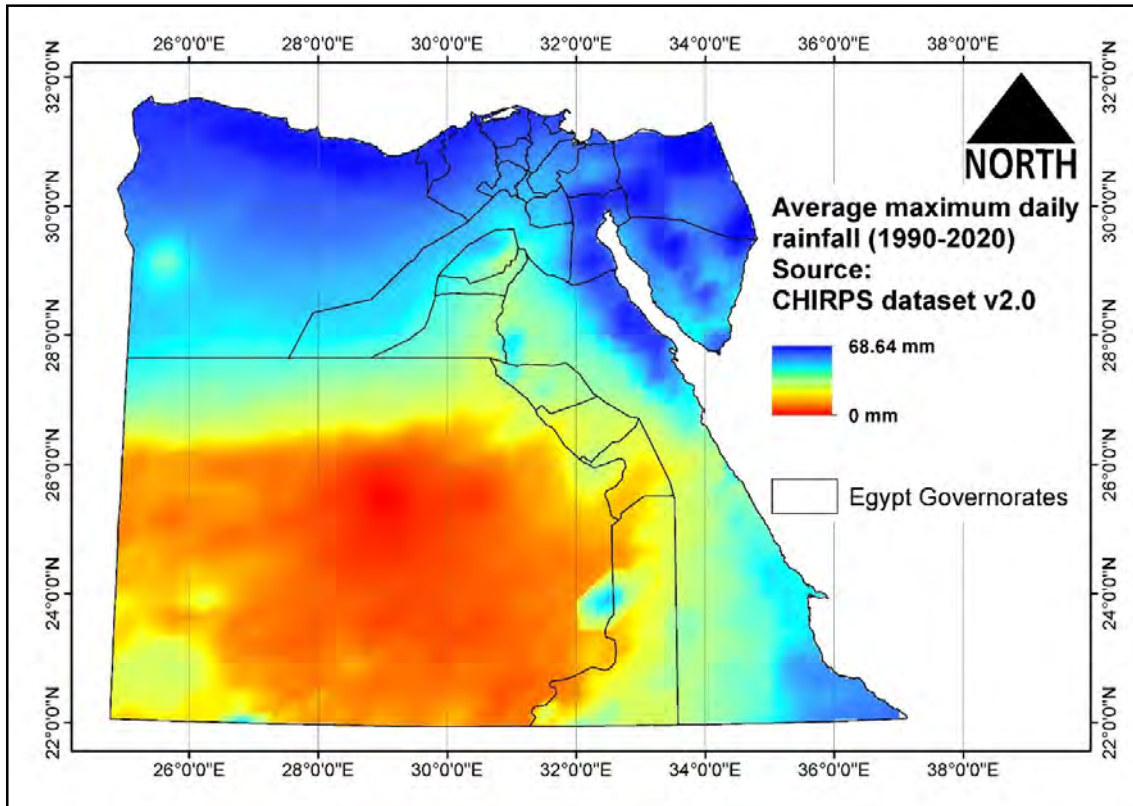


Figure 4-1: Distribution of average annual rainfall depth values over Egypt

4.1 Meteorological Analysis

According to project location, and as per available rainfall gauges, Station (Abu Qir) is found as the nearest gauge the study area as shown in Figure 4-2. However, since the available data set for this station is relatively short (from 1999 to 2016) compared with Al Nozha Airport and Ras Al Teen stations (from 1976 to 2016) Figure 4-3 present the maximum daily rainfall values. Statistically

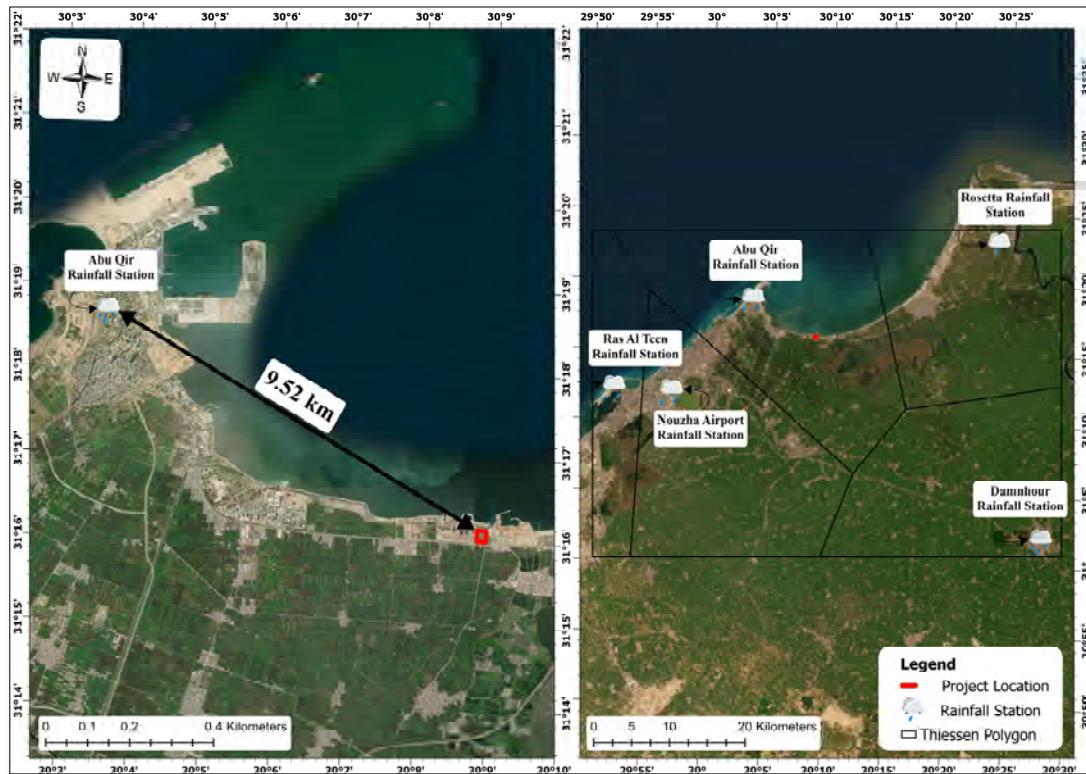


Figure 4-2: Rainfall station around the study area.

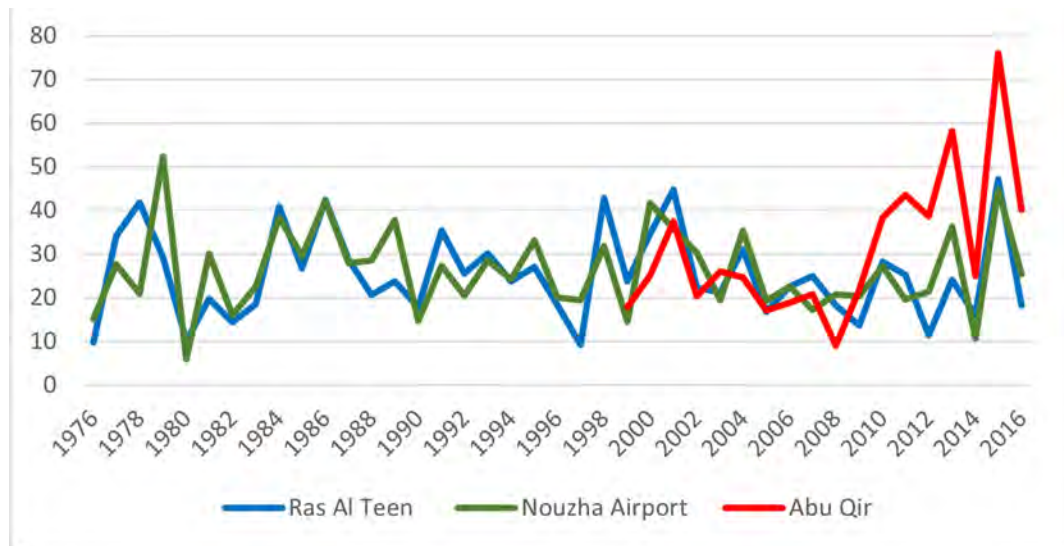


Figure 4-3: Maximum daily Rainfall records for different stations

The Pearson correlation matrix illustrates a generally consistent rainfall pattern across the three gauges for the period between 1999 and 2016, with correlations ranging from moderate to strong. The highest correlation is observed between Ras Al Teen and Nozha Airport ($r = 0.76$), which is expected given their relatively short separation distance of approximately 8 km. Despite Nozha being located about 5 km inland, the strong agreement suggests that rainfall systems affecting this part of Alexandria are spatially coherent over short distances. In contrast, Abu Qir shows slightly lower correlations with

both Nozha Airport ($r = 0.58$) and Ras Al Teen ($r = 0.51$), even though it is located directly along the coastal line like Ras Al Teen. This reduction in correlation may be attributed to the larger separation distances (approximately 16 km from Nozha and 24 km from Ras Al Teen), as well as localized coastal influences that can introduce variability in rainfall patterns along the shoreline.

Based on these findings and given the relatively strong correlation between Nozha Airport and Abo Qir station, it is reasonable to adopt the Nozha dataset as a long representative records (41 record) for the study area. In addition, the updated data set for abo Qir up to 2025 has been obtained which provide 27 record in abo Qir station. Therefore, the meteorological analysis will be provided for both stations.

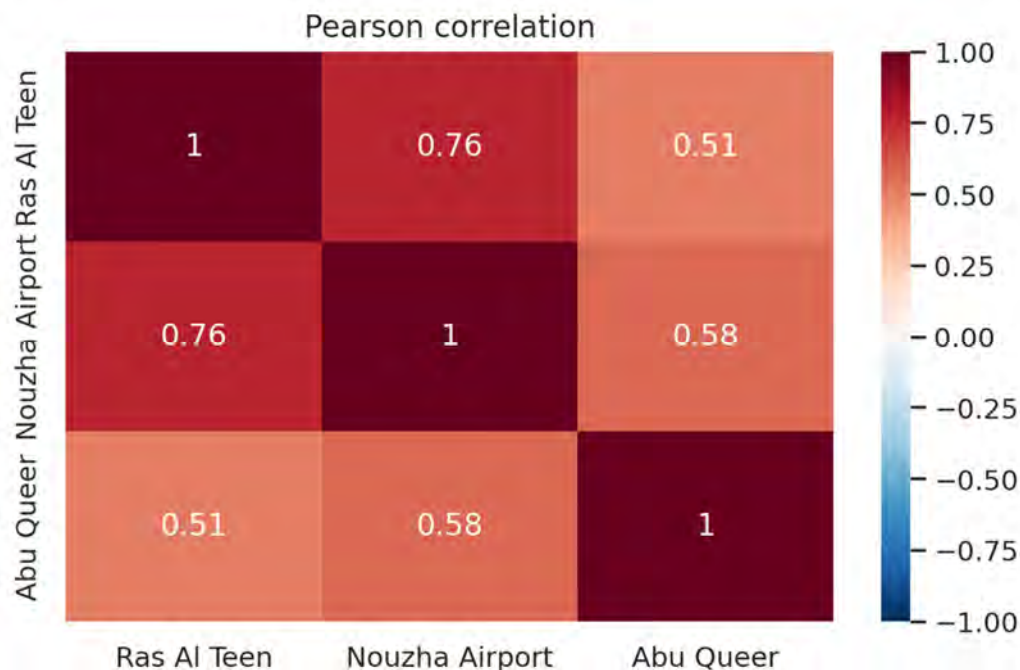


Figure 4-4: Correlation between the rainfall gauges for the period between 1999 and 2016

Daily rainfall records from the Al Nozha Airport rainfall station were analyzed using the HYFRAN software to estimate the statistical characteristics of extreme rainfall events. The available historical rainfall data were processed to determine the relationship between rainfall depth and return periods.

Several probability distributions were tested using HYFRAN to determine the most appropriate statistical model representing the rainfall data of Al Nozha station. The comparison between the tested distributions was carried out using different statistical criteria including the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

The comparison of statistical distributions for the Nouzha Airport rainfall data (sample size = 41, return period $T = 100$ years) indicates a relatively consistent range of estimated extreme values (XT) across most candidate models, generally between

approximately 49.7 mm and 57 mm. Among the tested distributions, the Weibull and Gamma (Method of Moments) provide the lowest AIC values (305.615 and 305.873, respectively), indicating a better balance between model fit and parsimony. The Gumbel distribution yields an XT estimate of 57 mm with a competitive AIC (307), closely aligning with the observed maximum value in the dataset (52.3 mm). The Lognormal (Maximum Likelihood) model gives a notably higher XT (64.1 mm), but its higher AIC (309.181) suggests a less reliable fit compared to other distributions.

Considering both the statistical performance and the consistency with the observed data, the Gumbel distribution is recommended as the most appropriate model for representing extreme rainfall at Nouzha Airport. Its estimated extreme value closely matches the recorded maximum (52.3 mm), providing confidence in its reliability for extrapolation. Therefore, the Gumbel distribution offers a more balanced and physically representative choice for hydrological design, with Weibull and Gamma distributions retained for sensitivity analysis.

Using the selected distribution, rainfall depths corresponding to different return periods (e.g., 5, 10, 25, 50, 100, and 200 years) were estimated. The resulting rainfall values are presented in Table 4-1.

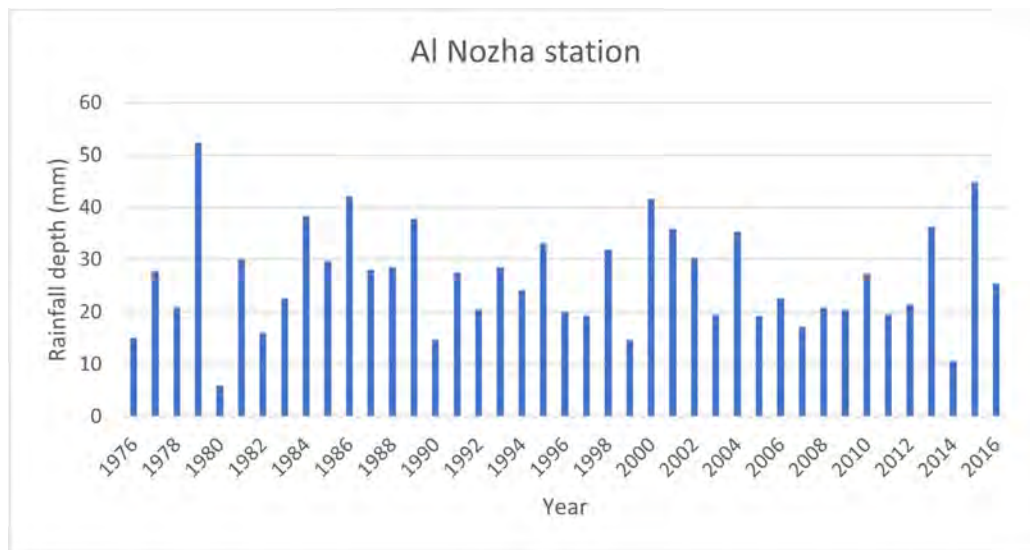


Figure 4-5: AlNozha max. annual Rainfallrecords

Comparison criteria of the distributions

Return period : WARNING ! The decision-support system (comparison criteria as described in the HYFRAN menu) is still being developed. It should therefore only be used as an indication.

Sample size :

Model	Nb param.	XT	P(Mi)	P(Mi x)	BIC	AIC
Weibull (Method of moments)	2	49.745	12.50	30.70	309.042	305.615
Gamma (Method of moments)	2	54.246	12.50	26.98	309.300	305.873
Gumbel (Method of moments)	2	57.007	12.50	10.01	311.284	307.857
GEV (Method of moments)	3	52.372	12.50	7.40	311.888	306.748
Pearson type 3 (Method of moments)	3	52.417	12.50	6.89	312.029	306.888
3-parameter lognormal (Method of moments)	3	52.506	12.50	6.84	312.046	306.905
Log-Pearson type 3 (Method of moments (BO	3	51.415	12.50	6.03	312.297	307.157
Lognormal (Maximum Likelihood)	2	64.072	12.50	5.16	312.608	309.181

P(Mi) : A priori probability P(Mi | x) : A posteriori probability (Method of Schwarz) BIC : Bayesian information criterion AIC : Akaike information criterion

Ponderated mean by A posteriori probability of quantiles :

Figure 4-6: Comparison of probability distributions for rainfall frequency analysis for Al Nozha station.

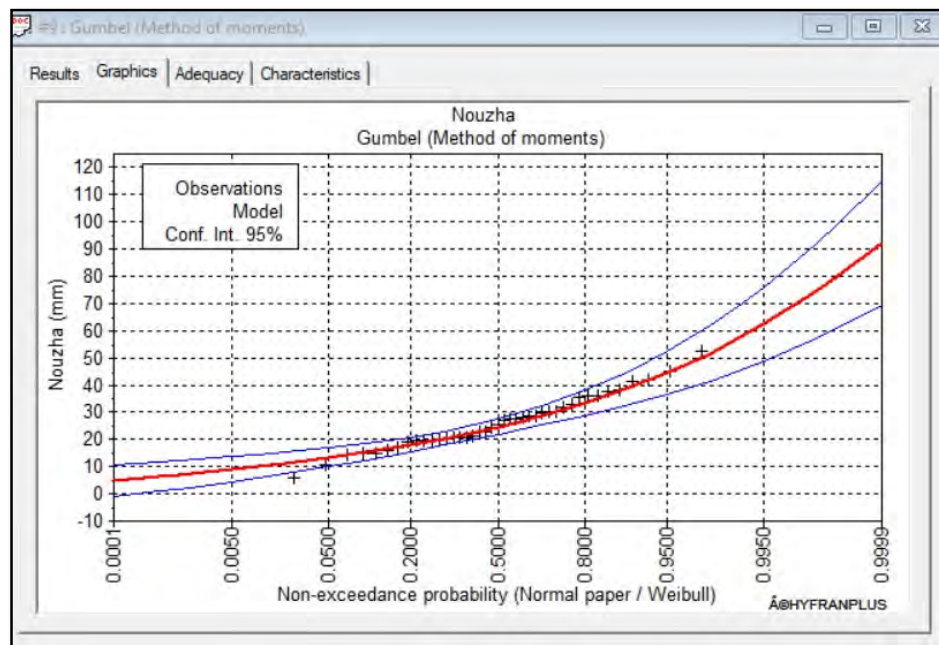


Figure 4-7: Rainfall frequency curve for Al Nozha rainfall station using the Gumbel distribution.

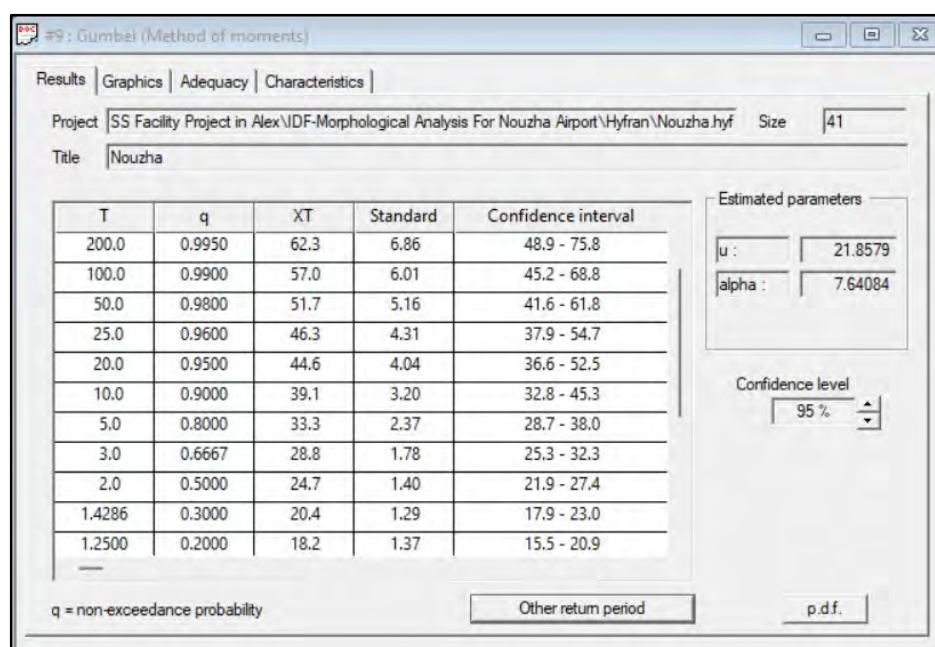


Figure 4-8: Gumbel Distribution results for Al Nozha rainfall station.

Table 4-1: Rainfall Statistical Analysis Results for AL Nozha airport Rainfall Station.

Returned Periods.	Rainfall Depth (mm)
P 200 yr.	62.3
P 100 yr.	57
P 50 yr.	51.7
P 25 yr.	46.3
P 10 yr.	39.1
P 5 yr.	33.3
P 2 yr.	24.7

Furthermore, Daily rainfall records from the Abu Qir rainfall station were analyzed using the HYFRAN software to estimate the statistical characteristics of extreme rainfall events. The available historical dataset, comprising 27 years of records up to 2025, was processed to establish the relationship between rainfall depth and return periods.

