Energy Valley Company

ESIA for Energy Valley Solar Power and Battery Storage Project in East Minya

Prepared by:

Environics, SAE
Environment & Development Advisors

6 Dokki St. 12th Floor, Giza 12311
Tel.: (+2010) 164 81 84 – (+202) 376 015 95 – 374 956 86 / 96
Fax: (+202) 333 605 99
Email: environics@environics.org
Website: www.environics.org

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List of Abbreviations

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

Abbreviation	Full Term
AC	Alternating Current
AoI	Area of Influence
BAT	Best Available Techniques
BAU	Business As Usual
CO	Carbon Monoxide
CR	Critically Endangered
DC	Direct Current
DD	Data Deficient
E&S	Environmental and Social
EGP	Egyptian Pound
EN	Endangered
EUR	Euro
EW	Extinct in the Wild
EX	Extinct
GHG	Greenhouse Gas
GPG	Gender Pay Gap
GWP	Global Warming Potential
HC	Hydrocarbons
HR	Human Resources
HS	Hazardous Substances
HW	Hazardous Waste
kV	Kilovolt
kWh	Kilowatt-hour
LC	Least Concern
MV	Medium Voltage
MVA	Mega-Volt Ampere
MW	Megawatt
MWh	Megawatt-hour
MWp	Megawatt-peak
NA	Not Applicable
NE	Not Evaluated
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPI	No Net Loss or Net Positive Impact
NT	Near Threatened
OS	Operational Safeguard
PPE	Personal Protective Equipment
PS	Performance Standard
SF6	Sulfur Hexafluoride

SO2	Sulfur Dioxide
TSP	Total Suspended Particulates
USD	United States Dollar
VU	Vulnerable

List of Acronyms

Acronym	Full Name / Description
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AfDB	African Development Bank Group
ARCS	Automatic Robotic Cleaning Systems
ATMP	Active Turbine Management Program
AVISTEP	Avian Sensitivity Tool for Energy Planning
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
CH	Critical Habitat(s)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLO	Community Liaison Officer
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CRVA	Climate Risk and Vulnerability Assessment
CSP	Concentrated Solar Power
CSR	Corporate Social Responsibility
CULTNAT	Center for Documentation of Cultural and Natural Heritage
DC	Direct Current (also used as an abbreviation in electrical context)
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DEIB	Diversity, Equity, Inclusion and Belonging
DNSH	Do Not Significant Harm (EU Taxonomy Principle)
EAAA	Ecologically Appropriate Area of Analysis
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)
ERM	Environmental Risk Management
ESHIA	Environmental, Social, Health and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

Acronym	Full Name / Description
ESMS	Environmental and Social Management System
ESR	Environmental and Social Requirement (EBRD)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FPIC	Free, Prior and Informed Consent
GBV	Gender-Based Violence
GBV/SH	Gender-Based Violence / Sexual Harassment
GBVH	Gender-Based Violence and Harassment
GER	Gross Enrolment Ratio
GIIP	Good International Industry Practice
GIS	Geographic Information System
GRM	Grievance Redress Mechanism
HSE	Health, Safety and Environment
HSMS	Health and Safety Management System
HSSE	Health, Safety, Security and Environment
IBAT	Integrated Biodiversity Assessment Tool
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
ILO	International Labour Organization
INDC	Intended Nationally Determined Contribution
ISS	Integrated Safeguards System (AfDB)
IUCN	International Union for the Conservation of Nature
LCO	Labor Compliance Officer
LFP	Lithium Iron Phosphate (battery chemistry)
LILO	Loop-In Loop-Out (substation connection configuration)
LRP	Livelihood Restoration Plan
LTO	Lithium-Ion Titanate (battery chemistry)
MOTA	Ministry of Tourism and Antiquities
MS	Minimum Safeguards (EU Taxonomy)
MSBT	Migratory Soaring Birds Tool
NCCS	National Climate Change Strategy (Egypt)
NDC	Nationally Determined Contribution
NMC	Lithium Nickel Manganese Cobalt (battery chemistry)
NREA	New and Renewable Energy Authority (Egypt)
NTS	Non-Technical Summary
OHS	Occupational Health and Safety
OHTL	Overhead Transmission Line
OPGW	Optical Ground Wire
PBF	Priority Biodiversity Features
PCS	Power Conversion System
PPA	Power Purchase Agreement
PV	Photovoltaic
RAP	Resettlement Action Plan
SCADA	Supervisory Control and Data Acquisition
SEAH	Sexual Exploitation, Abuse and Harassment