Several probability distributions were tested to identify the most suitable statistical model representing the rainfall characteristics at Abu Qir. The comparison between the tested distributions was conducted using standard statistical criteria, including the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

The results of the statistical comparison (for a return period of $T = 100$ years) indicate that the estimated extreme rainfall values (XT) are relatively consistent across the candidate models, generally ranging between approximately 83.5 mm and 96.3 mm. Among the tested distributions, the Lognormal (Maximum Likelihood) model provides the

lowest AIC (226.006) and BIC (228.597) values, indicating the best overall statistical fit among the evaluated models.

Considering both the statistical performance and engineering applicability, the Lognormal distribution will be considered the best-fitting model based on AIC/BIC criteria.

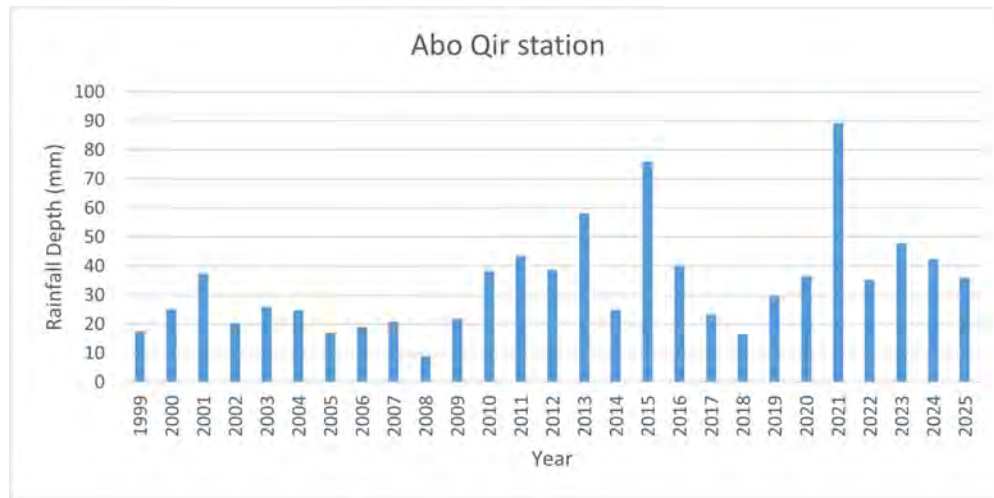


Figure 4-9: Abo Qir max. annual Rainfall records

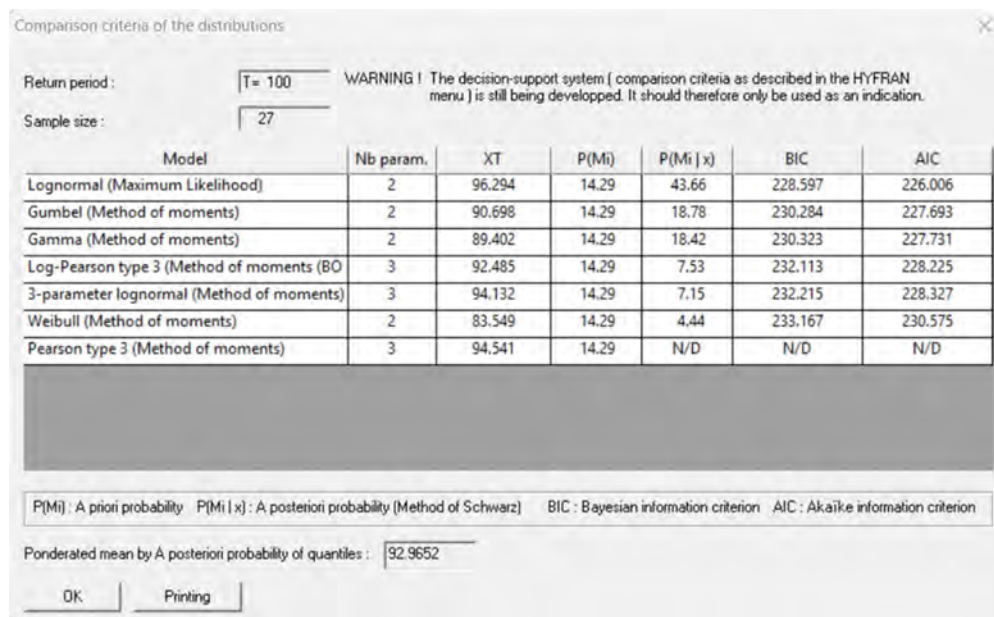


Figure 4-10: Comparison of probability distributions for rainfall frequency analysis for Abo Qir Station

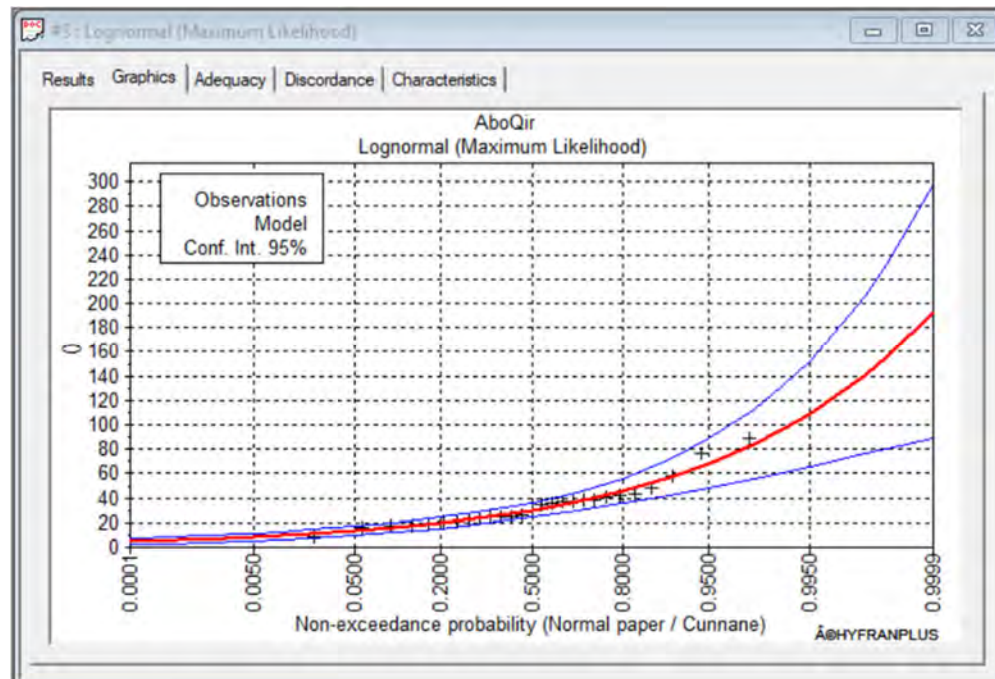


Figure 4-11: Rainfall frequency curve for Abo Qir rainfall station using the Lognormal distribution.

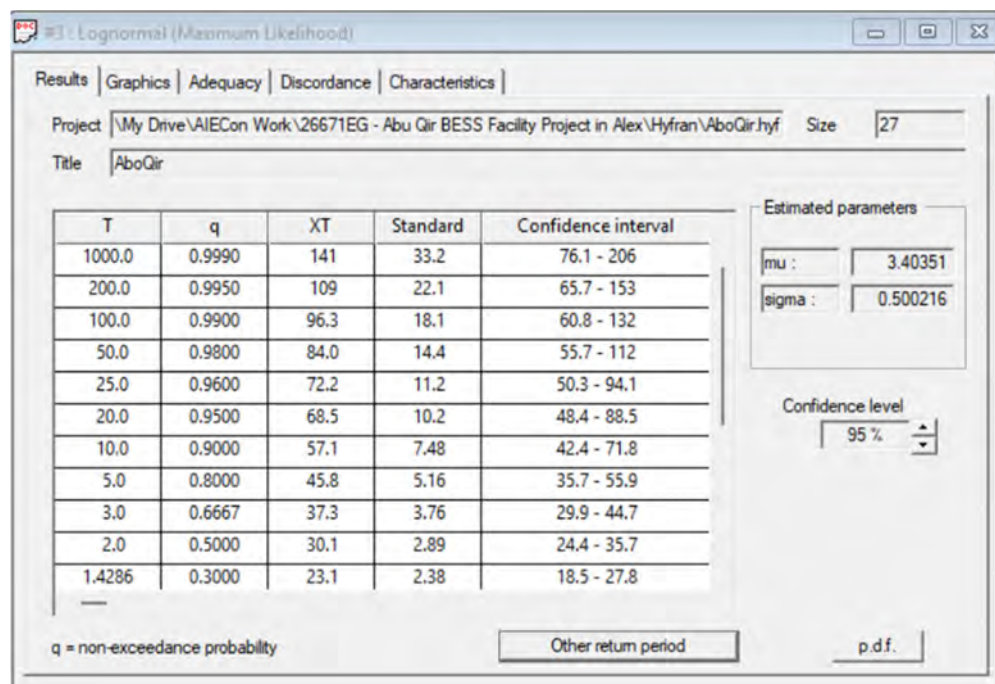


Figure 4-12: Lognormal Distribution results for AboQir rainfall station.

Table 4-2: Rainfall Statistical Analysis Results for AboQir Rainfall Station.

Returned Periods.	Rainfall Depth (mm)
-------------------	---------------------

P 200 yr.	109
P 100 yr.	96.3
P 50 yr.	84
P 25 yr.	72.2
P 10 yr.	57.1
P 5 yr.	45.8
P 2 yr.	30.1

In the absence of a universally agreed-upon multiplier, planning and vulnerability assessments often use predetermined scenarios to test the resilience of infrastructure. A $\pm 10\%$ and $\pm 20\%$ change in rainfall is a standard range used in some major assessments. The "[Development and Climate Change in Egypt: Focus on Coastal Resources and the Nile](#)" report (and related documents which is part of the UNDP-GEF/SCCF Project) mentions that for the Egypt Country Study, climate change scenarios were examined for changes in rainfall of $\pm 10\%$ and $\pm 20\%$ alongside temperature changes. This demonstrates that a $\pm 20\%$ change is **recognized and accepted**.

While general annual rainfall may be projected to decrease in some areas of Egypt (like the north coast) or remain uncertain, many climate models and studies agree on an increase in the intensity and frequency of extreme rainfall events, which are critical for design storm calculations.

- Nashwan and Shahid (2022) ([Source](#))
This study, focusing on the future precipitation changes in Egypt using CMIP6 multimodel ensemble for 1.5°C and 2°C warming scenarios, projected a significant regional increase. It showed an increase in precipitation in the northern high precipitation region by 37% and 54% for the SSP1-1.9 1.5°C and SSP1-2.6 2.0°C scenarios, respectively, at the end of the century (2081–2100). The 20% value is an intermediate, more conservative value compared to the maximum projected increases for the northern regions which are prone to flash floods.
- Alexandria-Specific Analysis ([Source](#))
A study assessing the impact of climate change on urban heavy rainfall extremes in Alexandria (which is particularly vulnerable) found that for a return period of one year, the variation in daily extreme rainfall intensities ranged from a 12% decrease to a 22% increase, suggesting that an increase in the 20% range is within the model-predicted variability for extreme events in a critical area.

Table 4-3: Rainfall Statistical Analysis Results with Climate change impact.

Returned Periods.	AL Nozha Rainfall Depth with 20% climate impact (mm)	AboQir Rainfall Depth with 20% climate impact (mm)
P 200 yr.	74.76	130.8
P 100 yr.	68.4	115.6
P 50 yr.	62.04	100.8

P 25 yr.	55.56	86.6
P 10 yr.	46.92	68.5
P 5 yr.	39.96	55.0
P 2 yr.	29.64	36.1

4.1.1 IDF curves

Intensity–Duration–Frequency (IDF) curves are fundamental tools in hydrologic and hydraulic design, providing a statistical relationship between rainfall intensity, storm duration, and frequency (return period). They are typically derived from long-term rainfall records and are used to design stormwater infrastructure, flood protection measures, and hydraulic structures.

In this study, IDF curves were developed using Bell's ratios method, which provides a simplified empirical approach for estimating rainfall intensities across multiple durations based on a known 24-hour depth. The Bell ratio technique relates shorter-duration rainfall depths to the 24-hour depth through dimensionless ratios, ensuring consistency across durations and allowing for practical application where continuous high-resolution data may be limited.

Recognizing the potential impacts of climate change on extreme rainfall, an additional set of IDF curves has been developed by applying a 20% increase to the design storm depths. This adjustment reflects projected intensification of rainfall extremes and provides a more conservative basis for design, ensuring resilience of hydraulic and stormwater systems under future climatic conditions.

Accordingly, two sets of IDF curves are presented:

1. Baseline IDF curves – derived using Bell ratios and historical rainfall data. **(Error! Reference source not found.)**
2. Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths, to account for climate change impacts. (Figure 4-14)

These parallel curves enable comparison between current design standards and future-resilient design considerations, supporting decision-makers in adopting robust and adaptive stormwater management solutions.

Table 4-4: Bell's Ratio

Duration (min.)	10	20	30	60	120	180	360	720	1440
Bell's Ratios	0.28	0.39	0.46	0.60	0.77	0.81	0.87	0.93	1.00

Table 4-5: Tabulated IDF Values for baseline Curves – AlNozha Station

Return period	Duration (min.)								
	10	20	30	60	120	180	360	720	1440
100 yrs	94.45	65.87	52.24	34.30	22.01	15.39	8.27	4.42	2.38
50 yrs	85.67	59.74	47.39	31.11	19.97	13.96	7.50	4.01	2.15
25 yrs	76.72	53.50	42.44	27.86	17.88	12.50	6.71	3.59	1.93
10 yrs	64.79	45.18	35.84	23.53	15.10	10.56	5.67	3.03	1.63

5 yrs	55.18	38.48	30.52	20.04	12.86	8.99	4.83	2.58	1.39
2 yrs	40.93	28.54	22.64	14.86	9.54	6.67	3.58	1.91	1.03

Table 4-6: Tabulated IDF Values for Modified Curves with climate impact - AlNozha Station

	Duration (min.)								
Return period	10	20	30	60	120	180	360	720	1440
100 yrs	113.34	79.04	62.69	41.16	26.41	18.47	9.92	5.30	2.85
50 yrs	102.80	71.69	56.86	37.33	23.96	16.75	9.00	4.81	2.59
25 yrs	92.06	64.20	50.92	33.43	21.46	15.00	8.06	4.31	2.32
10 yrs	77.75	54.22	43.00	28.23	18.12	12.67	6.80	3.64	1.96
5 yrs	66.21	46.17	36.63	24.05	15.43	10.79	5.79	3.10	1.67
2 yrs	49.11	34.25	27.17	17.84	11.45	8.00	4.30	2.30	1.24

Table 4-7: Tabulated IDF Values for baseline Curves – AboQir Station

	Duration (min.)								
Return period	10	20	30	60	120	180	360	720	1440
100 yrs	159.57	111.28	88.26	57.95	37.19	26.00	13.96	7.46	4.01
50 yrs	139.19	97.06	76.99	50.55	32.44	22.68	12.18	6.51	3.50
25 yrs	119.63	83.43	66.17	43.45	27.88	19.49	10.47	5.60	3.01
10 yrs	94.61	65.98	52.33	34.36	22.05	15.42	8.28	4.43	2.38
5 yrs	75.89	52.92	41.98	27.56	17.69	12.37	6.64	3.55	1.91
2 yrs	49.87	34.78	27.59	18.11	11.62	8.13	4.36	2.33	1.25

Table 4-8: Tabulated IDF Values for Modified Curves with climate impact - AboQir Station

	Duration (min.)								
Return period	10	20	30	60	120	180	360	720	1440
100 yrs	191.48	133.53	105.92	69.54	44.63	31.20	16.76	8.96	4.82
50 yrs	167.02	116.48	92.39	60.66	38.93	27.22	14.62	7.81	4.20
25 yrs	143.56	100.12	79.41	52.14	33.46	23.39	12.56	6.71	3.61
10 yrs	113.54	79.18	62.80	41.23	26.46	18.50	9.94	5.31	2.86
5 yrs	91.07	63.51	50.37	33.07	21.22	14.84	7.97	4.26	2.29
2 yrs	59.85	41.74	33.11	21.73	13.95	9.75	5.24	2.80	1.51

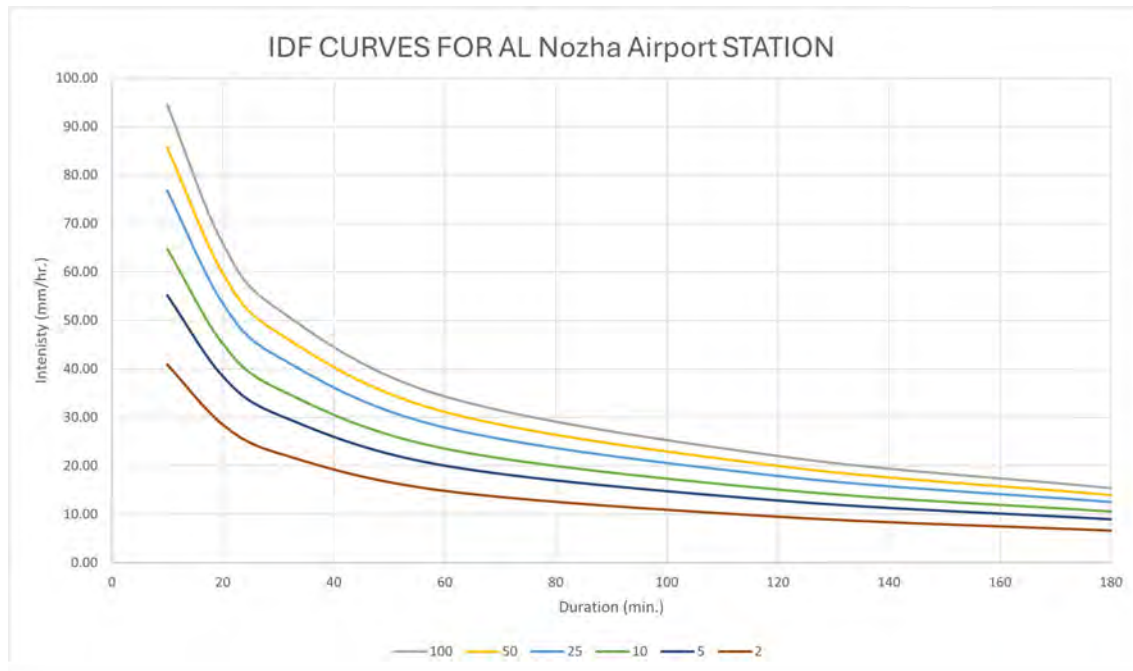


Figure 4-13: Baseline IDF curves – derived using Bell ratios and historical rainfall data - AlNozha Station

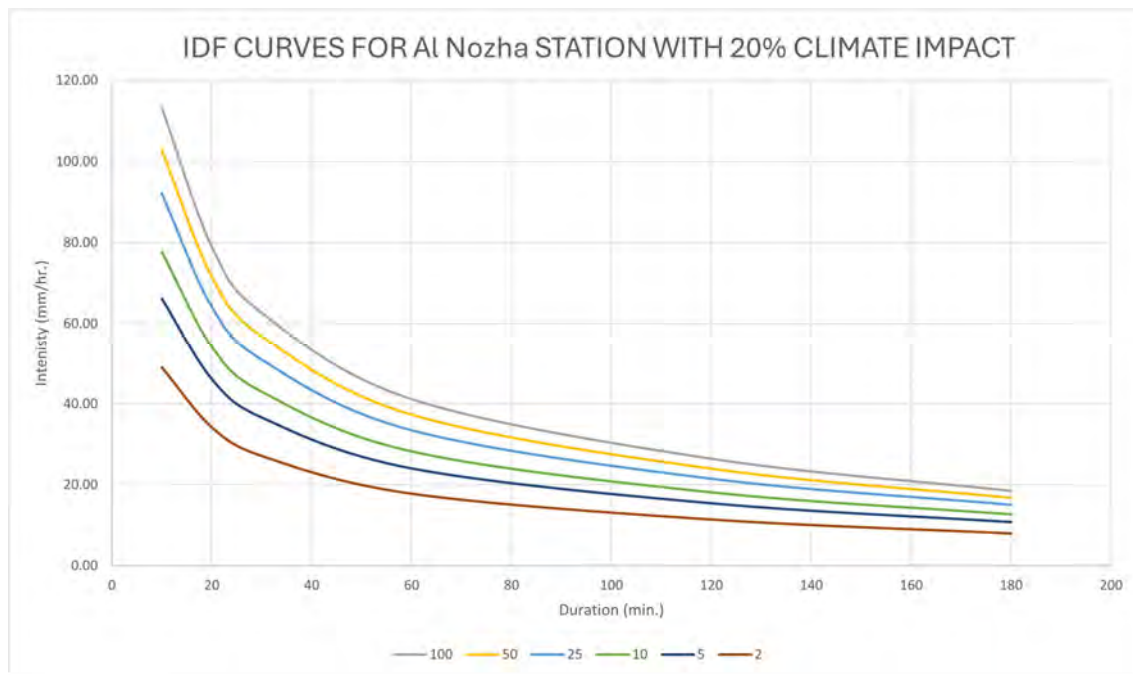


Figure 4-14: Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths - AlNozha Station

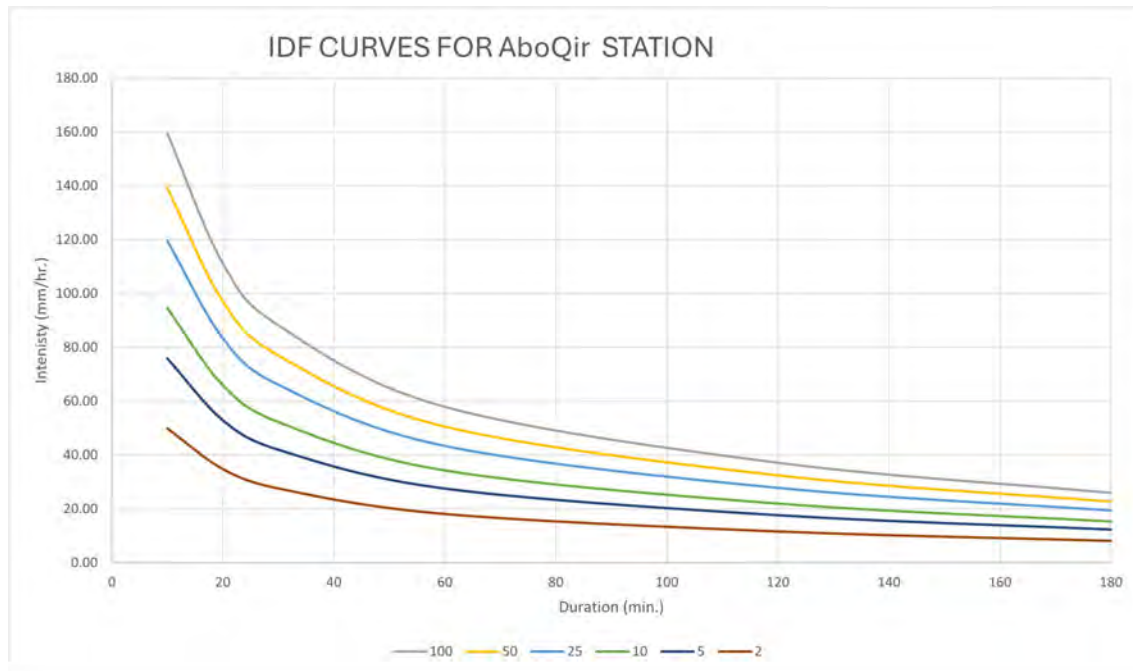


Figure 4-15: Baseline IDF curves – derived using Bell ratios and historical rainfall data - AboQir Station

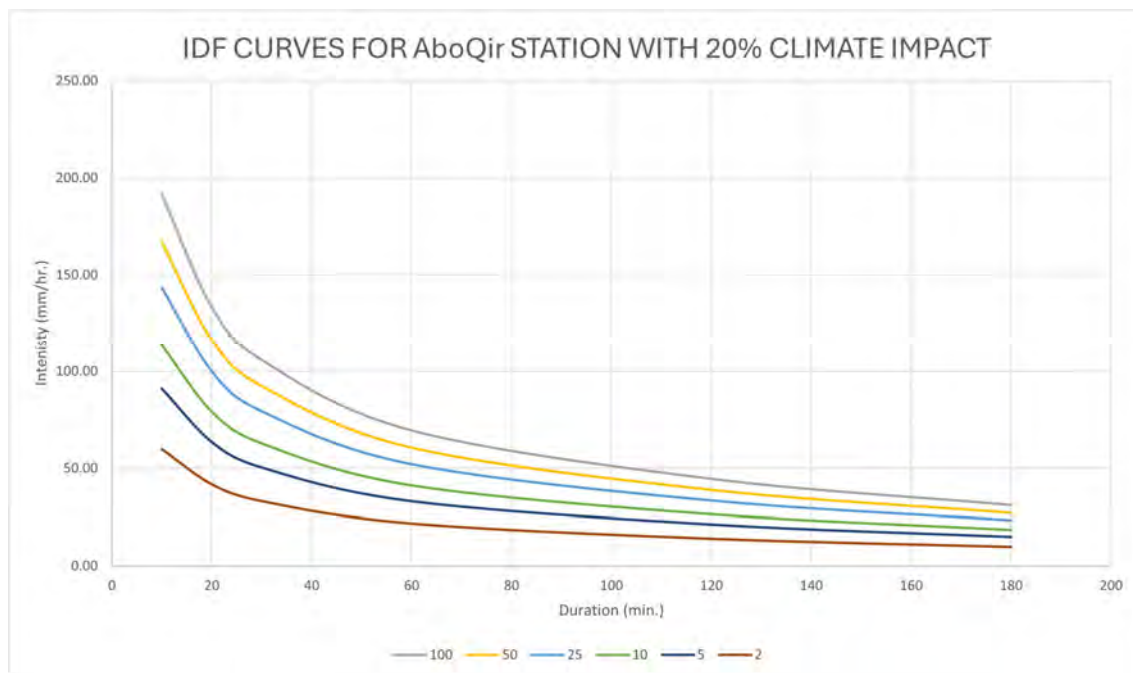


Figure 4-16: Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths – AboQir Station

4.2 MORPHOLOGICAL ANALYSIS

Morphological studies and identification of streams and drainage basins affecting the boundaries of the study area were performed using the SRTM reviewed previously in this

report on ArcGIS software. **Error! Reference source not found.** shows a general overview of the streams affecting the whole project area and from which the effective watersheds will be determined, while **Error! Reference source not found.** shows the effective watersheds in the study area projected on a Satellite image.

The topographic maps and recent satellite images were used to check the results of the software and determine the main effective watersheds. Topographic maps are widely used in determining the paths of streams in various areas, especially in areas that are not accessible. The names of major streams can be identified through the maps showing the names in each region and also the topographic maps show the elevations and contour lines, which are used in the identification of streams and watercourses in areas where there is no clear stream path and also used to determine the different morphological characteristics of all catchments (boundary, area, longest flow path, slope, shape, time of concentration, ... etc.).

Also, the topographic maps show some important elements such as roads, power lines and others.

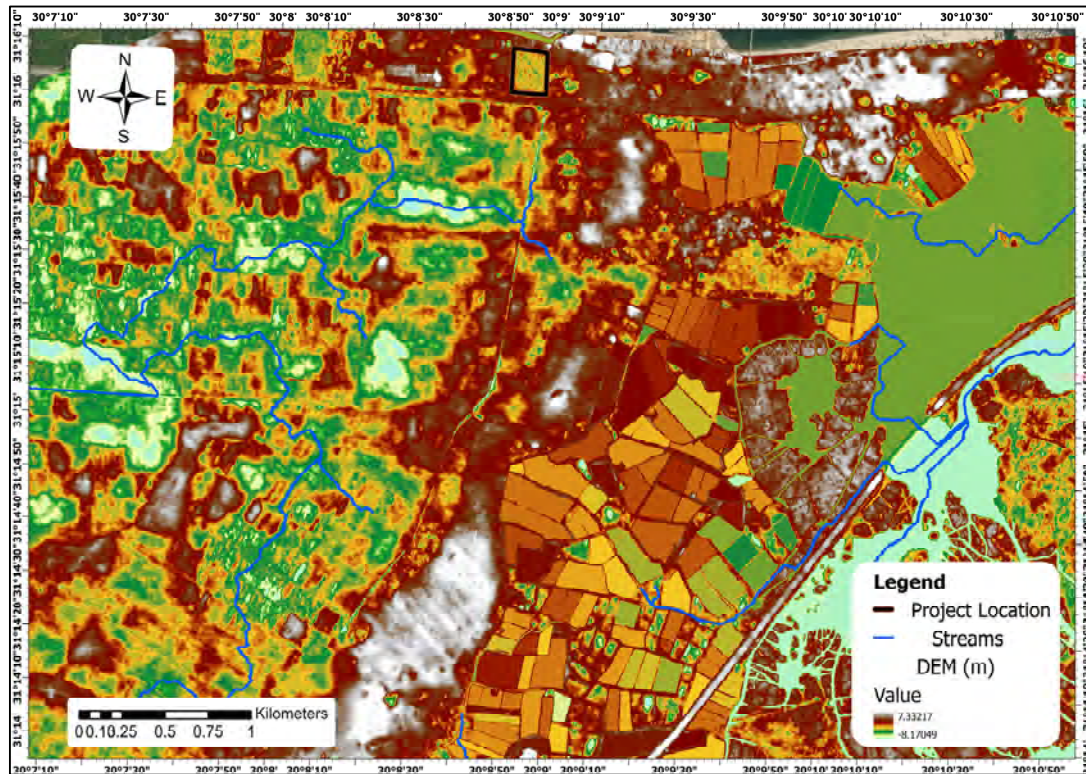


Figure 4-17: Regional stream network over DEM showing no direct impact on study area.

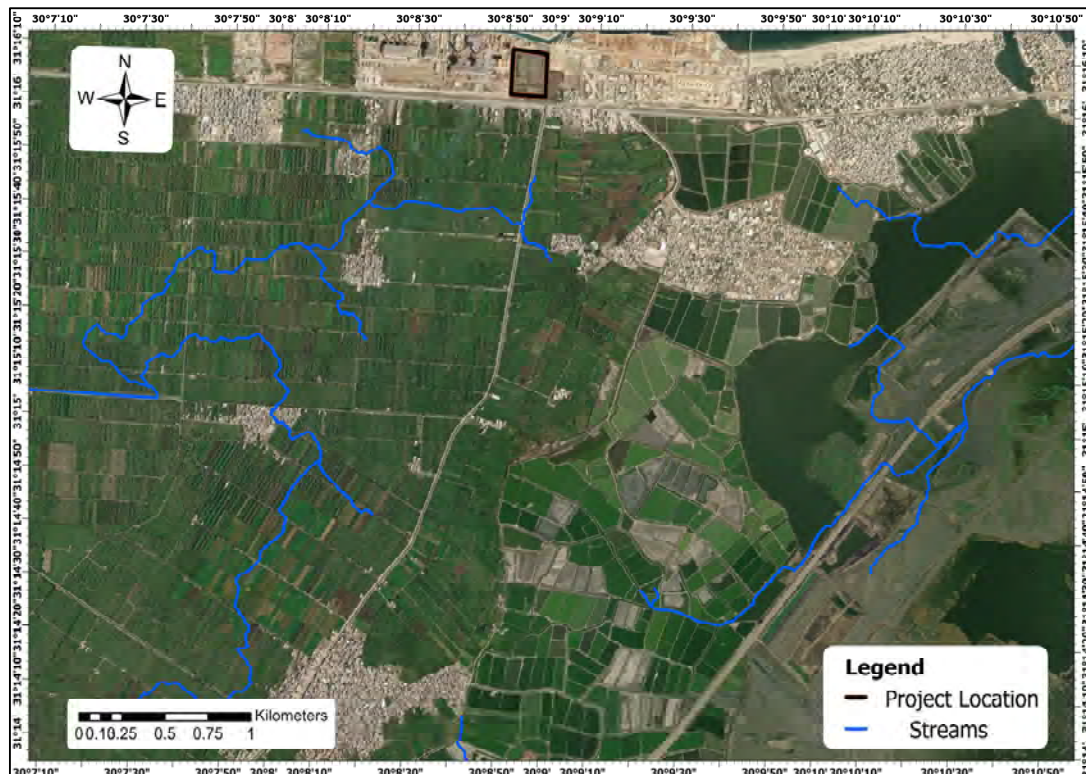


Figure 4-18: Effective watersheds projected on a satellite image, showing no direct intersection with the study area.

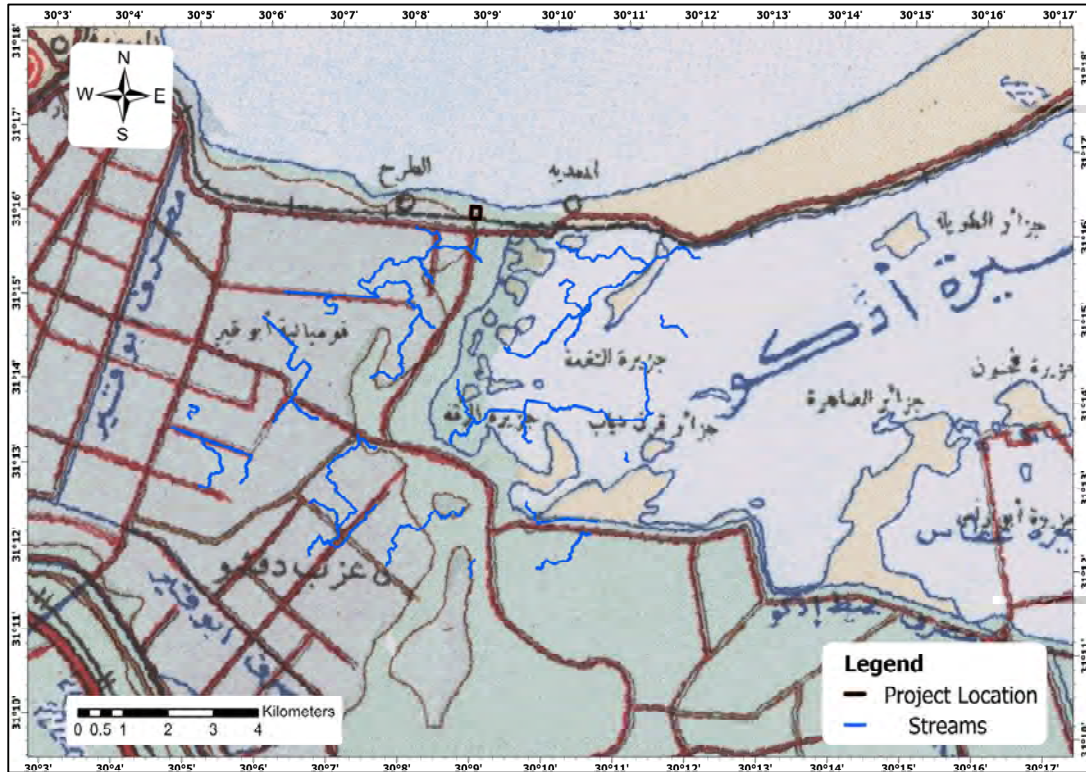


Figure 4-19: Effective watersheds projected on Topo Map, showing no direct intersection with the study area.

4.3 HYDROLOGICAL ASSESSMENT AND STORM DRAINAGE

4.3.1 External flood Hazard

A detailed morphological assessment and stream delineation analysis were carried out using HEC-HMS to evaluate potential external hydrological impacts on the project site. The results confirm that no natural watercourses, wadies, or active drainage streams intersect with or discharge into the study area.

The site is hydraulically enclosed by existing irrigation canals, drainage channels, and a nearby lake. These surrounding features act as physical and hydraulic boundaries, effectively preventing external floodwaters from reaching the project area.

In addition, the topographic analysis indicates that the site is positioned away from regional flash flood flow paths and is not located within any upstream catchment drainage corridor. As such, it is not exposed to flood risks originating from upstream runoff or external stream systems.

Based on the above findings, the hydrological consideration for the project is limited to direct rainfall falling within the site boundary and the resulting localized surface runoff. No external stream attack or upstream flood impact is anticipated under the assessed conditions.

4.3.2 Internal Storm Drainage

The project site is located between an existing cooling water canal to the north and a combination of infrastructure elements to the south, including a railway line, roadway, and irrigation canal, as illustrated in Figure 4-20. From a topographic perspective, the site is relatively depressed compared to its surroundings, with ground levels approximately 0.5 m lower on average, as shown in Figure 4-21. As the site is protected against external flooding, the primary challenge is managing direct precipitation within the site. Based on the site conditions and field investigations, three alternatives for internal stormwater drainage have been identified. This local depression limits the potential for natural drainage toward adjacent features.

Based on the site configuration, surrounding infrastructure, and field observations, the site is considered protected against external flood sources. The presence of elevated surrounding features and the absence of upstream contributing catchments prevent inflow from external areas. Accordingly, the flood risk is limited to direct precipitation over the site, and no external flood mitigation measures are required. The primary design consideration is therefore the management of internal stormwater runoff.

Based on site constraints, hydraulic considerations, and regulatory requirements, three stormwater management alternatives have been assessed:

- **Alternative 1: Discharge to Cooling Water Canal / Sea**

This option involves directing stormwater toward the adjacent cooling water canal, with discharge achieved either by gravity or pumping, depending on the final grading design.

Key considerations:

- Requires optimization of finished ground levels to ensure hydraulic conveyance.
- May require pumping due to the relative elevation difference.

Permitting requirements:

- Egyptian Environmental Affairs Agency (EEAA)
- Egyptian Coast Guard / Egyptian Navy (as the owner of the cooling water canal)

Assessment:

While technically feasible, this option involves multiple regulatory approvals and operational considerations, which may affect project implementation timelines.

- **Alternative 2: Discharge to Existing Irrigation Canal**

This option proposes conveying stormwater to the irrigation canal located south of the site.

Key considerations:

- Requires crossing existing infrastructure (road and railway), introducing significant engineering and coordination challenges.

- May require pumping depending on final grading levels.

Permitting requirements:

- General Authority for Roads and Bridges
- Egyptian National Railways Authority
- Ministry of Water Resources and Irrigation

Assessment:

This alternative is considered complex due to infrastructure crossings and the number of required permits, resulting in increased cost, risk, and implementation duration.

- **Alternative 3: Internal Collection and Removal (Preferred Option)**

This option involves managing stormwater entirely within the site through a collection and storage system, followed by removal using suction trucks.

Concept:

- Construction of trenches and soakways along internal roads to capture runoff.
- Conveyance of collected water to a ground-level storage tank.
- Periodic removal of stored water using suction trucks after rainfall events.

Design basis:

- Design return period: **5 years** (typical for internal drainage systems)
- Site area: **49,000 m²**
- Rainfall depth: **55 mm** based on AboQir station
- Estimated runoff volume: approximately **2700 m³**

Advantages:

- No external discharge or regulatory approvals required
- Proven solution already implemented at the existing power plant
- Reduced construction complexity and implementation risk

Assessment:

This option is considered the **most practical and feasible solution**, offering a reliable and implementable approach with minimal regulatory constraints.

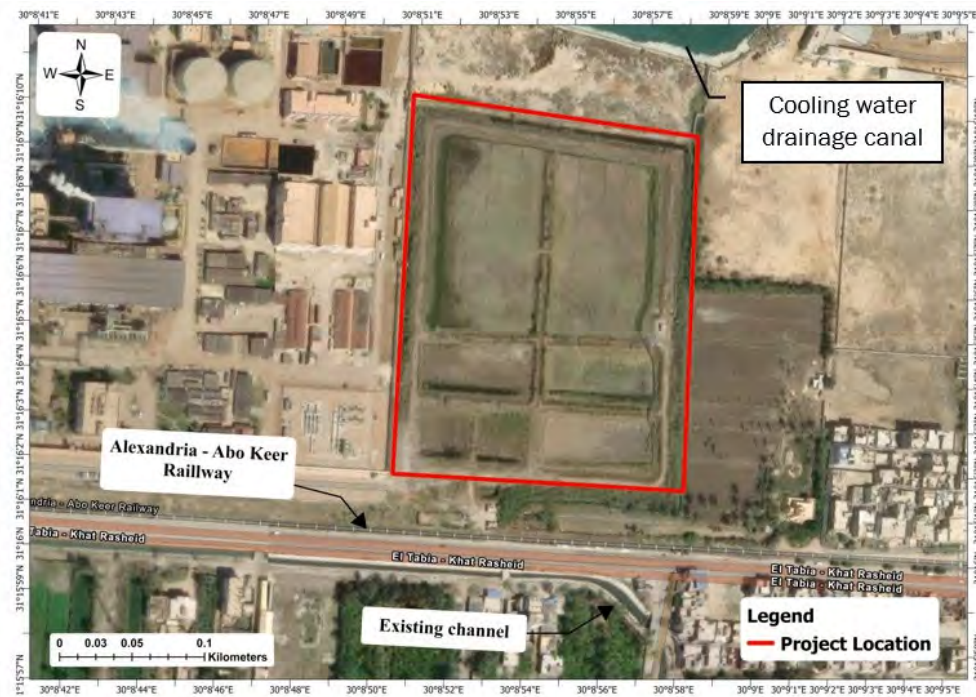


Figure 4-20: existing features around the site



Figure 4-21: levels of the site with the surrounding features

5 COSTAL STUDY

5.1 Data collection

Data collection stage is the most important stage during our studies because it represents accuracy for all our study, calculations, numerical models and the proposed protection work.

5.1.1 Met ocean data

The met-ocean data has been downloaded from ERA 5 website, it is a website that provides climate data and information about impacts on sectoral areas through Climate Data. Store (CDS) The CDS is designed to enable users to tailor services to more specific public or commercial. The data downloaded according to it is (LAT= 31.28, LONG= 30.15), and the data is downloaded from 1/1/1994 to 31/12/2025 which means 32 years, The met-ocean data extracted includes the following:

- Significant wave height
- Peak wave period
- Mean wave direction
- Wind speed components (U, V)
- Nautical angle
- Tidal data

Table 5-1: Raw met-ocean data, from (ERA5).