Acronym	Full Name / Description
SEP	Stakeholder Engagement Plan
SESA	Strategic Environmental and Social Assessment
SH	Sexual Harassment
SRREH	Special Report on Renewable Energy Sources and Climate Change Mitigation (IPCC)
TILO	Technology for Improved Learning Outcomes (USAID)
TMP	Traffic Management Plan
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VRFB	Vanadium Redox Flow Battery
WHO	World Health Organization
YEO	Youth Employment Office

General

الملخص التنفيذي

١. مقدمة

يمثل مشروع فالي للطاقة الشمسية وتخزين الطاقة بالبطاريات في شرق المنيا مساهمةً استراتيجية في جهود مصر نحو التحول إلى الطاقة المتجددة، كما يدعم أهداف رؤية مصر ٢٠٣٠ من خلال تعزيز إنتاج الطاقة منخفضة الكربون ودعم التنمية الصناعية المستدامة.

تعتزم شركة إنرجي فالي تنفيذ مشروع فالي للطاقة الشمسية وتخزين الطاقة بالبطاريات بمنطقة شرق المنيا، والذي يتضمن إنشاء محطة طاقة شمسية كهروضوئية بقدرة إجمالية مركبة تبلغ نحو ١,٩٥٠ ميجاوات (تيار مستمر)، وبقدرة تصدير للشبكة تقدر بحوالي ١,٧٠٠ ميجاوات (تيار متردد)، بالإضافة إلى نظام لتخزين الطاقة باستخدام البطاريات بسعة تخزينية تبلغ نحو ١,٥٠٠ ميجاوات/ساعة. وسيعتمد المشروع على ألواح شمسية أحادية البلورة ثنائية الوجه عالية الكفاءة، يتم تركيبها على هياكل تتبع أحادية المحور بهدف زيادة إنتاج الطاقة وتحسين الكفاءة التشغيلية.

يقع المشروع داخل منطقة امتياز مشروعات الطاقة المتجددة بشرق المنيا على أراضٍ صحراوية مملوكة للدولة تم تخصيصها من قبل هيئة الطاقة الجديدة والمتجددة. وتبلغ المساحة الإجمالية المخصصة للمشروع بنظام حق الانتفاع نحو ٤١ كم^2، وتقع في منطقة صحراوية نائية شرق محافظة المنيا، ولا توجد تجمعات سكنية داخل حدود موقع المشروع.

وسيتم تجميع الطاقة الكهربائية المنتجة من خلال شبكة داخلية للجهد المتوسط، ثم نقلها إلى محطة تجميع ورفع جهد بجهد ٣٣/٥٠٠ كيلوفولت داخل موقع المشروع، على أن يتم ربطها بالشبكة القومية للكهرباء من خلال خط نقل كهرباء هوائي جديد بجهد ٥٠٠ كيلوفولت. وقد تم تصميم المشروع لتوفير إمدادات مستمرة من الكهرباء المولدة من مصادر متجددة، بما يدعم خطط التصنيع الأخضر بمنطقة السريرية الصناعية، ويعزز موثوقية واستقرار الشبكة الكهربائية، ويساهم في خفض الاعتماد على مصادر الطاقة المعتمدة على الوقود الأحفوري.