Date	Wind Speed (m/s)	Wind direction	Mean Wave direction	T(sec)	H(m)
12/23/1994	2.106832015	158.3697058	335.7268	10.13755	0.6019196
11/5/1995	4.829677464	236.4060801	235.93172	9.775734	0.8955345
10/7/1996	2.124765581	266.2397636	302.12085	11.278175	0.67996174
11/25/1997	1.26889651	347.3383262	352.43945	13.346046	0.693522
5/6/1998	5.592185756	145.0583299	325.48853	10.743019	0.74434453
11/10/1999	2.974807718	260.6822779	310.44873	10.100929	0.4288696
12/7/2000	2.34305651	179.8012068	333.93066	9.021339	0.5084142
11/15/2001	1.392339055	258.069548	302.45117	11.53257	0.62483376
10/15/2002	0.341827001	78.82633445	302.90894	9.815773	0.92808574
1/13/2003	3.572222997	203.59208	309.3772	11.997414	0.82884085
11/10/2004	2.299014272	56.31978611	301.47754	11.059914	0.989926
1/22/2005	3.488379476	9.39285204	285.71143	10.721046	0.9587173
2/26/2006	2.436608685	108.9312922	296.55542	10.784523	0.9878097
1/27/2007	0.809449778	179.2482873	355.80298	10.909035	0.36704344
12/6/2008	2.819634479	359.7427948	351.85327	10.980324	0.9842566
10/20/2009	3.048031618	124.4433159	322.5327	10.135109	0.5633551
1/11/2010	3.198556592	332.4557317	303.011	10.652931	0.39754915
12/28/2011	3.554573272	183.8606788	343.76587	9.646339	0.87339276
12/1/2012	2.478677933	230.5812965	0.27365708	10.33506	0.39254946

12/3/2013	3.672307239	134.7246043	344.2307	11.164162	0.75748557
2/14/2014	2.755396421	278.9733574	316.62695	10.023293	0.7233625
5/24/2015	3.36286869	152.3303539	299.2827	11.134132	0.45578253
3/25/2016	3.641652718	96.34256067	305.18823	11.152687	0.62275934
12/30/2017	4.937501198	155.5841652	272.68677	10.795265	1.4133482
2/17/2018	2.790050117	71.56700406	297.79053	11.375343	1.6573381
1/11/2019	2.472635214	264.9943842	294.75098	11.525246	1.1179771
12/11/2020	3.415692317	111.1838974	275.51587	9.828957	0.65711933
12/13/2021	3.297599165	171.4862458	305.323	10.740089	1.0159559
5/15/2022	1.202255341	239.1146852	305.52686	5.4900894	0.5061272
1/12/2023	5.097957139	55.68364483	281.12744	10.340187	1.8370008
2/27/2024	3.136067949	299.5793931	294.25146	12.242043	1.2799425
11/28/2025	2.005421113	337.6941695	347.1648	8.803566	0.55585945

5.1.2 Wave data

Wave data is the most important element for coastal areas studies because it is the main threat for all coastal elements such as Breakwater, jetties, and bridges. Waves were statically analyzed to estimate operational and extreme wave heights corresponding to different directions. Wave data conditions include wave height, wave period and percentage of occurrence.

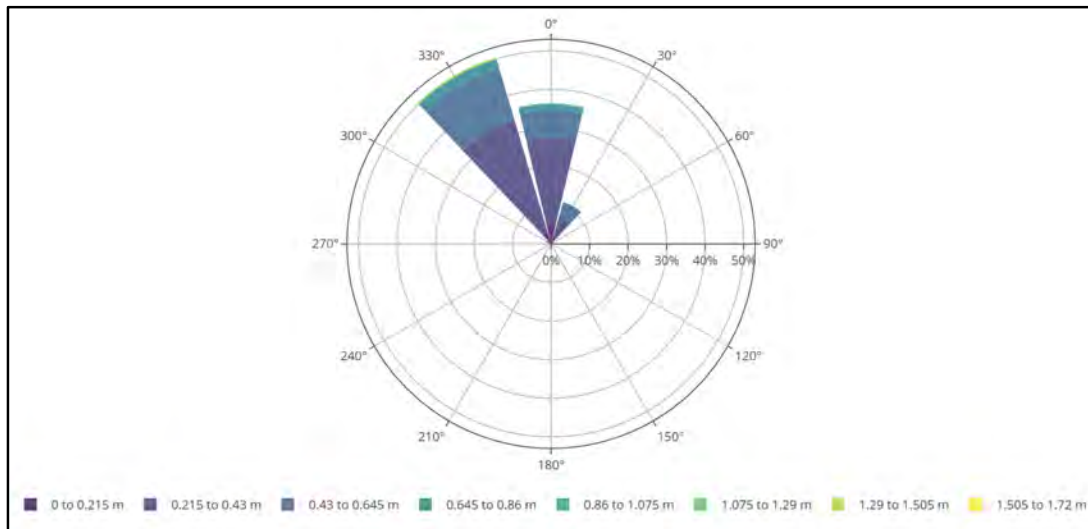


Figure 5-1: Wave rose for SWH, from (ERA5).

5.1.3 Wind data

Wind data is one of the main drivers of ocean dynamics in the project area because it is a huge amplifier for the waves in the area. Winds were statistically analyzed to estimate operational and extreme wind speeds corresponding to different directions, wind data conditions including wind speed, percentage of occurrence, and duration.

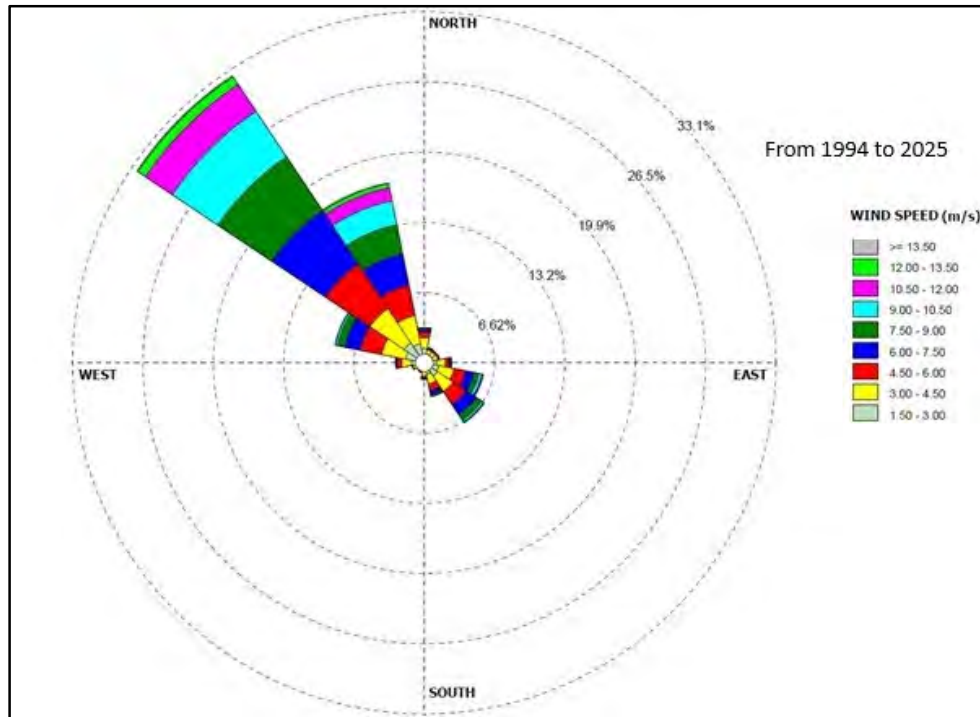


Figure 5-2: Wind rose, From (ERA5)

5.1.4 Tidal data

Determination of the maximum and minimum expected water levels during the lifetime of the project is essential for both the construction and the operation of the project. The design levels for the marine structures and waterfront features mainly depend on the measured and estimated sea water levels. These levels are determined according to tidal levels, storm surges, Sea Level Rise (SLR) and design wave heights. The tidal data at the project site was based on local data and Admiralty total tide and tidal model driver (TMD) MATLAB toolbox software's.

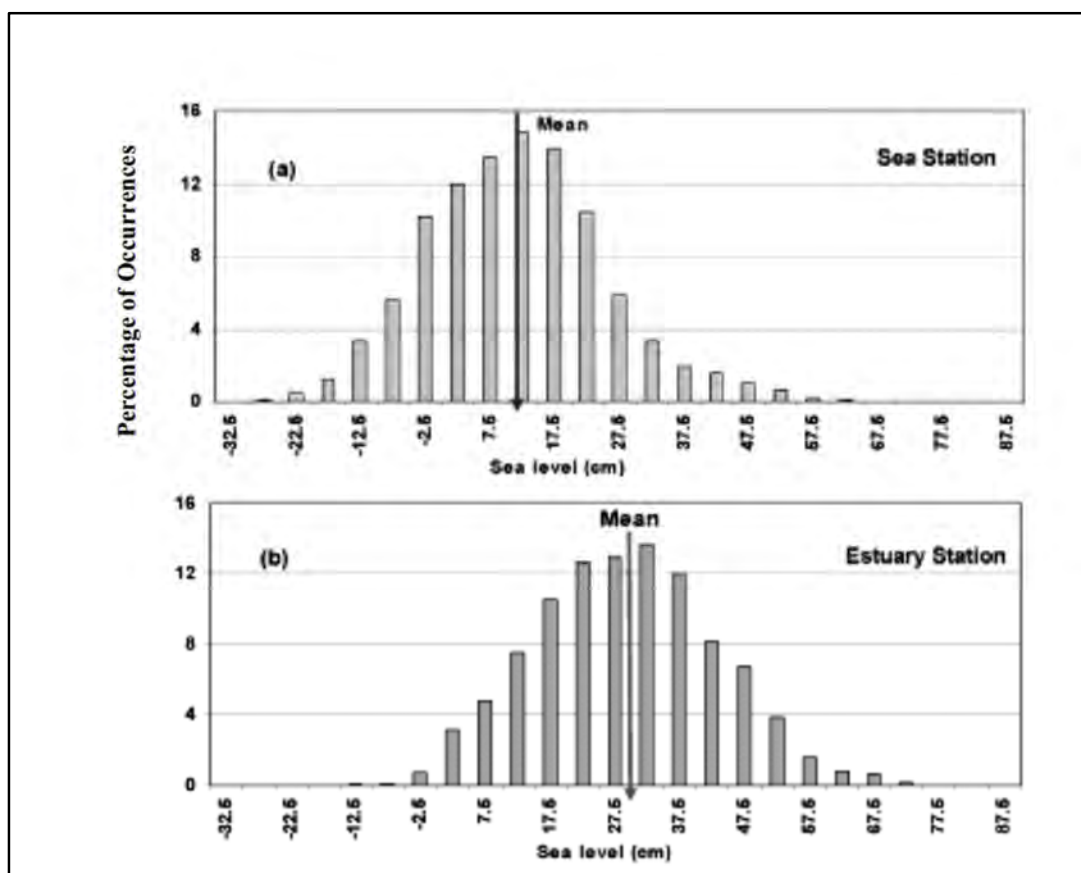


Figure 5-3: Frequency distribution of the hourly sea and surge levels at Rosetta Sea (a, c) and Rosetta Estuary (b, d) stations during 1982, from (SEA-LEVEL-CHANGES-AT-ROSETTA-PROMONTORY-EGYPT) paper.

	Monthly MSL		LLWL		HHWL		Monthly range	
Month	Stn.1	Stn.2	Stn.1	Stn.2	Stn.1	Stn.2	Stn.1	Stn.2
January	24.6	36.8	2	15	54	73	52	58
February	23.3	26.8	-1.5	-14	62	77	63.5	91
March	12.6	31.1	-7	4	47	69	54	65
April	-2.6	21.1	-27	-2	23	41	50	43
May	-0.1	15.1	-23	-5	15	34	38	39
June	5.8	24.9	-18.5	2	27	51	45.5	49
July	8.2	38.5	-19	15	27	59	46	44
August	3.1	39.2	-15	23	32	58	47	35
September	16.2	30.9	-2	10	37	52	39	42
October	18.9	34.2	-6	10	39	57	45	47
November	16.3	23.9	-11	-2	43	60	54	62
December	22.8	35.6	-4	-3	46	70	50	73
Mean	12.4	29.8	-11	4.4	37.7	58.4	48.7	54

Figure 5-4: Monthly mean sea (MSL), low low water (LLWL), high high water (HHWL) levels and monthly range (cm) at Rosetta Sea (stn.1) and Estuary (stn.2) stations during 1982, from (SEA-LEVEL-CHANGES-AT-ROSETTA-PROMONTORY-EGYPT) paper.

5.2 Climate Change Impact

Climate change represents a critical hydrodynamic forcing in coastal engineering, primarily manifested through Global Mean Sea Level Rise (GMSL) driven by thermal expansion and cryosphere loss. This long-term trend is exacerbated by Storm Surges, defined as the abnormal rise in seawater level generated by severe atmospheric pressure drops and wind stress during extreme weather events.

For the determination of the SLR_proj component, the NASA Sea Level Projection Tool was utilized. This platform provides localized, probabilistic sea level projections based on the IPCC Sixth Assessment Report (AR6), accounting for regional physical processes and Vertical Land Motion (VLM) under various Shared Socioeconomic Pathways (SSPs).

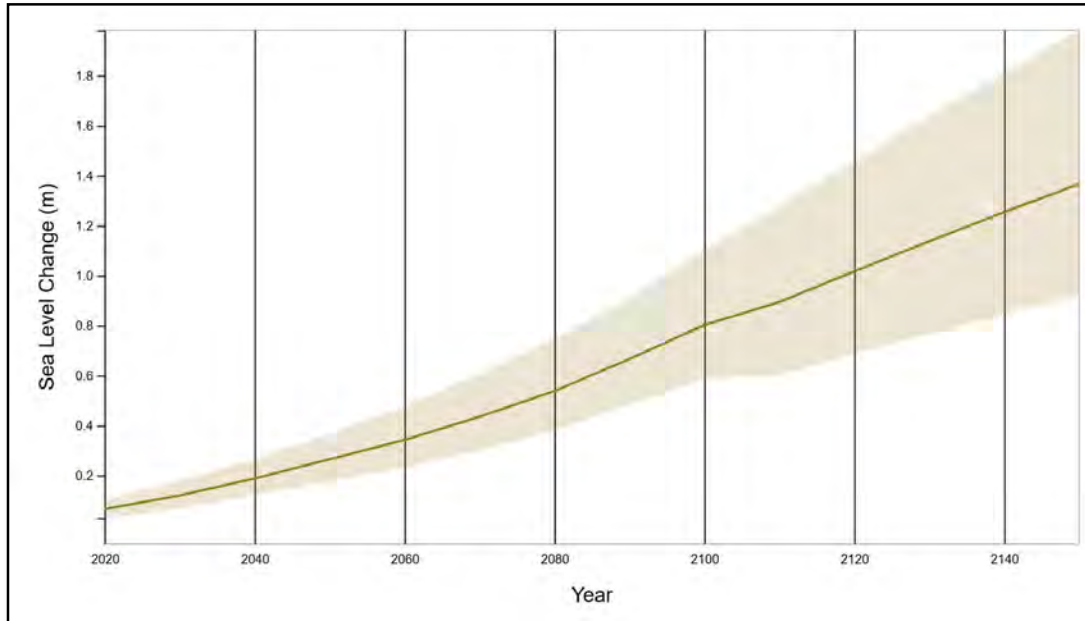


Figure 5-5: Climate change impact, from (NASA Tools)

5.3 Coastal Assessment

To ensure the structural integrity and operational resilience of coastal infrastructure, the Design Water Level (DWL) is computed by superimposing these variables. The governing equation adopted for this study is:

$$DWL = MHHW + SLR + S_{\text{surge storm}}$$

Where:

- MHHW: Mean Higher High Water (astronomical tide).
- SLR_: Projected Sea Level Rise due to climate change.

- **S_{surge} storm:** Storm Surge elevation inverse barometer effect + wind set-up+ eta_{wave} caused by breaking waves.

S_{surge} storm

Since the site is not in direct contact with the sea and is separated by an existing breakwater (formed by the bank of the cooling water drainage canal), which is protected with shore protection stones designed to resist erosion, wave action, and storm surges, wave impacts on the site are considered negligible. The crest level of this protective structure is approximately +2.0 m, as shown in Figure 5-7, , which provides an effective barrier against direct wave influence on the project area.

MHHW

The tidal range along the Egyptian Mediterranean coast is relatively small, as the tides are primarily semidiurnal in nature.

- **Alexandria Western Harbour:** The maximum tidal range is observed to be **0.35 m**.

(Said, M. Sea Level variations along the Egyptian Mediterranean Coast. National Institute of Oceanography and Fisheries (NIOF), Egypt)

- **Rosetta Promontory:** The tidal range is generally less than **26 cm**. At the Rosetta Estuary station, the "largest spring range" is calculated to be **26.2 cm**, while at the Sea station it is **17.6 cm**.

(UNESCO/IOC. (2026). Stations kindly provided by National Institute of Oceanography and Fisheries, Alexandria (Egypt). Sea Level Station Monitoring Facility, status as of March 25, 2026)

- **Seasonal Variation:** At Alexandria, the tidal range can fluctuate seasonally between **18.6 cm** and **22.9 cm**.

(World Bank Group. (2022). Egypt Country Climate and Development Report. Documents & Reports, November 8, 2022)

The value of 35 cm will be adopted for MHHW

References

- Abdallah, A.M., El-Gindy, A.A., & Debes, E.A. (2006). Sea Level Changes at Rosetta Promontory, Egypt. *Egyptian Journal of Aquatic Research*, Vol. 32, No. 1, pp. 34-47.
- Dawod, G.M. (2001). The Magnitude and Significance of Long-Term Sea Level Rise in Egypt from a Geodetic Perspective. *Proceedings of the Eleventh International Conference on Environmental Protection*, Alexandria University, pp. 207-215.
- Heiba, M.M.M., El-Geziry, T.M., & Abd El Fattah, S.T. (2025). Surge behavior in Alexandria western harbor and its correlation to dominant meteorological condition. *Maritime Research and Technology*, Vol. 4, No. 1.
- Said, M. Sea Level variations along the Egyptian Mediterranean Coast. National Institute of Oceanography and Fisheries (NIOF), Egypt.
- UNESCO/IOC. (2026). Stations kindly provided by National Institute of Oceanography and Fisheries, Alexandria (Egypt). Sea Level Station Monitoring Facility, status as of March 25, 2026.
- World Bank Group. (2022). Egypt Country Climate and Development Report. Documents & Reports, November 8, 2022.

SLR

Based Figure 5-6, The projected sea level rise by 2060 is estimated at approximately **45 cm**, with an uncertainty range of about **30 m to 60 cm**, based on the adopted climate projections and project life time.

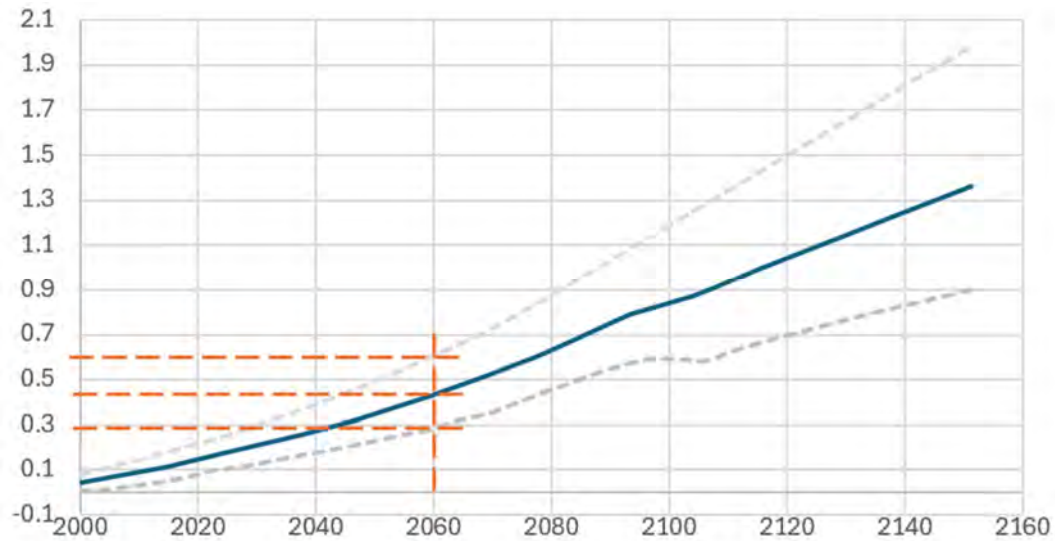


Figure 5-6: Projected Sea Level Rise values for project life time (30 years after construction)

$$\text{Design Level} = \text{MHHW} + \text{RSLR} = 35 + 45 = 80 \text{ cm}$$

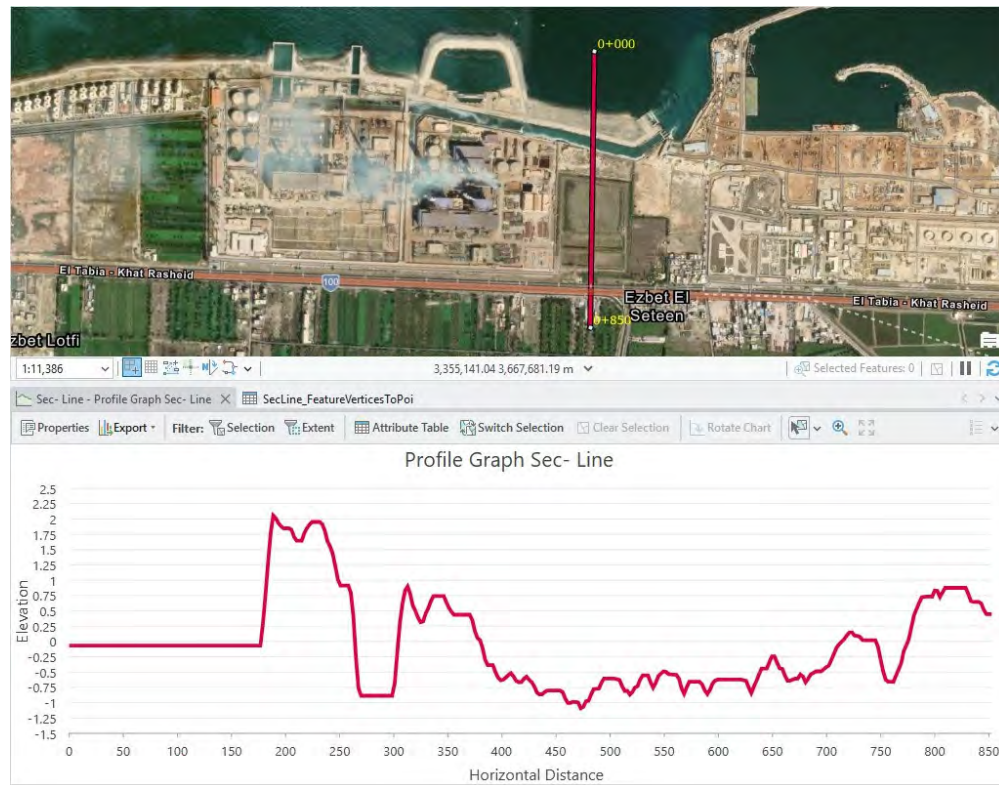


Figure 5-7: Existing site conditions and levels with respect to Sea level

6 CONCLUSION & RECOMMENDATION

6.1 Hydrological Study

Conclusions:

- **No External Stream Impact:** The hydrological modeling and stream delineation performed via HEC-HMS confirms that no natural watercourses or active streams directly intersect or discharge into the study area.
- **Hydrological Safety:** The project site is topographically situated away from regional flash flood paths, ensuring the area is safe from external flood hazards originating from upstream catchments.
- **Runoff Characterization:** The primary hydrological consideration for the site is limited to direct localized rainfall (onsite runoff) rather than external stream attacks.

Recommendations:

- **Internal Stormwater Network:** Design an efficient onsite drainage system to collect and convey runoff generated within the project footprint during extreme rainfall events.
- **Site Grading:** Optimize final site levels to prevent localized ponding, ensuring all internal runoff is directed toward designated discharge points.
- Based on the technical, regulatory, and operational evaluation, **Alternative 3 (Internal Collection and Removal)** is recommended for implementation. This approach aligns with site constraints, avoids permitting complexities, and provides a robust solution for managing stormwater generated from direct precipitation. The design will be further developed during the detailed design stage to optimize storage capacity, collection efficiency, and operational procedures.

6.2 Coastal Study

Conclusions:

Based on the above assessment, the Design Water Level (DWL) for the project has been established considering the combined effects of astronomical tides (MHHW), projected sea level rise (SLR), and storm surge components. Given the microtidal nature of the Egyptian Mediterranean coast, the contribution of MHHW is relatively minor and has been conservatively adopted as +0.35 m. The projected sea level rise for the design horizon (2060) is taken as +0.45 m, reflecting climate change impacts with an appropriate allowance for uncertainty. Furthermore, due to the presence of the existing breakwater with a crest level of approximately +2.0 m, the influence of wave setup and direct storm surge on the site is considered significantly attenuated. Accordingly, the overall DWL is governed primarily by sea level rise and residual surge effects, while direct wave action is negligible. This approach provides a technically robust and conservative

basis for defining design levels, ensuring the long-term safety and resilience of the project under both current and future coastal conditions.

Recommendations:

Minimum Design Crest Level: It is strongly recommended that the Minimum Design Level (DL) for all coastal infrastructure and land reclamation at the site be set at no less than +0.8 m (MSL). This elevation is critical to accommodate the cumulative effects of the Mean Higher High Water (0.35m), and the expected climate change 0.45m

Annex 3: Site Visit Report

Scatec

Environmental Impact Assessment for
Battery Energy Storage System (BESS) in
Abu Qir, Alexandria Governorate
(Site Visit Report)

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Table of Contents

List of Figures	ii
1. Background	3
2. Methodology	3
3. Description and Key Findings	3
3.1 Site Surroundings	6
3.1.1 Agricultural Lands	6
3.1.2 Wastelands.....	7
3.1.3 Urban and industrial Environment	8
3.1.4 Littoral Area	9
3.2 Project Site	9
3.2.1 Topography and Soil	10
3.2.2 Recorded Flora	11
3.2.3 Recorded Fauna	12
4. Conclusion	13
5. References	14

List of Figures

Figure 1: Sign indicating Abu Qir Power Plant’s ownership of the Project Site	4
Figure 2: Map showing the project Site and its surrounding area	5
Figure 3: Palm plantations located south of the Project Site	6
Figure 4: Agricultural plot located on the eastern borders of the Project Site	7
Figure 5: Agricultural ditch running parallel to the eastern fence of the Project Site ..	7
Figure 6: Wastelands located on the southern borders of the Project Site	7
Figure 7: Abu Qir Power Plant.....	8
Figure 8: Extension of Ezbet El-Settin, east of the Project Site	8
Figure 9: View of the reed-dominated site.....	9
Figure 10: Western walkway bordering the fence of the Abu Qir Power Plant	10
Figure 11: Water accumulation in the low-lying parts of the Project Site	10
Figure 12: View of the topsoil of the Project Site at the eastern walkway	11
Figure 13: Common Knotgrass (<i>Polygonum aviculare</i>).....	11
Figure 14: Field Wormwood (<i>Artemisia campestris</i>)	11
Figure 15: Small Mallow (<i>Malva pusilla</i>).....	12
Figure 16: Egyptian Mallow (<i>Malva parviflora</i>)	12
Figure 17: Vimba (<i>Pluchea dioscoridis</i>)	12
Figure 18: Quincy Pride (<i>Pluchea ovalis</i>).....	12

1. Background

As part of the Energy Valley Project, Scatec is planning to construct a 2,435 MWh Battery Energy Storage System (BESS) in Abu Qir. In this respect, an ESIA has to be developed for the Abu Qir BESS Project.

According to EEAA recent memorandum regarding categorization of Electricity Storage Batteries projects the project is categorized under “Scoped Category B” projects. Moreover, as per lenders’ requirements, the project is to be categorized as “Category B”. Both EEAA and lenders’ categorization do not require the organization of a Public Disclosure meeting.

As part of the ESIA study for the project, a field visit has been carried out. Accordingly, the present Field Visit Report provides an account on the environmental settings of the sites visited within the Project Site, its Area of Influence (Aol)¹ within the close project surroundings, as well as a brief overview of the general context of the area focusing on biodiversity.

2. Methodology

Environics carried out an initial assessment based on analysis of satellite images before undertaking the field survey. This step resulted in the preliminary identification of the land use sets and habitat types of the study area and provided an initial identification of the area features and landmarks. Accordingly, a site visit to the project site and its close surroundings was undertaken on the 22nd of January 2026 by three Environics team members.

The location of characteristic features was recorded using a GPS. The survey included an active search to record the main species of flora and signs indicating the presence of fauna (markings, urine, scats, tracks, trails, burrows and dens, carcasses, remains of prey or direct observation of the animal). Field notes were taken, and photographic records of flora and fauna were obtained, whenever possible.

3. Description and Key Findings

The project will be built on a land belonging to the new Abu Qir Power Plant, located in Abu Qir City on the Tabia – Rashid Road, within the administrative borders between the Alexandria and Beheira Governorates. The closest settlement is the village of Ezbet El-Settin located southeast and east of the Project Site. The project site can be accessed via Tabia – Rashid Road.

¹ The Aol considered for the project has been estimated at 500 m around the Project Site boundaries, using a precautionary approach.

The site has been previously rented to an investor to develop a fish farm. However, the fish farm lasted for about six months, and the site was then abandoned.



Figure 1: Sign indicating Abu Qir Power Plant's ownership of the Project Site

The project boundaries are defined as follows:

- North: Abu Qir Power Plant storage area;
- West: Abu Qir Power Plant;
- East: Open land and agricultural land; and
- South: Tabia – Rashid Road and railway.

Figure 2 shows the location of the Project Site and its surrounding area.

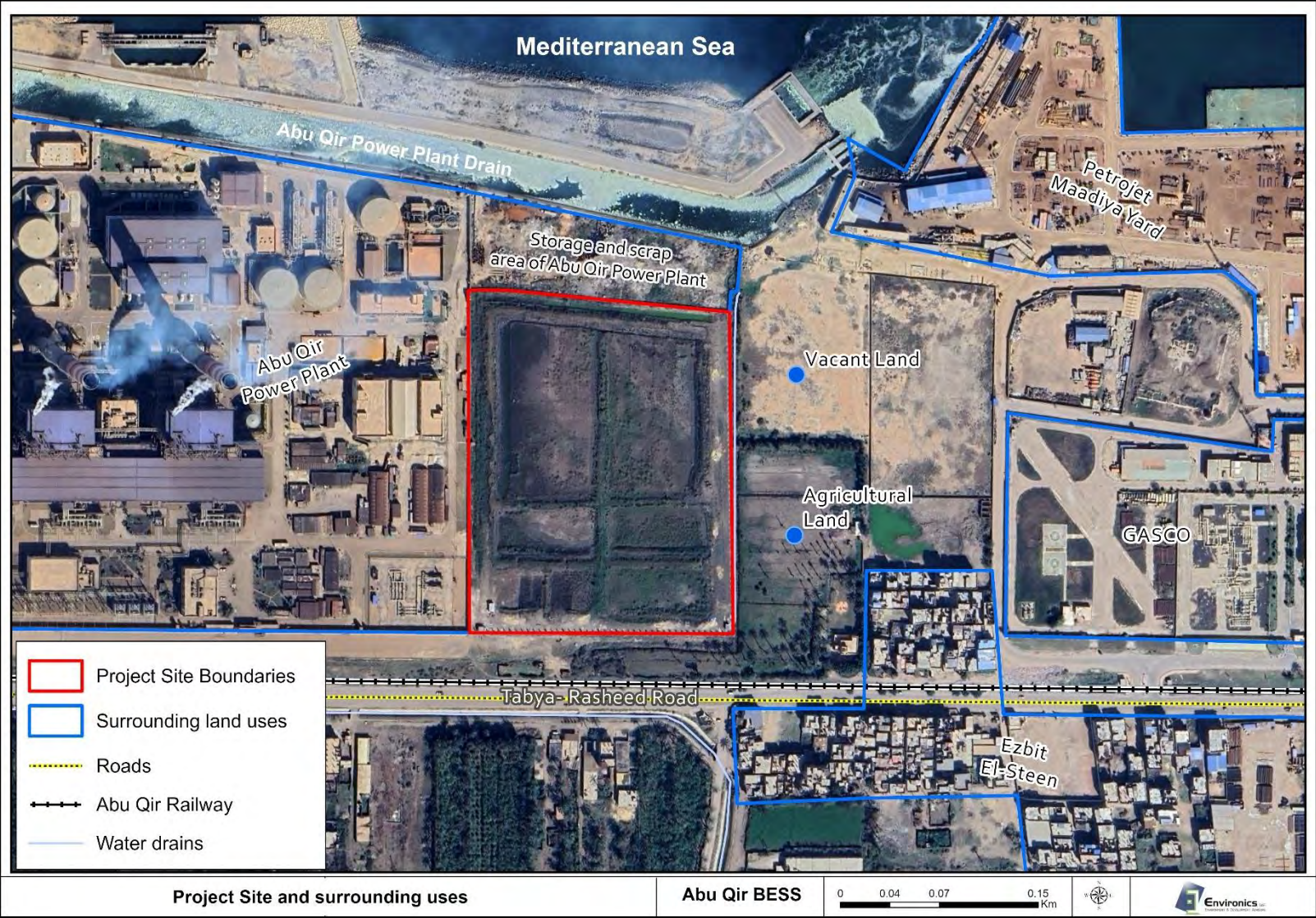


Figure 2: Map showing the project Site and its surrounding area

3.1 Site Surroundings

The habitats in close proximity to the Project Site can be divided into four main habitat types.

3.1.1 Agricultural Lands

Agriculture is the main activity of residents in rural areas and there are essentially two types of cultivations: open fields with crops and palm plantations. The main cultivated crops are tomato, cauliflower, cabbage, squash, clover and chards in winter. In summer, tomato, pepper, eggplant and fodder are the main crops. Date palm plantations and orchards are abundant in the area as well.

These farmlands are essentially completely modified habitats, nevertheless, they provide habitat for a variety of weeds and ruderal plants in the fields, canal and drain banks.



Figure 3: Palm plantations located south of the Project Site

There is a small agricultural plot (El Shazly Land) located on the eastern borders of the Project Site (Figure 4), with a small agricultural ditch running parallel to the eastern fence of the site (Figure 5).



Figure 4: Agricultural plot located on the eastern borders of the Project Site



Figure 5: Agricultural ditch running parallel to the eastern fence of the Project Site

3.1.2 Wastelands

Wastelands with extensive flora are present on the southern borders of the project site (Figure 6), probably due to the relatively frequent rainfalls characterizing the area and possibly due to the presence of irrigation water from the nearby agricultural lands.



Figure 6: Wastelands located on the southern borders of the Project Site

3.1.3 Urban and industrial Environment

In addition to the Abu Qir Power Plant (Figure 7), the coastal area is characterized by the presence of numerous other industrial facilities such as Abu Qir Fertilizers Company, GASCO, etc.



Figure 7: Abu Qir Power Plant

Moreover, there are urban settlements scattered throughout the farmlands, Ezbet El-Settin being the closest to the Project Site. This village is located southeast of the Project Site and extends northwards, to the east of the Project Site (Figure 8).



Figure 8: Extension of Ezbet El-Settin, east of the Project Site

The built environment of the area also includes irrigation canals and drains, roads and roadsides, a railway and other constructions. These habitats are home to exotic plants and trees introduced for ornamental purposes, as well as opportunistic fauna associated with human activities (e.g., feral dogs and cats, rats, mice, and several species of birds).

3.1.4 Littoral Area

The beach at Abu Qir Bay is characterized by gravel or sand deposit although silty and muddy tidal flats are within this zone. Ancient sediments in this zone contain organisms typical of the tidal flat such as worms, crabs and clams (Shehata, 1987).

On the other hand, north of the Project Site, the beach is virtually inexistent being occupied by the Abu Qir Power Plant drain.

3.2 Project Site

This Project Site covers an area of about 0.06 km² (60,000 m²) and is completely fenced. It was used as a fish farm approximately three years ago and then abandoned. Accordingly, the site layout was developed for this purpose. Currently, the site is divided into ponds, where the invasive reed *Phragmites australis* dominate (Figure 9). No buildings related to the previous project are present.



Figure 9: View of the reed-dominated site

Accordingly, the site is mostly low-lying, except for the walkways bordering the site fence (Figure 10).



Figure 10: Western walkway bordering the fence of the Abu Qir Power Plant

3.2.1 Topography and Soil

Most of the Project Site is low-lying due to the previous presence of fishponds, while the side walkways are flat and levelled.

Evidence of rainwater accumulation and potential seawater intrusion was observed across the low-lying parts of the site (Figure 11). The existing ponds facilitate the collection and retention of rainwater and, possibly, groundwater rise, allowing to the growth of extensive reed vegetation.



Figure 11: Water accumulation in the low-lying parts of the Project Site

The surface soil of the walkways is mostly composed of wet clay (clayey soil), with scattered sand and gravel (Figure 12).



Figure 12: View of the topsoil of the Project Site at the eastern walkway

3.2.2 Recorded Flora

As previously mentioned, the site is dominated by the invasive Common Reed (*Phragmites australis*), forming a reed swamp. Other recorded species included the Common Knotgrass (*Polygonum aviculare*), Field Wormwood (*Artemisia campestris*), Small Mallow (*Malva pusilla*), Egyptian Mallow (*Malva parviflora*), Vimba (*Pluchea dioscoridis*) and Quincy Pride (*Pluchea ovalis*).



Figure 13: Common Knotgrass (*Polygonum aviculare*)



Figure 14: Field Wormwood (*Artemisia campestris*)



Figure 15: Small Mallow (*Malva pusilla*)



Figure 16: Egyptian Mallow (*Malva parviflora*)



Figure 17: Vimba (*Pluchea dioscoridis*)



Figure 18: Quincy Pride (*Pluchea ovalis*)

3.2.3 Recorded Fauna

Amphibians, such as the Egyptian Toad (*Sclerophrys regularis*), are common in the nearby agricultural fields and in the irrigation and drainage network of the area, and probably among the reeds of the Project Site. The endemic Nile Delta Toad (*Sclerophrys kassasii*) is also reported from the area. It is a highly aquatic species that prefers densely vegetated microhabitats such as reed swamps, overgrown canals and waterways (Baha El Din, 2006). Therefore, *Sclerophrys kassasii* might also occur within the man-made reed swamp of the site.

Snakes found in the agricultural fields of the area include the African Beauty Snake (*Psammophis sibilans*), Diced Water Snake (*Natrix tessellata*), Eastern Montpellier Snake (*Malpolon insignitus*) and the highly venomous Egyptian Cobra (*Naja haje*). The presence of snakes onsite was also reported by officials from the Abu Qir Power Plant.

Recorded birds include the House Sparrow (*Passer domesticus*), Barn Swallow (*Hirundo rustica*), Hooded Crow (*Corvus cornix*) and Cattle Egret (*Bubulcus ibis*). Numerous other birds typical of the agricultural areas are also present including the Palm Dove (*Spilopelia senegalensis*), Spur-Winged Lapwing (*Vanellus spinosus*), Black-winged Kite (*Elanus caeruleus*), Common Kestrel (*Falco tinnunculus*), Common Barn-owl (*Tyto alba*) and many others (EEAA/UNEP, 1993).

Mammalian fauna is mainly composed of commensal species such as the Black Rat (*Rattus rattus*), Brown Rat (*Rattus norvegicus*), House Mouse (*Mus musculus*), Egyptian Weasel (*Mustela subpalmata*) and Red Fox (*Vulpes vulpes*). The Egyptian Slit-faced Bat (*Nycteris thebaica*) and Kuhl's Pipistrelle (*Pipistrellus kuhlii*) have a wide habitat range and roost in caves, tombs, houses and old buildings. *Pipistrellus kuhlii* is found even in buildings located in busy streets (Hoath, 2009).

4. Conclusion and Recommendations

The Project Site is located in the Abu Qir coastal area of Alexandria Governorate. The region is relatively rainy, allowing rainwater accumulation and the natural growth of vegetation.

The area is an entirely modified habitat which includes numerous coastal industrial facilities, as well as human settlements, agricultural areas and palm plantations in the close surroundings, particularly south of the Project Site.

The Project Site was previously used as a fish farm and structured accordingly. Consequently, except for the walkways bordering the site fence, it consists of low-lying ponds where water accumulates, thus resulting in the growth of extensive reed vegetation.

Results of the survey indicate that the site has a high vegetation cover. Flora is mostly composed of the invasive Common Reed (*Phragmites australis*), as well as other common and widespread species. Fauna of the area includes several commensal species, and other common animals, widespread in Egypt's rural environments.

Despite the presence of numerous resident birds typical of agricultural areas, due to the type and nature of the project, there will be no interaction between the Project Site and local avifauna, even in the case of birds passing over the Project Site. On the other hand, the nearby agricultural lands constitute the ideal habitat for several resident birds and might be also utilized as resting and roosting sites for potential migratory birds passing over the area.