وقد تم تكليف شركة إنفايرونكس من قبل شركتي إنرجي فالي وسكاتك بإعداد دراسة تقييم الأثر البيئي والاجتماعي لمشروع شرق المنيا الهجين، وذلك وفقاً لمتطلبات جهاز شئون البيئة المصري، بالإضافة إلى المتطلبات البيئية والاجتماعية لمؤسسات التمويل الدولية، بما في ذلك معايير الأداء البيئي والاجتماعي لمؤسسة التمويل الدولية (IFC) ، ومتطلبات الأداء الخاصة بالبنك الأوروبي لإعادة الإعمار والتنمية (EBRD)، والنظام المتكامل للضمانات البيئية والاجتماعية للبنك الأفريقي للتنمية (AfDB)، والمعايير البيئية والاجتماعية لبنك الاستثمار الأوروبي (EIB) .

وتتناول دراسة تقييم الأثر البيئي والاجتماعي الحالية على وجه التحديد مشروع شرق المنيا الهجين، بينما تخضع المرافق المرتبطة الأخرى الواقعة في نجع حمادي وأبو قير لدراسات تقييم أثر بيئي واجتماعي منفصلة، يتم إعدادها وفقاً للمتطلبات الوطنية والدولية ذات الصلة.

General

أهداف الدراسة

يهدف المشروع إلى المساهمة في تحقيق أهداف مصر في مجال الطاقة المتجددة من خلال إنتاج كهرباء نظيفة من مصادر متجددة وتعزيز استقرار وموثوقية الشبكة الكهربائية عبر دمج نظام تخزين الطاقة بالبطاريات.

ويتمثل الهدف العام من إعداد دراسة تقييم الأثر البيئي والاجتماعي في تزويد متخذي القرار والقائمين على المشروع بالمعلومات اللازمة بشأن الآثار والمخاطر البيئية والاجتماعية المحتملة ذات الأهمية المرتبطة بمشروع محطة الطاقة الشمسية الكهروضوئية ونظام تخزين الطاقة بالبطاريات المقترح في منطقة نجع حمادي.

وتتمثل الأهداف المحددة للدراسة فيما يلي:

- تحديد الآثار البيئية والاجتماعية الإيجابية والسلبية المحتملة الناتجة عن تنفيذ المشروع المقترح.
- اقتراح تدابير التخفيف المناسبة للحد من الآثار السلبية ذات الأهمية، وتعظيم وتعزيز الآثار الإيجابية المتوقعة للمشروع.
- إعداد خطط الإدارة والرصد البيئي والاجتماعي اللازمة لضمان الإدارة الفعالة للآثار والمخاطر المرتبطة بالمشروع خلال مختلف مراحل تنفيذه.
- التأكد من توافق المشروع المقترح مع التشريعات واللوائح البيئية المصرية ذات الصلة، بالإضافة إلى متطلبات ومعايير المؤسسات المالية الدولية والجهات التمويلية المعنية.

٢. الإطار القانوني والتشريعي والإداري

يتضمن الإطار المؤسسي والتشريعي للمشروع كلاً من التشريعات الوطنية والمعايير والإرشادات الدولية ذات الصلة.

التشريعات الوطنية

يلتزم المشروع بالامتثال لجميع القوانين واللوائح البيئية والاجتماعية المصرية ذات الصلة، والتي تشمل على سبيل المثال لا الحصر ما يلي:

تقييم الأثر البيئي:

ينص قانون حماية البيئة رقم ٤ لسنة ١٩٩٤ ولائحته التنفيذية وتعديلاتهما على ضرورة إعداد دراسة تقييم أثر بيئي للمشروعات الجديدة وعرضها على السلطة المختصة لمراجعتها واعتمادها. وطبقاً للتصنيف المعتمد من جهاز شئون البيئة المصري، يُصنف المشروع ضمن مشروعات التصنيف البيئي الفئة (ب – محددة) .