5. References

- Baha El Din, S. (2006) *A Guide to the Reptiles and Amphibians of Egypt*. The American University of Cairo Press, Cairo – New York
- EEAA/UNEP (1993) *Habitat Diversity: Egypt*. Publications of the National Biodiversity Unit, 1, EEAA, Cairo: 302 pp
- Hoath, R. (2009) *A Field Guide to the Mammals of Egypt*. The American University in Cairo Press, Cairo, Egypt
- Shehata, M.H. (1987) *Seismic Sounding in Abu Qir – Lake Idku Area*. M.Sc. Thesis, Department of Environmental Studies, Institute of Graduate Studies and Research, Alexandria University

Annex 4: National and Lenders Environmental and Social, Requirements Gap Analysis

National and Lenders' Environmental and Social Requirements Gap Analysis

Updated to incorporate AfDB ISS 2023, EBRD ESP 2024, EIB Environmental and Social Standards 2022, and IFC Performance Standards 2012

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
Assessment and Management of Environmental and Social Risk and Impact			
Environmental and Social Assessment (ESA)	An integrated ESA shall be conducted for the project encompassing direct, indirect, and cumulative E&S risks and impacts throughout the project life cycle (OS1, para. 19). The ESA must address all relevant OSs (OS1–OS10), including climate change vulnerability, gender inequalities, and impacts on vulnerable groups. The updated ISS 2023 expands the ESA scope to include: contextual risk assessment covering human rights, SEAH/GBV risks, labour influx, and conflict dynamics (OS1, Annex 1). For high-risk (Category 1) projects, independent specialists must conduct the ESA (OS1, para. 21). Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, EIB Standards 1 and 5, and IFC PS1 likewise require an integrated and proportionate assessment of direct, indirect and cumulative risks and impacts over the project life cycle, including the Area of Influence, associated facilities, vulnerable groups, relevant human-rights considerations and climate-related risks. Higher-risk projects require appropriately qualified and, where warranted, independent specialists.	According to Law 4/1994 and its Amendments Law 9/2009 and Law 105/2015, an Environmental Impact Assessment (EIA) should be prepared before project execution to assess the potential impacts resulting from the project.	The national EIA framework is largely aligned with the basic requirement for pre-project assessment. However, significant gaps remain: (i) national law does not require explicit assessment of cumulative or indirect impacts; (ii) climate change vulnerability assessment is not mandated; (iii) gender and vulnerability screening are not required under national law; (iv) contextual risk assessment covering SEAH/GBV, labour influx, and human rights is not addressed by Egyptian legislation. The updated ISS 2023 strengthens these requirements beyond what is captured in national law. Additional gap context: The broader lender frameworks also make associated-facility screening, human-rights and contextual-risk review, climate-risk integration and lifecycle management more explicit than the national EIA process.
Environmental and Social Management Systems (ESMS)	An ESMS shall be in place to address E&S issues across the project life cycle (OS1, para. 12). ESMS requirements shall be incorporated into third-party contracts. The updated ISS 2023 requires the ESMS to include procedures addressing SEAH, GBV, modern slavery, and labour influx risks (OS1, Annex 2). Contractor compliance shall be monitored against contractual conditions.	--	The national laws do not obligate facilities to develop a documented ESMS. Such systems are usually voluntarily developed by facilities aiming to obtain international quality management certification (e.g. ISO). The updated ISS 2023 adds new requirements for the ESMS to explicitly address SEAH, GBV, and modern slavery — areas not covered by Egyptian law. This

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	Additional lender context (EBRD / EIB / IFC): EBRD ESR 1 and IFC PS1 require a proportionate ESMS comprising policy, risk identification, management programmes, organisational capacity, emergency preparedness, stakeholder engagement, monitoring and review. EIB Standard 1 similarly requires documented management arrangements, adequate resources, contractor controls and corrective action throughout implementation.		gap is significant for projects with large contracted workforces. Additional gap context: Egyptian law does not establish a comparable integrated ESMS covering contractor management, stakeholder engagement, emergency preparedness, adaptive management and management review.
Environmental and Social Policy	An overarching E&S policy shall be in place to define the environmental and social objectives and principles guiding the project's E&S performance. This policy shall be communicated to all employees. The updated ISS 2023 requires the policy to explicitly address non-discrimination, gender equality, and protection from SEAH/GBV (OS1, para. 12; OS2). Additional lender context (EBRD / EIB / IFC): IFC PS1 expressly requires an overarching E&S policy. EBRD ESR 1 and EIB Standard 1 also require the promoter/client to establish commitments and governance arrangements consistent with applicable E&S requirements and to communicate them through the organisation and relevant contractors.	--	The national laws do not obligate facilities to develop an E&S policy. However, such policies are usually developed for facilities seeking international quality management certification. The updated ISS 2023 adds a specific requirement to address SEAH/GBV and gender equality in E&S policies — a gap relative to Egyptian national requirements. Additional gap context: Other lenders similarly expect a documented policy covering human rights, labour, stakeholder and environmental commitments, which is not expressly required by national law.
Environmental and Social Management Plans (ESMP)	An ESMP shall be developed to address identified environmental and social risks and impacts, appropriate to the nature and scale of the project. The ESMP is binding and referred to in the financing agreement (Bank Policy, para. 54). It shall include: mitigation and monitoring measures, climate adaptation measures, and measures to address SEAH/GBV and labour influx risks. Requirements shall be communicated to all levels of the organization including contractors. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, EIB Standard 1 and IFC PS1 require time-bound management programmes or ESMPs with responsibilities, resources, monitoring	According to the Egyptian Guidelines for EIA (EEAA, 2009), an ESMP should be developed as an essential part of the EIA. The ESMP should consist of a set of mitigation, monitoring and institutional measures to be performed during different phases of the project. Responsibilities for mitigation and monitoring should be clearly defined in the ESMP.	There is no binding law requiring communication of the ESMP to all workers, and no penalties in national law for non-compliance. The updated ISS 2023 adds new ESMP requirements covering climate adaptation and SEAH/GBV management — areas not addressed by Egyptian law. Since the ESMP is part of the EIA, environmental approval implies approval of the ESMP from the competent authority, but enforcement mechanisms remain weak. Additional gap context: Additional lender gaps include the absence of nationally

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	indicators, contractor flow-down, corrective action and management-of-change arrangements. These commitments may be incorporated into financing documents and monitored through an ESAP or equivalent instrument.		prescribed budgets, schedules, contractor flow-down, management-of-change and lender-verifiable action tracking.
Organizational E&S Capacity and Commitment	Specific in-house personnel with clear lines of responsibility and authority shall be designated for E&S issues. The E&S representative shall possess the requisite knowledge, skills, and experience. Relevant training programmes shall be conducted, including on SEAH/GBV prevention (updated ISS 2023). Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, EIB Standard 1 and IFC PS1 require sufficient competent personnel, clear authority, adequate resources and training proportionate to project risk, including contractor oversight and specialist input where needed.	Articles 1, 2 of Decree 134/2003 of Labour Law 14/2025 set the required number of responsible personnel for managing H&S aspects. Article 5 of Decree 134/2003 requires facilities employing more than 50 employees to establish a Safety Committee. Articles 14, 15, and 16 of Decree 134/2003 address qualifications of HSE responsible persons.	Egyptian legislation establishes responsibilities for OH&S personnel and committee but does not require dedicated H&S personnel with clearly defined responsibilities covering the full spectrum of environmental and social risks. Furthermore, national requirements do not include training on SEA/GBV prevention and response as required under AFDB ISS 2023. Additional gap context: The national framework remains focused mainly on OHS staffing and does not prescribe full E&S capacity, social expertise, stakeholder functions or independent specialist review.
Contextual Risk Assessment	The updated ISS 2023 introduces a new requirement for a contextual risk assessment to complement ESDD (OS1, Annex 1). This assessment covers: political economy dynamics; SEAH and GBV risks; labour influx and conflict risks; limitations on free speech and reprisal risks; corruption and rule of law issues; and land access and tenure conflicts. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1 requires assessment to consider the project context, human rights, security, conflict and reprisal risks. EIB Standards 1 and 7 and IFC PS1 similarly require contextual and human-rights considerations where relevant, including risks to vulnerable groups and workers or communities.	--	There is no national legislative requirement for a contextual risk assessment covering SEAH/GBV, political economy, reprisal risks, or labour influx dynamics. This is an entirely new requirement introduced by the updated ISS 2023 that is not reflected in Egyptian environmental or social law. Projects will need to conduct this assessment as an additional step beyond national EIA requirements. Additional gap context: The national EIA framework does not require a standalone contextual or human-rights risk assessment or explicit consideration of reprisal and conflict dynamics.
Supply Chain Management	Where there is a high risk of significant E&S issues in the supply chain (child labour, forced	--	Supply chain E&S management is not addressed by Egyptian national law. The

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	labour/modern slavery, significant OHS risks, biodiversity), primary suppliers shall be required to introduce corrective measures. The updated ISS 2023 explicitly adds 'modern slavery' and 'human trafficking' as supply chain risks to be assessed and managed (OS2, paras. 41–44). Where remedy is not possible, the Borrower shall within a reasonable period shift to compliant suppliers. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, ESR 3 and ESR 6, EIB Standards 3, 4 and 8, and IFC PS2 and PS6 require risk-based screening and management of primary suppliers where significant labour, OHS, pollution or biodiversity risks may be present, with corrective action or supplier substitution where remedy is not feasible.		updated ISS 2023 has strengthened this requirement by explicitly adding modern slavery and human trafficking — not covered in either the 2013 ISS or Egyptian legislation. This represents a significant new compliance obligation for projects with complex supply chains. Additional gap context: National law does not provide a project-level primary-supplier due-diligence, monitoring and remedy framework comparable to these lender requirements.
Project Monitoring and Reporting	Procedures shall be in place to track and evaluate E&S performance throughout the project life cycle. The Borrower shall promptly notify the Bank within three working days of any materially adverse E&S event (updated ISS 2023, OS2, para. 45). E&S performance information shall be periodically reported internally to senior management and, as appropriate, to investors and affected communities. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, EIB Standard 1 and IFC PS1 require ongoing monitoring, periodic E&S reporting, tracking of ESAP and management-plan commitments, prompt notification of serious incidents and corrective action based on performance results. Stakeholder-facing reporting is required where appropriate.	The Egyptian Environmental Law 4/1994 requires activities with potential environmental impacts to maintain records/registers and report on their environmental performance. Records must be available for inspection by the competent authority. The Egyptian Guidelines for EIA (EEAA, 2009) require the ESMP to include monitoring and reporting provisions.	No requirements exist for periodic reporting to affected communities. The updated ISS 2023 introduces a new mandatory requirement to notify the Bank within three working days of materially adverse events — a stricter standard than Egyptian law. National law also does not require a systematic ESMP compliance monitoring system for the operational phase. Additional gap context: Additional gaps include lender-specific incident notification, ESAP tracking, periodic performance reporting and documented corrective-action closure throughout construction and operation.
Labour and Working Conditions			
General	Working conditions shall comply with national labour and employment laws and the requirements of OS2. The updated ISS 2023 introduces new Labour Management Procedures	The Egyptian Labour Law No. 14/2025 addresses working conditions and management of worker relationships,	The national law is broadly aligned with the general requirement, but does not mandate the preparation of formal Labour Management Procedures (LMPs). The LMP

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	(LMPs) as a mandatory management tool, replacing less structured approaches. LMPs shall cover all categories of workers including direct workers, contracted workers, community workers, and primary supply workers. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require labour-management arrangements proportionate to the workforce and risks, covering direct and contracted workers, terms of employment, non-discrimination, worker organisations, OHS, worker grievance and primary-supply-chain risks.	covering rights, duties, and occupational health and safety requirements.	concept is new to the updated ISS 2023 and represents a gap relative to both the 2013 ISS and Egyptian law. Additional gap context: The national framework does not require a consolidated LMP covering all worker categories, contractor oversight, worker grievance and primary-supplier labour risks.
Human Resources Policies	HR policies shall be consistent with national law and international standards, and shall be clearly accessible to all employees. Policies shall cover: protection from SEAH and GBV (new requirement under updated ISS 2023); non-discrimination; and management of third-party labour. Procedures shall be implemented for managing and monitoring third-party employers. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require written and accessible HR policies and procedures consistent with national law and lender standards, including contractor labour management, non-discrimination, grievance, disciplinary measures and protection from harassment and retaliation.	According to Article 58 of Labour Law (14/2025), internal regulation lists shall be in place covering rules of work and disciplinary sanctions. Decree 185/2003 describes the work regulation policy components including workers' complaints.	The national laws do not specifically require development of procedures for managing and monitoring third-party employer performance. The updated ISS 2023 adds an explicit requirement for HR policies to address SEAH and GBV — a gap not covered by Egyptian labour law. Additional gap context: National requirements do not prescribe lender-style HR procedures covering contracted workers, confidential grievance, harassment or SEAH risk, contractor monitoring and primary suppliers.
Working Relationships	Terms and conditions of employment shall be documented and communicated in understandable language to all workers. The updated ISS 2023 requires this to include community workers and workers in fragile or conflict contexts. All wages, social security benefits, and entitlements shall be paid on termination of employment (OS2, para. 13). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require clear and understandable information on employment terms, wages, hours, leave, benefits	Book 2 of Labour Law 14/2025 includes requirements for working relationships. Article 32 addresses contracts specifying job type, hours, rest days, wages, and vacations. Decree 211/2003 requires notification to labour offices prior to subcontracting. Article 36 addresses minimum wages. Social insurance is regulated under Law 63/1964, amended by Law 148/2019.	-- Additional gap context: National law substantially addresses employment contracts, but lender standards are more explicit regarding understandable communication, coverage of contracted workers, transparency of deductions and timely settlement of all entitlements.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	and termination, provided at the start of employment and updated when conditions change.		
Child Labour and Forced Labour / Modern Slavery	The HR policy shall clearly prohibit child labour and forced labour. The updated ISS 2023 explicitly adds 'modern slavery' and 'human trafficking' as prohibited practices (OS2, para. 23). Young workers (under 18) shall not be employed in hazardous work. Regular monitoring of young workers' health, conditions, and hours is required. LMPs shall specify the minimum age for employment (14 unless national law specifies higher). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 prohibit forced labour, trafficking and harmful child labour and require age verification and protection of young workers. EBRD and IFC also require risk-based monitoring of primary suppliers where these risks are significant.	Article 2 of Child Law 126/2008 and Article 98 of Labour Law 14/2025 define a child as a person under 18. Article 99 of Labour Law 14/2025 prohibits engagement of children under 14. Decree 118/2003 lists work prohibited for children under 16 and 18. Article 12 of the Egyptian Constitution 2014 prohibits forced labour.	Egyptian legislation prohibits child labour and forced labour and includes provisions addressing human trafficking through separate legislation. However, it doesn't explicitly require employers to address modern slavery risks through labour management procedures, supply chain management, or project specific policies as required under AFDB ISS 2023. Additional gap context: The principal additional gap is the absence of a project-level due-diligence and remediation framework extending these protections through contractors, labour suppliers and primary suppliers.
SEAH and GBV Prevention	The updated ISS 2023 introduces explicit requirements for the Borrower to protect workers and communities from Sexual Exploitation, Abuse and Harassment (SEAH) and Gender-Based Violence (GBV). This includes: developing a SEAH/GBV prevention and response plan; integrating SEAH/GBV requirements into contractor contracts (OS1, Annex 2); training for workers; and establishing confidential reporting mechanisms (OS2; OS4). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, ESR 4 and ESR 10 and EIB Standards 7, 8 and 9 require prevention, reporting and response arrangements for harassment, exploitation and gender-based risks affecting workers and communities. IFC PS1, PS2 and PS4, supported by IFC good-practice guidance, require these risks to be assessed and managed through codes of conduct, confidential channels and survivor-centred response.	--	There is no national legislative requirement in Egypt addressing SEAH and GBV in the context of project operations and labour management. This is an entirely new requirement introduced by the updated ISS 2023 and represents a significant compliance gap relative to Egyptian law. Projects will need to develop specific SEAH/GBV prevention and response frameworks. Additional gap context: Egyptian law does not provide an equivalent project-specific prevention, contractor-flow-down, confidential-reporting and referral framework.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
Non-Discrimination and Equal Opportunity	Employment decisions shall not be made on the basis of personal characteristics unrelated to job requirements. The updated ISS 2023 expands protected characteristics to explicitly include sexual orientation and gender identity (OS2; OS7). Gender-responsive approaches shall be adopted throughout project implementation. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standards 7 and 8 and IFC PS2 require equal opportunity and prohibit discrimination across recruitment, employment, training, promotion, remuneration and termination, with attention to vulnerable workers and reasonable accommodation where relevant.	Article 35 of Labour Law 14/2025 prohibits discrimination against employees on grounds of gender, origin, culture, politics, religion, or beliefs.	Egyptian law addresses basic non-discrimination but does not explicitly cover sexual orientation and gender identity as protected characteristics — a gap relative to the updated ISS 2023 requirements. Additional gap context: The lender standards are broader in their protected characteristics and require proactive measures for vulnerable workers and equal opportunity, beyond the more general national prohibition.
Workers' Organizations	Workers shall be allowed to form and join workers' organizations. The Borrower shall not interfere with or control these organizations, and shall engage with workers' representatives for collective bargaining. The updated ISS 2023 clarifies that the Borrower shall not discriminate against or retaliate against workers participating in unions (OS2, para. 20). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 protect workers' rights to form or join organisations and bargain collectively, prohibit interference or retaliation and require alternative means of worker representation where national law substantially restricts these rights.	Article 4 of Law 213/2017 (amended by Law 142/2019) concerning trade union organizations states that workers have the right to form trade union organizations and freely join or withdraw from them.	-- Additional gap context: National law recognises trade-union rights, but lender standards add explicit non-retaliation, non-interference and alternative worker-representation requirements.
Retrenchment	Prior to implementing collective dismissals, the Borrower shall carry out an analysis of alternatives to retrenchment. A retrenchment plan shall be developed based on non-discrimination principles, consultation with workers, and compliance with national law (OS2, para. 18). This is a new explicit requirement under the updated ISS 2023. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require consideration of alternatives, consultation,	Egyptian Labour Law provides for dismissal procedures and severance entitlements under Labour Law 14/2025.	While Egyptian law covers aspects of dismissal, it does not mandate a specific analysis of alternatives to retrenchment or a formal retrenchment plan as required by the updated ISS 2023. This represents a gap requiring additional management procedures. Additional gap context: National dismissal procedures do not provide the same structured alternatives analysis, consultation and monitoring framework.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	objective and non-discriminatory selection criteria, payment of entitlements and a documented retrenchment plan for significant collective dismissals.		
Worker Accommodation	Worker accommodation shall be clean, safe, and meet basic needs, including water, sanitation, and medical care where appropriate. The updated ISS 2023 specifies that accommodation shall not restrict workers' freedom of movement or association, and shall provide segregated facilities for women and men (OS2, para. 14). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require accommodation, where provided, to be safe, hygienic, appropriately managed and consistent with worker dignity, privacy and freedom of movement. The EBRD/IFC workers' accommodation guidance provides additional benchmarks on space, sanitation, services, security, fees, inspections and grievance access.	Article 221 of Labour Law 14/2025 requires projects in remote areas to provide accommodation and meals. Ministry of Labour Decree 200/2003 provides specifications.	Egyptian law addresses accommodation provisions in remote areas. The updated ISS 2023 adds requirements on non-restriction of freedom of movement and gender-segregated facilities — elements not explicitly covered by Egyptian law. Additional gap context: National provisions do not address the full set of lender expectations for accommodation management, privacy, freedom of movement, charges, gender-sensitive facilities, inspection and grievance access.
Grievance Mechanism (Workers)	A workers' grievance mechanism shall be in place, accessible to all project workers including contracted and non-employee workers, and shall be communicated at recruitment. The updated ISS 2023 requires the mechanism to operate without reprisal, independently and objectively, and to not impede access to judicial remedies (OS2, paras. 24–26). Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require an accessible, confidential and non-retaliatory worker grievance mechanism for direct and contracted workers, communicated at recruitment and without restricting access to judicial or administrative remedies.	According to Article 19 of Decree 185/2003, workers' complaints shall be raised to the head of department and then to management. All complaints shall be documented.	Egyptian legislations provides mechanisms for workers to submit complaints through management channels; however, it does not require a dedicated, confidential, independent, and non-retaliatory grievance mechanism accessible to all categories of project workers, including contracted and non-employee workers, as required by AFDB ISS 2023. Additional gap context: National complaint channels do not provide the same independence, confidentiality, anonymity, escalation and coverage of contracted workers.
Labour Influx Management	The updated ISS 2023 introduces explicit provisions for managing the influx of project labour (OS4, paras. applicable). Where significant labour influx is anticipated, the Borrower shall	--	Labour influx is not addressed in Egyptian national law. This is a new requirement introduced by the updated ISS 2023 that was not present in the 2013 ISS and is