ويُعد **جهاز شئون البيئة المصري (EEAA)** الجهة الوطنية المسؤولة عن مراجعة دراسات تقييم الأثر البيئي وإصدار الموافقة البيئية لها، بالإضافة إلى متابعة الالتزام بالتشريعات البيئية المعمول بها خلال مرحلتي تنفيذ وتشغيل المشروع.

جودة الهواء والانبعاثات :

يحدد قانون البيئة رقم ٤ لسنة ١٩٩٤ ولائحته التنفيذية الحدود القصوى المسموح بها لتركيزات ملوثات الهواء المحيط وانبعاثات المصادر المختلفة. ويلتزم المشروع بالامتثال لهذه الحدود خلال مرحلتي الإنشاء والتشغيل.

الضوضاء والاهتزازات:

يحدد قانون البيئة رقم ٤ لسنة ١٩٩٤ الحدود القصوى المسموح بها لمستويات الضوضاء في بيئات العمل والمناطق المحيطة، ويلتزم المشروع باتخاذ التدابير اللازمة لضمان الالتزام بهذه الحدود.

إدارة المخلفات:

ينظم قانون تنظيم إدارة المخلفات رقم ٢٠٢ لسنة ٢٠٢٠ ولوائحه التنفيذية إدارة المخلفات غير الخطرة والخطرة الناتجة عن الأنشطة المختلفة، ويضع المتطلبات الخاصة بجمعها وتخزينها ونقلها والتخلص منها بصورة آمنة وسليمة بيئياً.

حماية التنوع البيولوجي وصون الطبيعة:

يحظر قانون البيئة رقم ٤ لسنة ١٩٩٤، وخاصة المادة (٢٨) منه، الأنشطة التي قد تؤدي إلى الإضرار ببعض أنواع النباتات والحيوانات البرية أو موائلها الطبيعية. كما يتضمن الملحق رقم (٤) بالقانون قائمة بالأنواع المحمية. ورغم وقوع المشروع في بيئة صحراوية ذات حساسية بيئية محدودة نسبياً، سيتم تطبيق إجراءات حماية التنوع البيولوجي كلما دعت الحاجة لذلك.

حماية التراث الثقافي والآثار:

ينظم القانون رقم ١١٧ لسنة ١٩٨٣ بشأن حماية الآثار، والمعدل بالقانون رقم ٣ لسنة ٢٠١٠، الحماية القانونية للمواقع الأثرية والتراثية. وسيتم تطبيق إجراءات الاكتشافات العرضية أثناء أعمال الإنشاء، مع التنسيق المستمر مع الجهات المختصة كلما استدعت الحاجة.

الصحة والسلامة المهنية:

يحدد قانون العمل رقم ١٤ لسنة ٢٠٢٥ والقرارات الوزارية ذات الصلة المتطلبات الخاصة بحماية العاملين والصحة والسلامة المهنية وساعات العمل والاستعداد للطوارئ والوقاية من المخاطر المهنية. وتسري هذه المتطلبات على جميع المقاولين والمقاولين من الباطن العاملين بالمشروع.

تخصيص الأراضي وتطوير مشروعات الطاقة المتجددة:

يتم تطوير المشروع على أراضٍ مخصصة من قبل هيئة الطاقة الجديدة والمتجددة، وذلك وفقاً للتشريعات والضوابط الوطنية المنظمة لتخصيص الأراضي وتنفيذ مشروعات الطاقة المتجددة بالمناطق الصحراوية.

الصحة والسلامة المجتمعية:

تتضمن أحكام قانون البيئة رقم ٤ لسنة ١٩٩٤ وقانون العمل رقم ١٤ لسنة ٢٠٢٥ والتشريعات الأخرى ذات الصلة متطلبات حماية المجتمعات المحلية ومستخدمي الطرق من المخاطر المرتبطة بأعمال الإنشاء، بما في ذلك التأثيرات المرورية والغبار والضوضاء وحالات الطوارئ المحتملة.

General

الإطار المؤسسي

تتولى عدة جهات حكومية مسئوليات تنظيمية ورقابية فيما يتعلق بالمشروع، وتشمل ما يلي:

- جهاز شؤون البيئة المصري : مسئول عن مراجعة دراسة تقييم الأثر البيئي والاجتماعي، وإصدار الموافقة البيئية ومتابعة التزام المشروع بالمتطلبات البيئية المعمول بها.
- هيئة الطاقة الجديدة والمتجددة : مسئولة عن تخصيص الأراضي والإشراف على مشروعات الطاقة المتجددة.
- الشركة المصرية لنقل الكهرباء مسئولة عن ترتيبات الربط بالشبكة القومية وتطوير وتشغيل البنية التحتية اللازمة لنقل الكهرباء.
- وزارة الكهرباء والطاقة المتجددة : مسئولة عن الإشراف الاستراتيجي على قطاع الكهرباء ودعم خطط التوسع في مشروعات الطاقة المتجددة.
- وزارة العمل : مسئولة عن متابعة تطبيق متطلبات العمل والصحة والسلامة المهنية وإنفاذ التشريعات ذات الصلة.
- محافظة المنيا والجهات المحلية المختصة : مسئولة عن التنسيق الإداري المحلي وإصدار التصاريح والموافقات اللازمة وفقاً للتشريعات المعمول بها.
- وزارة السياحة والآثار : مسئولة عن حماية وإدارة وصون الآثار والتراث الثقافي والتنسيق بشأن أي مكتشفات أثرية محتملة.

المعايير والإرشادات الدولية

بالإضافة إلى الالتزام بالتشريعات واللوائح الوطنية ذات الصلة، سيلتزم المشروع بالمعايير والإرشادات البيئية والاجتماعية الدولية المعمول بها، ولا سيما متطلبات مؤسسات التمويل الدولية التي قد تشارك في تمويل المشروع. وفي هذا السياق، يوضح الجزء التالي الأطر والمعايير الدولية ذات الصلة بالمشروع.

معايير الأداء الخاصة بمؤسسة التمويل الدولية(IFC Performance Standards)

سيلتزم المشروع بمعايير الأداء الخاصة بمؤسسة التمويل الدولية بشأن الاستدامة البيئية والاجتماعية، والتي تُعد إطاراً دولياً معترفاً به لإدارة المخاطر والتأثيرات البيئية والاجتماعية للمشروعات. وتشمل هذه المعايير متطلبات تتعلق بتقييم وإدارة المخاطر والآثار البيئية والاجتماعية، وظروف العمل والعمالة، وكفاءة استخدام الموارد ومنع التلوث، وصحة وسلامة وأمن المجتمع، والاستحواذ على الأراضي وإعادة التوطين غير الطوعي، والحفاظ على التنوع البيولوجي، وحماية التراث الثقافي، ومشاركة أصحاب المصلحة.

وسوف يتم إعداد وتنفيذ المشروع بما يتوافق مع متطلبات معايير الأداء ذات الصلة طوال مراحل الإنشاء والتشغيل والإغلاق، حسب الاقتضاء.

متطلبات الأداء الخاصة بالبنك الأوروبي لإعادة الإعمار والتنمية(EBRD Performance Requirements)

سيلتزم المشروع بسياسة البنك الأوروبي لإعادة الإعمار والتنمية البيئية والاجتماعية ومتطلبات الأداء المرتبطة بها، والتي تحدد المبادئ والمتطلبات الخاصة بالإدارة البيئية والاجتماعية، والعمالة وظروف العمل، وكفاءة استخدام الموارد ومنع التلوث، والحفاظ على التنوع البيولوجي، وحماية التراث الثقافي، والإفصاح عن المعلومات ومشاركة أصحاب المصلحة.