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	prepare a Labour Influx Management Plan covering: community health impacts; SEAH/GBV risks; provision of services for incoming workers; and measures to avoid conflicts between workers and host communities. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, ESR 2, ESR 4 and ESR 10, EIB Standards 1, 2, 8 and 9, and IFC PS1, PS2 and PS4 require labour-influx risks to be assessed and managed proportionately, including accommodation, services, traffic, community interaction, communicable disease, GBV/SEA/SH and grievance.		entirely absent from Egyptian legislation. For projects involving significant labour influx, a dedicated management plan will be required. Additional gap context: There is no national requirement for a labour-influx assessment or dedicated management measures addressing host-community pressures and worker-community interaction.
Non-Employee Workers	Contractors shall have their own policies and procedures addressing non-employee workers aligned with OS2. Risks associated with non-employee workers shall be assessed. Contracted workers shall have access to a grievance mechanism. The updated ISS 2023 requires explicit contractual provisions for SEAH/GBV protection and modern slavery prevention for contracted workers. Additional lender context (EBRD / EIB / IFC): EBRD ESR 2, EIB Standard 8 and IFC PS2 require the client or promoter to assess and monitor labour conditions of contracted workers, include lender requirements in contracts, provide grievance access and take corrective action where contractors do not comply.	According to Decree 162/2019, the employer using non-employee workers (including contractors such as carpenters, welders, electricians) shall notify the labour office within ten days of commencement of work.	Egyptian legislation requires notification of labour authorities regarding the use of contractors and non-employee workers; however, it does not require contractors to implement labour management procedures, provide dedicated grievance mechanisms, address SEAH/GBV risks, prevent modern slavery, or demonstrate compliance with environmental and social requirements as required by AfDB ISS 2023. Additional gap context: National notification requirements do not establish a comprehensive contractor labour-management, audit, grievance and remedy system.
Occupational Health and Safety	A safe and healthy work environment shall be provided. Workers shall receive PPE at no cost. OHS procedures shall be established per Good International Industry Practice (GIIP). The updated ISS 2023 requires workplace processes to allow workers to report unsafe conditions without reprisal, and prohibits retaliation against workers who remove themselves from imminent danger (OS2, para. 30). OHS records shall include injury rates, occupational diseases, and fatalities.	Article 1 of Decree 211/2003 requires safe working areas. Decree 126/2003 addresses incident investigation and reporting. Article 217 of Law 14/2025 requires hazard awareness and PPE provision. Article 1 of Decree 211/2003 requires owners and contractors to ensure OHS conditions.	-- Additional gap context: Egyptian OHS law is substantial, but lender standards add explicit GIIP benchmarking, management-system requirements, worker stop-work protection, contractor oversight and systematic performance reporting.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	Additional lender context (EBRD / EIB / IFC): EBRD ESR 2 and ESR 4, EIB Standards 8 and 9, and IFC PS2 require an OHS management system consistent with GIIP, hazard identification, prevention and control, training, free PPE, incident investigation, worker participation and the right to remove oneself from imminent danger without retaliation. Applicable World Bank Group EHS Guidelines provide technical benchmarks.		
Security Personnel Requirements	Where security personnel are engaged, contract provisions shall include guidelines on their interaction with communities. A grievance mechanism shall allow affected communities and workers to express concerns about security arrangements. The updated ISS 2023 additionally requires that security personnel training include provisions on the use of force, non-discrimination, and SEAH/GBV prevention. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require risk-based security arrangements, screening and training of personnel, proportionate use of force, respect for human rights, investigation of allegations and accessible grievance channels for workers and communities.	Law 86/2015 and its Executive Regulation 133/2016 define conditions for security personnel. Security companies are responsible for addressing grievances and compensating potentially affected persons.	-- Additional gap context: National licensing provisions do not fully address human-rights due diligence, use-of-force principles, community interaction, SEAH/GBV awareness, incident investigation and lender monitoring.
Resources Efficiency and Pollution Prevention and Management			
Resource Efficiency	Measures shall be adopted to minimize consumption and improve efficiency in the use of energy, water, and other resources. The updated ISS 2023 strengthens this requirement by linking it to climate change mitigation commitments and Sustainable Development Goals (SDGs). Use of resources and material inputs shall be tracked. Additional lender context (EBRD / EIB / IFC): EBRD ESR 3, EIB Standards 3 and 5, and IFC PS3 require technically and financially feasible measures to improve energy, water and material efficiency, assess water availability and	Articles 49 and 50 of Electricity Law No. 87/2015 concern annual energy efficiency planning and policies. No specific regulation for water resources efficiency exists, although a national water resources plan (2017) was developed. The Environmental Register required by Law 4/1994 requires facilities to record resource consumption.	-- Additional gap context: National requirements do not prescribe a systematic project-level resource-efficiency assessment, alternatives analysis, water-stress review or performance targets.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	cumulative demand where relevant, and monitor resource use over the project life cycle.		
Pollution Prevention and Control	Air, land, and water releases of pollutants shall be monitored. Procedures, practices, and techniques shall be introduced to avoid, or where avoidance is not feasible, minimize and/or control the intensity and mass flow of pollutant releases. The updated ISS 2023 requires explicit consideration of greenhouse gas (GHG) emissions as part of pollution management. Additional lender context (EBRD / EIB / IFC): EBRD ESR 3, EIB Standard 3 and IFC PS3 require application of the mitigation hierarchy and GIIP to prevent or minimise emissions, discharges and contamination, using the World Bank Group EHS Guidelines or other internationally recognised benchmarks where national standards are less stringent.	Law 4/1994 (amended by Laws 9/2009 and 105/2015) and its Executive Regulations (Decree 338/1995 and amendments) address pollution prevention to air, soil, and water. Law 93/1962 and Decree 44/2000 address discharge to public sewer networks.	No written management procedures are required by national law. The updated ISS 2023 adds an explicit requirement to account for GHG emissions — not addressed in Egyptian environmental law. Additional gap context: National law regulates pollution limits, but does not require the same documented alternatives analysis, GIIP benchmarking, lifecycle management, contractor controls and adaptive monitoring.
Waste Management	Procedures for storage, handling, and disposal of solid and hazardous wastes shall be in place. Third-party waste disposal contractors shall be reputable and licensed. Chain of custody documentation shall be maintained to the final destination. The updated ISS 2023 aligns waste management with the circular economy approach and SDGs. Additional lender context (EBRD / EIB / IFC): EBRD ESR 3, EIB Standard 3 and IFC PS3 require application of the waste hierarchy, circular-economy principles where feasible, safe storage and transport, licensed contractors, chain of custody and verification of final recovery or disposal, including hazardous and end-of-life wastes.	Article 37 of Law 4/1994 (amended) and Articles 38 and 39 of its ERs address solid waste management. Articles 30 and 28 address hazardous waste. Law 202/2020 and its ER 722/2022 regulate solid and hazardous waste management. Article 49 requires segregation and delivery to authorized collectors. Chapter Five and Articles 50–54 of ER 722/2022 regulate hazardous waste.	No written management procedures are required by national law beyond compliance with waste regulations. Waste management plans are not mandated. Additional gap context: National law regulates waste activities but does not require a project-specific waste-management plan integrating prevention targets, circularity, chain-of-custody verification and lifecycle or end-of-life planning.
Safe Use and Management of Hazardous Substances	Procedures for storage, handling, transportation, and use of hazardous materials shall be in place. The updated ISS 2023 references the Stockholm Convention and Rotterdam Convention as	Articles 29–33 of Law 4/1994 (amended) and Article 31 of its ERs address hazardous materials. Article 34 of Decree 211/2003 requires selection of chemicals that reduce hazard risk.	No written management procedures are required by national law. International conventions (Stockholm, Rotterdam) referenced in the updated ISS 2023 have

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	international benchmarks for hazardous substances management. Additional lender context (EBRD / EIB / IFC): EBRD ESR 3, EIB Standard 3 and IFC PS3 require avoidance or substitution of hazardous materials where feasible, lifecycle controls for procurement, storage, use, transport and disposal, emergency preparedness and compliance with international restrictions on hazardous substances.		not been fully integrated into Egyptian regulatory requirements. Additional gap context: National controls do not provide the same documented substitution assessment, international-convention screening, lifecycle management and emergency or contractor controls.
Greenhouse Gas (GHG) Emissions Assessment	The updated ISS 2023 introduces an explicit requirement to assess and quantify GHG emissions associated with the project, including indirect emissions (OS1, para. 24). This is consistent with the Bank's Climate Change and Green Growth Strategic Framework (2021) and aligns with Sustainable Development Goals. Additional lender context (EBRD / EIB / IFC): EBRD ESR 3, EIB Standard 5 and IFC PS3 require assessment and, for material emissions, quantification and periodic reporting of project GHG emissions, together with technically and financially feasible measures to reduce emissions. The EIB additionally applies climate-alignment and carbon-footprint requirements to relevant projects.	--	There are no national legislative requirements in Egypt for GHG emissions quantification or reporting for project-level activities. This is a new requirement introduced by the updated ISS 2023 that creates a gap relative to Egyptian environmental law. Projects will need to develop GHG assessments as a supplementary requirement. Additional gap context: Egyptian law does not require project-level GHG accounting, threshold-based reporting, lifecycle carbon assessment or documented mitigation options.
Community Health, Safety and Security			
General Requirements for Health and Safety Management	Preventive measures and plans shall be prepared and implemented to manage health and safety risks using the mitigation hierarchy approach and Good International Industry Practice (GIIP). The updated ISS 2023 adds requirements to address: risks from labour influx on community health (communicable diseases, SEAH/GBV); and risks from large-scale emergency/pandemic situations. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require systematic identification and management of risks to communities from project activities,	The Egyptian Civil Law 131/1948 addresses community safety and security. Law 4/1994 also addresses community safety aspects related to hazardous waste management.	No written management procedures are required by national law. The updated ISS 2023 expands the scope of community health and safety management to include labour influx risks and pandemic preparedness — areas not addressed by Egyptian law. Additional gap context: National law does not require an integrated community health, safety and security management framework covering these combined risk pathways.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	equipment, infrastructure, labour influx, hazardous materials, disease, traffic, natural hazards and security, applying GIIP and the mitigation hierarchy.		
Community Health and Safety	Procedures shall be implemented to address community health and safety issues in the context of operations. Safety procedures shall deal with hazardous material release, transport, and disposal. The updated ISS 2023 adds an explicit requirement for Dam Safety Plans where applicable, and for community health risk management plans where labour influx could introduce communicable diseases. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require project-specific controls, monitoring and communication for community exposure to construction and operational hazards, including infrastructure safety, emergency scenarios, hazardous releases and service pressures.	Law 4/1994 requires projects to monitor pollutants to air and water to protect the surrounding environment and community. Article 34 of Decree 211/2003 requires selection of less hazardous chemicals.	No written management procedures required in national law to address community health and safety issues. The updated ISS 2023 introduces new requirements on dam safety and communicable disease management from labour influx — gaps not covered by Egyptian law. Additional gap context: National provisions do not require the same documented community-risk assessment, monitoring indicators, consultation and management plans.
Exposure to Hazardous Materials	Appropriate measures shall be taken to prevent or minimize potential worker and community exposure to hazardous materials released by the project. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require prevention of community exposure throughout the hazardous-material lifecycle, including transport, storage, accidental release, emergency communication and remediation.	Article 34 of Decree 211/2003 requires selection of less hazardous substances and evaluation of chemical risks with air concentration monitoring.	-- Additional gap context: National chemical controls do not fully address community-facing risk communication, transport-route risk, emergency coordination and post-incident remediation.
Traffic and Road Safety	Potential traffic and road safety risks shall be evaluated and monitored for workers and communities. The updated ISS 2023 requires this to include assessment of heavy vehicle traffic impacts on community roads and vulnerable road users. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require road-safety risk assessment and management for	Egyptian Guidelines for EIA (EEAA, 2009) require assessment of infrastructure use and traffic in the EIA.	No written management procedures required by national law. The updated ISS 2023 provides more detailed requirements for traffic management planning than current Egyptian requirements. Additional gap context: National EIA guidance is less prescriptive on formal traffic-management plans, vulnerable road

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	project fleets and affected roads, consideration of vulnerable road users, safe routing and scheduling, driver and vehicle standards, incident monitoring and community communication. Relevant World Bank Group EHS guidance applies.		users, contractor fleet standards, route-specific assessment and monitoring.
Exposure to Disease	Procedures shall deal with avoiding/minimizing communicable diseases (including those related to influx of project labour) that could result from the project. The updated ISS 2023 strengthens this to include epidemic and pandemic preparedness measures, informed by COVID-19 experience (OS1, para. 3; OS4). Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require assessment and management of communicable and vector-borne disease risks arising from workforce mobilisation, accommodation and community interaction, including prevention, awareness and coordination with health services where relevant.	--	Labour influx and disease exposure are not addressed in Egyptian national law. The updated ISS 2023 significantly expands this requirement — particularly regarding pandemic preparedness — creating a gap relative to Egyptian legislation. Additional gap context: National law does not require a project-specific communicable-disease assessment linked to labour influx and host-community exposure.
Emergency Preparedness and Response	Emergency Preparedness and Response Plans (EPRPs) shall be developed considering risks and impacts from the project on local communities. The updated ISS 2023 requires EPRPs to include provisions for natural disasters, climate-related events, and pandemic situations as new explicit requirements. Additional lender context (EBRD / EIB / IFC): EBRD ESR 4, EIB Standard 9 and IFC PS4 require emergency preparedness and response proportionate to project risks, including coordination with affected communities and external responders, communication arrangements, drills, recovery measures and consideration of natural and climate-related hazards.	Article 215 of Law 14/2025 and Article 3 of Decree 211/2003 require each facility to prepare an emergency response plan.	-- Additional gap context: National emergency-plan requirements do not expressly require community consultation or notification, external-response coordination, climate or disaster scenarios, periodic drills and public-facing communication arrangements.
Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement			
Avoid or Minimize Displacement	Plans/procedures shall be developed to avoid or minimize economic and physical displacement,	Law 10/1990 (amended by Laws 1/2015 and 24/2018) enables land acquisition for	National laws do not include requirements for developing a written Land Acquisition

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	considering alternative designs. The updated ISS 2023 maintains this principle and emphasizes avoiding displacement as the highest priority, with compensation at full replacement cost as a last resort (OS5). Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require avoidance and minimisation of physical and economic displacement through alternatives analysis, with compensation at full replacement cost and livelihood restoration where impacts cannot be avoided.	public investment projects. Compensation is estimated at prevailing market prices plus 20% based on Law 24/2018. Article 8 of Law 10/1990 allows affected communities to object to compensation values. The Egyptian Survey Authority is responsible for land acquisition and compensation estimation.	and Resettlement Management Plan. Procedures are handled by government authorities. Eligibility criteria differ — Egyptian regulations assume legal titles, while the updated ISS 2023 requires compensation for property AND livelihood, regardless of legal title. The 20% premium under Egyptian law falls short of the full replacement cost standard required by the ISS. The updated ISS 2023 strengthens requirements for vulnerable group consideration in resettlement — a significant gap. Additional gap context: The additional lender frameworks confirm the same material gaps regarding informal users, economic displacement, replacement cost, livelihood restoration and alternatives analysis.
Consultation in Resettlement	All relevant information shall be disclosed and affected persons consulted. The updated ISS 2023 requires that consultation be conducted in a safe environment, free of reprisal, and in a culturally appropriate manner (OS5; OS10). Particular attention shall be given to vulnerable groups in consultation design. Additional lender context (EBRD / EIB / IFC): EBRD ESR 5 and ESR 10, EIB Standards 2 and 6, and IFC PS1 and PS5 require early, meaningful and documented consultation with affected persons, including vulnerable groups, throughout planning, implementation and monitoring, in a culturally appropriate and non-retaliatory manner.	--	There is no explicit consultation requirement in Egyptian law for resettlement. However, affected communities are usually informed about the project. The updated ISS 2023 introduces stronger requirements on the quality and safety of consultation, free of coercion or reprisal — a gap relative to Egyptian law. Additional gap context: National procedures do not prescribe the same ongoing, documented and differentiated consultation process or disclosure of entitlements and monitoring results.
Socio-Economic Assessment and Census	A detailed census shall be carried out to: identify displaced persons; determine eligible persons for compensation; and develop an inventory of affected land and property. The updated ISS 2023 requires the census to include documentation of	--	Egyptian law provides for a census/inventory through the Survey Authority. However, informal land rights and customary tenure are not recognized in Egyptian law — a gap relative to the updated ISS 2023 requirements.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	informal land rights and customary tenure arrangements. Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require a socio-economic baseline, census and asset inventory covering formal and informal users, livelihood dependence, vulnerable persons and a clearly communicated eligibility and cut-off framework.		Additional gap context: National inventory procedures do not adequately cover informal tenure, livelihood dependence, vulnerability or lender-defined eligibility.
Compensation for Displaced Persons	Compensation for loss of assets shall be provided at full replacement cost. The updated ISS 2023 clarifies that 'full replacement cost' means the market value of the assets plus transaction costs, and shall not be reduced by depreciation or salvage value (OS5). Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require compensation at full replacement cost before displacement, without depreciation or deductions, and coverage of transaction costs and transitional assistance where relevant.	--	Compensation under Egyptian law is based on market prices plus 20% premium, which does not necessarily equal full replacement cost as defined by the updated ISS 2023. This gap is particularly relevant when market prices undervalue affected assets. Additional gap context: National market-value approaches may not meet full replacement cost or the sequencing and transaction-cost requirements of the lenders.
Income Restoration	Loss of income resulting directly from project implementation shall be compensated. The updated ISS 2023 requires income restoration programmes to bring affected persons to pre-displacement income levels or better. Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require livelihood restoration and, where feasible, improvement for economically displaced persons, with targeted assistance, monitoring and completion criteria.	--	Egyptian regulations do not specify income restoration allowances for losses of business income. This is a gap relative to the ISS requirements. Additional gap context: National law does not require a documented livelihood-restoration programme, outcome monitoring or completion audit.
Cut-Off Date	A cut-off date is required to prevent opportunistic in-migration to the project area. The updated ISS 2023 maintains this requirement and specifies that it shall be communicated publicly and transparently. Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require an	--	There is no cut-off date mechanism under Egyptian law. This is a gap relative to ISS requirements. Additional gap context: National law does not provide an equivalent transparent project-level cut-off-date process.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	eligibility cut-off date, effective public communication and measures to prevent opportunistic claims while preserving the rights of persons present before the cut-off.		
Grievance Mechanism (Resettlement)	An effective grievance mechanism shall be established for affected communities, accessible to all including vulnerable groups. The updated ISS 2023 requires the mechanism to operate without reprisal and to be linked to the Bank's Independent Recourse Mechanism (IRM). Additional lender context (EBRD / EIB / IFC): EBRD ESR 5 and ESR 10, EIB Standards 2 and 6, and IFC PS1 and PS5 require a project-level grievance mechanism accessible to affected persons throughout land acquisition and livelihood restoration, without restricting judicial remedies.	--	No specific resettlement grievance mechanism is required by Egyptian law. The updated ISS 2023 introduces additional requirements regarding the IRM linkage that are entirely absent from Egyptian law. Additional gap context: National processes do not provide a dedicated, accessible, time-bound and lender-monitored resettlement grievance mechanism.
Vulnerable Groups in Resettlement	Special attention shall be given to vulnerable groups affected by resettlement. Differentiated measures shall be provided to ensure adverse impacts do not fall disproportionately on the vulnerable. The updated ISS 2023 expands the definition of vulnerable groups to include those marginalized on the basis of sexual orientation and gender identity. Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standards 6 and 7, and IFC PS5 require identification of vulnerable affected persons, differentiated assistance, protection against disproportionate impacts and monitoring of outcomes.	--	Egyptian regulations have not addressed how vulnerable groups affected by expropriation should be treated. The updated ISS 2023 expands the definition of vulnerability and strengthens protection requirements — a significant gap relative to Egyptian law. Additional gap context: National expropriation procedures do not require vulnerability screening, differentiated assistance or outcome monitoring.
Resettlement Action Plan (RAP) / Livelihood Restoration Plan	A RAP (if physical displacement) or Livelihood Restoration Plan (if economic displacement) shall be developed. The updated ISS 2023 clarifies that RAP costs must be fully integrated into project costs and either bank-financed, co-financed, or confirmed as counterpart funding before disbursement (Bank Policy, para. 54 footnote).	--	National law does not require a RAP or Livelihood Restoration Plan. The updated ISS 2023 strengthens financial arrangements for resettlement cost coverage — a gap relative to Egyptian law and practice. Additional gap context: National law does not require an integrated lender-standard