وتوفر هذه المتطلبات إطاراً متكاملاً لتحديد وإدارة المخاطر والآثار البيئية والاجتماعية للمشروع بما يتوافق مع أفضل الممارسات الدولية.

General

الإجراءات الوقائية التشغيلية للبنك الأفريقي للتنمية(AfDB Operational Safeguards)

سيلتزم المشروع بالإجراءات الوقائية التشغيلية للبنك الأفريقي للتنمية وإجراءات التقييم البيئي والاجتماعي ذات الصلة، والتي تهدف إلى تجنب وتقليل وإدارة المخاطر والآثار البيئية والاجتماعية المرتبطة بالمشروعات التنموية.

وتشمل هذه الإجراءات متطلبات تتعلق بإدارة المخاطر البيئية والاجتماعية، والعمالة وظروف العمل، والحفاظ على التنوع البيولوجي، ومنع التلوث وإدارته، وصحة وسلامة المجتمع، وإشراك أصحاب المصلحة، بما يضمن توافق المشروع مع أهداف التنمية المستدامة ومتطلبات التمويل الدولي.

المعايير البيئية والاجتماعية للبنك الأوروبي للاستثمار(EIB Environmental and Social Standards)

سيتم تصميم المشروع وتنفيذه وفقاً للمعايير البيئية والاجتماعية المعمول بها لدى البنك الأوروبي للاستثمار، والتي تغطي مجموعة واسعة من الموضوعات البيئية والاجتماعية، بما في ذلك تقييم وإدارة الآثار البيئية والاجتماعية، وحماية التنوع البيولوجي والنظم البيئية، والعمل المناخي، وحقوق العمال وظروف العمل، والصحة والسلامة المهنية، وصحة وسلامة المجتمع.

وتهدف هذه المعايير إلى ضمان تنفيذ المشروعات بطريقة مسؤولة ومستدامة تتماشى مع الممارسات الدولية الجيدة والمتطلبات البيئية والاجتماعية للاتحاد الأوروبي.

الإرشادات العامة للصحة والسلامة والبيئة الصادرة عن مجموعة البنك الدولي

سيتم تطبيق الإرشادات العامة للصحة والسلامة والبيئة، بالإضافة إلى أي إرشادات قطاعية ذات صلة، باعتبارها مرجعاً للممارسات الصناعية الدولية الجيدة طوال دورة حياة المشروع.

وتوفر هذه الإرشادات مستويات الأداء والتدابير الفنية المتعلقة بمنع التلوث، وإدارة المخلفات، والصحة والسلامة المهنية، وصحة وسلامة المجتمع، وكفاءة استخدام الموارد، والتي تعتبر قابلة للتحقيق باستخدام التقنيات المتاحة ووفقاً للممارسات الدولية المعترف بها.

اتفاقيات منظمة العمل الدولية(ILO Conventions)

سيلتزم المشروع بالمبادئ والمتطلبات الواردة في اتفاقيات منظمة العمل الدولية التي صدّقت عليها جمهورية مصر العربية، بما في ذلك الاتفاقيات المتعلقة بالصحة والسلامة المهنية، وعدم التمييز وتكافؤ الفرص، ومنع العمل الجبري، وحظر عمالة الأطفال، وحرية تكوين الجمعيات، وحق المفاوضة الجماعية.

وسيتم دمج هذه المتطلبات ضمن سياسات وإجراءات إدارة العمالة بالمشروع، بما يضمن توفير بيئة عمل آمنة وعادلة ومتوافقة مع المعايير الدولي

General

٣. وصف المشروع

موقع المشروع

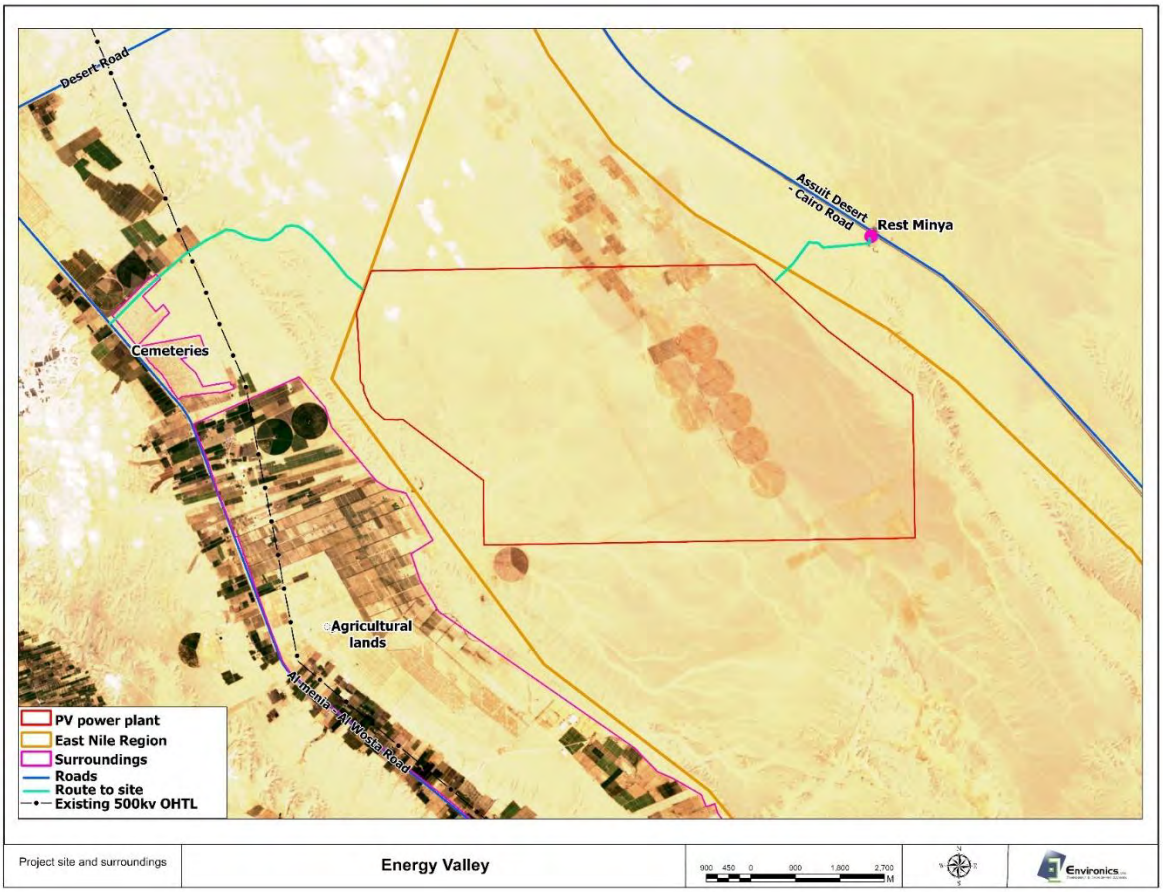
تبلغ مساحة أرض حق الانتفاع المخصصة لمحطة فالي للطاقة الشمسية الكهروضوئية نحو ٤١ كيلومترًا مربعًا، وتقع في الجزء الشرقي من محافظة المنيا بجمهورية مصر العربية. ويقع موقع المشروع ضمن بيئة صحراوية غير مطورة، تتميز بتضاريس منبسطة إلى متموجة بشكل طفيف، مع عدم وجود استخدامات أراضٍ قائمة ذات أهمية أو تجمعات سكنية دائمة أو مرافق بنية تحتية رئيسية داخل نطاق الموقع.

ولأغراض التحديد المكاني الدقيق والإسناد الجغرافي لحدود المشروع، تم اعتماد نظام الإحداثيات Africa Lambert Conformal Conic، كما هو موضح في الجدول التالي.