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	Additional lender context (EBRD / EIB / IFC): EBRD ESR 5, EIB Standard 6 and IFC PS5 require a proportionate resettlement or livelihood-restoration instrument with budget, schedule, responsibilities, consultation, grievance, monitoring and completion arrangements, implemented before displacement.		RAP or LRP, implementation budget, monitoring framework or completion criteria.
Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources			
Assessment of Issues and Impacts on Biodiversity	Impacts on biodiversity shall be identified and assessed as part of the ESIA. The updated ISS 2023 requires assessment to include ecosystem services, and to consider climate change impacts on biodiversity (OS6). The Bank exercises a precautionary approach to biodiversity offsets (OS1, footnote 68). Additional lender context (EBRD / EIB / IFC): EBRD ESR 6, EIB Standard 4 and IFC PS6 require biodiversity assessment across the Area of Influence, habitat classification, legally protected and internationally recognised areas, priority species, ecosystem services and cumulative impacts, applying the mitigation hierarchy and precautionary approach.	According to the EIA guidelines issued in 2009, the biological environment shall be described in the baseline EIA, covering fauna and flora, terrestrial and marine. Law 102/1983 addresses protection of natural protectorates.	-- Additional gap context: National EIA requirements do not prescribe lender habitat classifications, critical-habitat assessment, ecosystem-services evaluation, EAAA or cumulative analysis, or measurable biodiversity outcomes.
Biodiversity Conservation Requirements	Types of habitats shall be identified by in-house or external experts. The ESIA shall study alternatives and include mitigation measures. In the case of critical habitat, a Biodiversity Management Plan (BMP) or Biodiversity Action Plan shall be developed. The updated ISS 2023 maintains the distinction between natural habitat, modified habitat, and critical habitat, and aligns with CITES requirements. Additional lender context (EBRD / EIB / IFC): EBRD ESR 6, EIB Standard 4 and IFC PS6 require avoidance of impacts on critical habitat and priority biodiversity, no net loss for natural habitat where feasible, net gain for critical habitat where applicable, and biodiversity management	Law 4/1994 (amended by Laws 9/2009 and 105/2015) addresses biodiversity protection. Article 28 (as amended) and Annex 4 of the ERs define wild animals and plants prohibited from hunting, killing, or capturing.	National laws do not require a written BMP or Biodiversity Action Plan. The updated ISS 2023 maintains this requirement and adds explicit reference to climate change impacts on biodiversity assessment — a gap relative to Egyptian law. Additional gap context: National law does not require no-net-loss or net-gain outcomes, critical-habitat criteria, biodiversity offsets under strict conditions or outcome-based monitoring plans.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	or action plans with monitoring where risks warrant.		
Ecosystem Services	The updated ISS 2023 introduces an explicit requirement to assess and manage impacts on ecosystem services that underpin human well-being (OS6). This includes provisioning services (water, food), regulating services (flood control, carbon sequestration), and cultural services. Additional lender context (EBRD / EIB / IFC): EBRD ESR 6, EIB Standard 4 and IFC PS6 require identification of priority ecosystem services and management of project dependence and impacts, with engagement of affected communities where services are relevant to livelihoods or wellbeing.	--	Ecosystem services assessment is not required under Egyptian environmental law. This is a new requirement introduced by the updated ISS 2023 that creates an additional compliance obligation not reflected in national legislation. Additional gap context: Egyptian law does not require systematic ecosystem-services screening, community prioritisation or management of project dependencies.
Vulnerable Groups			
Identification and Protection of Vulnerable Groups	As early as possible in project planning, the Borrower shall identify individuals and groups who might be vulnerable, including: female-headed households, the landless, the elderly, youth and children, persons with disabilities, groups marginalized by ethnicity, religion, language, sexual orientation, and gender identity, and Highly Vulnerable Rural Minorities (HVRM) (OS7, para. 5). The updated ISS 2023 significantly expands this OS, introducing a comprehensive framework for HVRM and Indigenous Peoples management, including FPIC requirements. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, ESR 5 and ESR 10, EIB Standard 7 and IFC PS1, PS5 and PS7 require early identification of vulnerable or marginalised groups, differentiated assessment and engagement, and measures to prevent disproportionate impacts and barriers to benefits. Indigenous Peoples requirements apply where the relevant criteria are met.	Egyptian law does not contain specific provisions for protecting vulnerable groups in the context of project development.	This OS was absent from the original Gap Analysis and represents a significant area where Egyptian law has no equivalent provisions. The updated ISS 2023 has substantially expanded OS7, introducing formal identification and management requirements for vulnerable groups — including women and girls, minorities, and HVRM. FPIC requirements for HVRM are entirely absent from Egyptian law. Additional gap context: National law lacks a project-level framework for vulnerability screening, differentiated engagement, benefit access and monitoring of disproportionate impacts.
Free, Prior, and Informed Consent (FPIC) for HVRM	Where Highly Vulnerable Rural Minorities (HVRM) are present in or have collective attachment to the project area, the Borrower shall obtain their	--	There are no FPIC requirements under Egyptian law. HVRM groups are not recognized as a legal category in Egyptian

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	Free, Prior and Informed Consent (FPIC) in three specific circumstances: (i) commercial use of cultural resources; (ii) physical relocation; and (iii) significant adverse impacts on critical cultural heritage (OS7, para. 36 as referenced in OS7). Additional lender context (EBRD / EIB / IFC): EBRD ESR 7, EIB Standard 7 and IFC PS7 require FPIC from Indigenous Peoples in defined high-impact circumstances, together with culturally appropriate consultation, representative institutions and documented good-faith negotiation.		legislation. This is a comprehensive new requirement under the updated ISS 2023 with no national law equivalent. Additional gap context: No equivalent national framework exists; project-specific applicability must be screened against the lender definitions rather than national legal categories alone.
Gender-Responsive Approach	The updated ISS 2023 requires the Borrower to adopt a gender-responsive approach to E&S impact management, explicitly addressing the differentiated burden of impacts on women and girls (OS7, objective). Gender assessments shall be carried out for every project (Bank Vision, para. 7). This is a significantly expanded requirement compared to the 2013 ISS. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, ESR 2 and ESR 10, EIB Standard 7 and IFC PS1 and PS2 require gender-responsive assessment and management where impacts or access to benefits may differ, including gender-disaggregated engagement, employment considerations and prevention of harassment and violence.	--	Egyptian law does not require gender impact assessment or gender-responsive project management in the context of E&S safeguards. This represents a gap relative to the updated ISS 2023 requirements. Additional gap context: National law does not require project-level gender analysis, differentiated mitigation, gender-responsive indicators or monitoring.
Vulnerable Group Plans	Where project impacts on vulnerable groups are identified, the Borrower shall prepare a Vulnerable Group Plan or equivalent management plan detailing measures to avoid, minimize, or mitigate adverse impacts and ensure equitable benefit-sharing. Additional lender context (EBRD / EIB / IFC): EBRD ESR 1, ESR 5 and ESR 7, EIB Standard 7 and IFC PS1, PS5 and PS7 require specific and proportionate measures or plans where vulnerable or Indigenous groups may experience	--	No equivalent requirement exists under Egyptian law. Vulnerable group plans are an entirely new requirement with no national law basis. Additional gap context: National law does not require a dedicated vulnerable-group instrument, differentiated benefit measures or outcome monitoring.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	material impacts or barriers to benefits, with responsibilities and monitoring.		
Cultural Heritage			
Assessment of Cultural Heritage	The ESIA shall include assessment of cultural heritage in the project area. The updated ISS 2023 expands the scope to include intangible cultural heritage (living heritage, traditional knowledge, cultural practices) in addition to physical/tangible heritage (OS8). Additional lender context (EBRD / EIB / IFC): EBRD ESR 8, EIB Standard 10 and IFC PS8 require assessment of tangible and intangible cultural heritage, including archaeological, historical, religious and community-valued resources, consultation with affected communities and relevant authorities, and consideration of project access and cumulative impacts.	According to EIA guidelines (EEAA, 2009), the baseline environment including tourist attractions shall be described in the EIA.	-- Additional gap context: National EIA guidance is less explicit on intangible heritage, community-valued resources, consultation and project-wide cultural-heritage risk assessment.
Managing Impacts on Cultural Heritage	Where cultural heritage may be found, a Chance Find Procedure shall be established. The updated ISS 2023 expands requirements for cultural heritage management to include explicit protection of intangible heritage and traditional knowledge associated with project activities (OS8). Additional lender context (EBRD / EIB / IFC): EBRD ESR 8, EIB Standard 10 and IFC PS8 require application of the mitigation hierarchy, chance-find procedures, consultation, continued access where appropriate and specific controls for removal, commercial use or impacts on critical cultural heritage.	Law 117/1983 (amended by Law 3/2010) addresses protection of antiquities. It requires that works stop and the archaeological authority be promptly informed in case of chance finds.	-- Additional gap context: National antiquities law provides a chance-find and authority-notification basis, but does not fully address intangible heritage, community access, commercial use, stakeholder consultation and lender monitoring.
Financial Intermediaries			
Financial Intermediary (FI) ESMS	Where the Bank provides support to a Financial Intermediary (FI), the FI shall put in place and maintain an Environmental and Social Management System (ESMS) to identify, assess, manage, and monitor E&S risks and impacts of FI subprojects on an ongoing basis (OS9; Bank	--	Financial Intermediary E&S requirements are not addressed in Egyptian national law. OS9 is a new standalone safeguard in the updated ISS 2023, representing a new compliance category not addressed in the

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	Policy, para. 38). The updated ISS 2023 has elevated FI requirements into a standalone OS (OS9), reflecting their increased importance. The ESMS must be in place and reviewed by the Bank before any lending takes place. Additional lender context (EBRD / EIB / IFC): EBRD ESR 9, EIB Standard 11 and IFC's Sustainability Policy for financial intermediaries require an FI ESMS proportionate to portfolio risk, screening against exclusion lists and applicable standards, organisational capacity, monitoring and reporting.		original Gap Analysis document and absent from Egyptian legislation. Additional gap context: The broader lender frameworks confirm a complete national gap for FI-specific E&S governance. This row is not applicable to the Energy Valley Project unless financing is channelled through an intermediary.
FI Subproject Risk Categorization	The FI shall develop and maintain a risk rating/categorization system for subprojects (high, moderate, low risk). Subprojects involving resettlement, adverse impacts on vulnerable groups, or significant biodiversity or cultural heritage impacts shall be categorized as high risk regardless of the FI's own system (OS9, para. 19). Additional lender context (EBRD / EIB / IFC): EBRD ESR 9, EIB Standard 11 and IFC FI requirements require risk categorisation, due diligence, escalation of higher-risk subprojects, contractual requirements and portfolio monitoring.	--	No equivalent requirement exists under Egyptian law. Additional gap context: No equivalent national requirement exists. The provision is not applicable to the current direct project-finance structure.
Stakeholder Engagement and Information Disclosure			
Stakeholder Identification	The Borrower shall have a mechanism to identify stakeholders (project-affected parties and other interested parties). The updated ISS 2023 requires early identification of vulnerable individuals and groups who may require differentiated engagement approaches (OS10, para. 13). Stakeholder identification and analysis shall be sufficiently detailed to determine appropriate communication levels. Additional lender context (EBRD / EIB / IFC): EBRD ESR 10, EIB Standard 2 and IFC PS1 require systematic identification and analysis of affected and interested stakeholders, including vulnerable	According to EIA Guidelines 2009, public involvement is mandatory for Category C projects through public consultation with concerned parties. Formal public consultation is not required for Category A or B projects.	Egyptian EIA requirements for public consultation are limited to Category C projects. The updated ISS 2023 requires comprehensive stakeholder engagement for all project categories — a significant gap relative to Egyptian law. Additional gap context: National consultation requirements do not provide the same lifecycle stakeholder mapping, vulnerability analysis and differentiated engagement planning.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	groups, with engagement methods proportionate to impacts, influence, access barriers and information needs.		
Stakeholder Engagement Plan (SEP)	The Borrower shall develop and implement a Stakeholder Engagement Plan (SEP) proportionate to project risks and impacts. The SEP shall be disclosed as early as possible and before appraisal. The updated ISS 2023 requires the SEP to include specific provisions for: safe consultation free of reprisal; engagement with vulnerable groups; and a sufficient budget for all stakeholder engagement activities throughout the project life cycle (OS10, para. 15). Additional lender context (EBRD / EIB / IFC): EBRD ESR 10, EIB Standard 2 and IFC PS1 require a proportionate SEP or equivalent documented programme covering disclosure, consultation methods, responsibilities, resources, schedule, vulnerable groups, feedback, grievance and ongoing reporting.	--	Egyptian law does not require a Stakeholder Engagement Plan. The SEP concept with its detailed requirements on budget, vulnerable group engagement, and reprisal-free consultation is entirely new in the updated ISS 2023 and represents a gap relative to Egyptian legislation. Additional gap context: National law does not require a lifecycle SEP with defined resources, differentiated engagement, monitoring and integration with project decision-making.
Information Disclosure	Relevant E&S information shall be disclosed to affected communities in a timely, understandable, accessible, and appropriate manner. For high-risk (Category 1) projects, ESA documentation shall be disclosed at least 120 days before Board consideration (Bank Policy, para. 59). The updated ISS 2023 requires disclosure through the Integrated Safeguards Tracking System (ISTS). Additional lender context (EBRD / EIB / IFC): EBRD ESR 10, EIB Standard 2 and IFC PS1 require timely disclosure of relevant E&S information in accessible language and formats, before decisions are made and throughout implementation where material changes occur. Bank-specific disclosure periods and institutional disclosure requirements also apply.	EIA guidelines require publication of EIA results, but specific timelines for public disclosure are not clearly defined in national law.	Egyptian disclosure requirements are less prescriptive than the updated ISS 2023, which specifies the 120-day advance disclosure requirement for high-risk projects and mandatory ISTS use. These requirements represent a gap relative to Egyptian law. Additional gap context: National law is less prescriptive on timing, accessibility, local availability, disclosure of updates and ongoing reporting; lender-specific institutional disclosure obligations remain additional.
Grievance Redress Mechanism (Community)	The Borrower shall provide a grievance mechanism to receive and facilitate resolution of	Egyptian law does not require a dedicated community grievance mechanism for	No written community grievance mechanism is required by Egyptian law.

Environmental and Social Requirements	International Requirements	National Requirements	Gap Description
	concerns from project-affected parties. The updated ISS 2023 links this to the Bank's Independent Recourse Mechanism (IRM) and requires the mechanism to operate safely, without reprisal (OS10; Bank Policy, paras. 73–75). The mechanism shall be communicated to communities clearly, including information on the IRM. Additional lender context (EBRD / EIB / IFC): EBRD ESR 10, EIB Standard 2 and IFC PS1 require an accessible, inclusive, culturally appropriate and non-retaliatory community grievance mechanism, with confidential channels where needed, documented response, monitoring and no restriction on judicial remedies.	project operations beyond general civil litigation recourse.	The updated ISS 2023 strengthens this requirement by: (i) requiring linkage to the Bank's IRM; (ii) mandating reprisal-free operation; and (iii) requiring communities to be informed of the IRM. All of these are gaps relative to Egyptian law. Additional gap context: National law does not require a project-level external grievance mechanism with these accessibility, confidentiality, tracking, escalation and reporting features.
Reprisal-Free Engagement	The updated ISS 2023 introduces an explicit requirement that all consultation and stakeholder engagement activities be conducted in an environment free of reprisal, intimidation, coercion, manipulation, or discrimination (OS10, para. 9). The Bank is committed to protecting all stakeholders against reprisals at any time during the project life cycle (Bank Policy, para. 27). Additional lender context (EBRD / EIB / IFC): EBRD ESR 10, EIB Standard 2 and IFC PS1 require engagement free from coercion, intimidation, manipulation and retaliation, with confidential channels and protective measures where reprisal risks are identified.	--	Protection against reprisals in the context of project consultations is not addressed by Egyptian law. This is a new explicit requirement in the updated ISS 2023 that creates an additional compliance obligation beyond Egyptian legal requirements. Additional gap context: National law does not establish specific project-level anti-reprisal assessment, prevention, monitoring and response arrangements.

Annex 5: ESIA Methodology

Impact Assessment Methodology

Interaction between the different activities and the environmental receptors, identified through the baseline information, was specified. As such interactions could result in negative or positive impacts, the different types of impacts were identified.

Based on the analysis of the baseline environmental conditions and the nature of the receiving environment, some aspects were found to be irrelevant to the specific activities of this particular project. These are "scoped out impacts". Those that were considered relevant were "scoped-in impacts"

Scoped in impacts were subject to a process of impact evaluation, based on the analysis of the proposed project components and activities, to determine the magnitude of the related aspects, in relation to the importance of the receptors. Accordingly, the significance of the different impacts was assessed. The evaluation process took into account the information collected in the field, available in the literature, and/or based on the professional judgment of the consulting team, as well as concerns and opinions expressed during stakeholder consultation.

For any impact that is Minor or higher, mitigation measures were identified that would reduce its significance to no more than Minor. This is not expected to be possible for all impacts, and for means to offset or compensate for the impact was considered for those.

Accordingly, the following methodology has been adopted

i. SCOPING IMPACTS

Impacts are the result of the interaction of an aspect of the project with a receptor. If the aspect and receptor are concluded during scoping to be connected by a pathway, the impact is relevant and is scoped in, irrespective of its significance. This provides the skeleton of the "impact assessment" chapter, where each scoped-in impact would be described and assessed.

ii. ASSESSMENT, and Assigning SIGNIFICANCE to IMPACTS

Impact assessment is the assignment of **SIGNIFICANCE** to each impact. The **SIGNIFICANCE** of potential negative impacts is assessed, considering the **MAGNITUDE** of an **ASPECT** in combination with the **PERTINENCE** of the **RECEPTOR** exposed to this aspect through a defined **PATH**.

- **MAGNITUDE OF AN ASPECT**

The **MAGNITUDE** of an aspect is based on the following criteria:

- The **temporal scale**
- The **spatial scale**
- The **intensity scale**

- The **temporal scale** is the timeframe during which the aspect occurs or might occur.

Category	Description
Short term	Less than 5 years (e.g., construction phase of a single wind project)
Medium term	Between 5 and 20 years (e.g., construction phase of projects in the concession)
Long term	Between 20 and 40 years (a generation) and from a human perspective essentially permanent (e.g., lifetime of a project)
Permanent	Over 40 years (e.g. aspects of the project that are nor reversible)

The temporal scale considers the overall time frame in which the “aspect” occurs or might occur, and it is not the time period during which the “impact” persists.

- **The *Spatial Scale***, the geographic extent of the aspect

The spatial scale is closely related to the concept of Area of Influence (Aoi) defined as “the *geographic extent where the specific aspect is evident and could therefore potentially interact with the physical, biotic and socio-economic components of the environment within this extent*”.

Category	Description
Localised	Does not exceed the project footprint
Project area	The project footprint and its immediate surroundings
Regional to National	Extending through and to environmental and social systems not in direct contact with the project ¹ , or Project itself is “linear” (a road, a train, a water canal, an OHTL, ...)
Global	Global scale, such as GHG and Ozone depleting substances or species extinctions

- The ***Intensity Scale*** expresses the “size” of the aspect
The intensity is the systemic “input” the aspect introduces to the host environmental and social systems, as opposed to the “change” it triggers in this system. Intensity is related to the nature of the project, especially whether the aspect is inherent to it, as well as its size as clarified in the table below.

Intensity Scale		Size of Project	
Relation to Project	Not inherent	Slight	Low
	Inherent	Moderate	High

iii. The Susceptibility of a RECEPTOR

The **susceptibility** of a receptor to the assessment combines its value and sensitivity. Its value is based on established criteria independent of the project being considered, or aspects to which it is exposed. On the other hand, as a receptor could be sensitive to some aspects but not to others, its sensitivity may differ according to the aspect to which it is exposed and cannot be assessed independently.

¹ For example, a dam on flood path which would cause shoreline erosion

- **The Value Scale**

A receptor has different sources of values that are considered. These include:

- Economic value, not only considering revenue streams but also livelihoods and downstream activities
- Environmental value, including importance for ecosystem, conservation status of species, and especially formal protection of habitats and species.
- Cultural value, including cultural heritage and importance to society; and
- Intrinsic value, usually related to human life and well being

A receptor could have many values and a high value in different respects is more valued than that with high value on a single criterion.

- **The Sensitivity Scale**

Receptor (or resource) sensitivity is the degree to which a particular receptor is susceptible to a given aspect. Sensitivity could be combined with resilience.

Category	Description
Not sensitive	This is a basis for exclusion (scoping out) the impact of a specific aspect on the receptor ... it should have been already reflected in the Impacts/receptors matrix above, e.g. a building (not its users) is not sensitive to noise.
Low	Able to withstand aspect at a considerably large magnitude
Medium	Vulnerable to aspect even if at smaller magnitude but could recover
High	Vulnerable to aspect but is unlikely, or will take a considerable time, to recover, An aspect might at a certain magnitude can disrupt important functions and the integrity of the receptor.

- **Susceptibility , Combining Value and Sensitivity**

Susceptibility is a function of value and sensitivity.

Value	Sensitivity		
	Low	Medium	High
Low	Very Low	Low	Medium
Medium	Low	Medium	High
High	Medium	High	Very High

iv. IMPACT SIGNIFICANCE

- **Combining Magnitude and Susceptibility**

The following table combines the significance of a potential impact by combining the stressor's (aspect) magnitude with the Pertinence of the receptor or resource that is affected. Potential impacts whose significance is assessed to be more than minor (that is, Moderate, Major, or Extreme) require the identification of mitigation measures that would avoid the impact or reduce it to acceptable levels. the impact.

Magnitude of Aspect	Susceptibility of Resource / Receptor		
	Low	Medium	High
Small	Insignificant	Minor	Moderate
Medium	Minor	Moderate	Major
Large	Moderate	Major	Extreme

v. RE-ASSESSMENT POST MITIGATION

Mitigation measures can decrease the magnitude of the aspect (typically on its intensity scale, but also on its temporal or spatial scale) as well as the exposure of the receptor to this aspect. However, it does not change the sensitivity or the value of the resource and/or receptor.

A second assessment is conducted to identify the “residual impacts”, those that remain after the implementation of mitigation measures.

vi. CUMULATIVE IMPACTS

The ESR also evaluates, also at a high level, the “cumulative impacts” of all wind projects in the concession and their Associated Facilities, as well as other planned developments that would affect the same receptors.