جدول ١: إحداثيات موقع المشروع (Africa Lambert Conformal Conic)

النقطة	Easting	Northing
1	632032.4921602416	3035807.5252274573
2	624695.9596219833	3035706.2761660814
3	624414.0993877718	3034922.366002381
4	624483.9767640651	3033605.109857768
5	624537.3388341365	3033527.9947473705
6	624689.2237992727	3033096.5491323173
7	624938.7207172832	3032878.0961324275
8	625291.5657612912	3032878.325832367
9	626828.8022436886	3031715.6398382485
10	626834.7831908315	3030485.2029592395
11	635075.9186972552	3030596.964916587
12	635039.9421693081	3033316.4403622746

يوضح الشكل ١ أدناه الأنشطة واستخدامات الأراضي المحيطة بموقع المشروع المقترح.



شكل ١: الأنشطة واستخدامات الأراضي المحيطة بالموقع المقترح

يمكن الوصول إلى موقع المشروع من خلال شبكة الطرق الإقليمية القائمة التي تخدم محافظة المنيا، وعلى رأسها طريق القاهرة–أسيوط الصحراوي الواقع على مسافة تقارب ١,٢ كيلومتر شرق الموقع، بالإضافة إلى طريق رأس غارب–المنيا الواقع على مسافة تقارب ٤ كيلومترات شمال الموقع .ومن المتوقع أن تسهم هذه الطرق في تسهيل نقل المواد والمعدات والعمالة خلال مرحلتي الإنشاء والتشغيل.

٤. المكونات الرئيسية للمشروع والأنشطة المرتبطة به

يتكون مشروع المنيا الهجين المقترح من أربعة مكونات رئيسية متكاملة تشمل محطة طاقة شمسية كهروضوئية واسعة النطاق، ونظام تخزين الطاقة بالبطاريات، والبنية التحتية الكهربائية الداخلية، ومرافق الربط بالشبكة الكهربائية، بالإضافة إلى أعمال تطوير الموقع وطرق الوصول.

المكون الأول: حقل الطاقة الشمسية (الألواح الشمسة)

يتضمن المشروع إنشاء محطة طاقة شمسية كهروضوئية بقدرة إجمالية تبلغ ١٩٥٠ ميجاوات ذروة (تيار مستمر)، باستخدام ألواح شمسية أحادية البلورة ثنائية الوجه (Mono-crystalline Bifacial PV Modules) مثبتة على أنظمة تتبع أحادية المحور (1P Single Axis Tracker) بهدف تعظيم إنتاج الطاقة.

General

ويتكون النظام من نحو 3ملايين لوح شمسي بقدرة تتراوح بين ٦٤٠ و٦٦٠ وات ذروة للوحدة الواحدة، مرتبطة من خلال ٢٤٩٦ مغير تيار (الانفرتر) موزعة على ٢٠٨ محطات مغير تيار/رفع جهد متوسط.

كما سيتم إنشاء شبكة تجميع داخلية بجهد ٣٣ كيلوفولت لتجميع الطاقة المنتجة من قطاعات المحطة المختلفة قبل رفع الجهد إلى مستويات أعلى تمهيدًا لنقلها إلى الشبكة الكهربائية.

ويمثل نظام الخلايا الشمسية المصدر الرئيسي لتوليد الطاقة الكهربائية بالمشروع.

المكون الثاني: نظام تخزين الطاقة بالبطاريات

يتضمن المشروع إنشاء نظام لتخزين الطاقة بالبطاريات من نوع ليثيوم أيون فوسفات الحديد (LFP) بسعة إجمالية تبلغ 1,500ميجاوات/ساعة، بهدف دعم استقرار الشبكة الكهربائية وتمكين إدارة الأحمال وتحويل الطاقة بين فترات الإنتاج والاستهلاك.

ويتكون النظام من وحدات بطاريات معبأة داخل حاويات مجهزة مسبقًا ومزودة بأنظمة التحكم الحراري وأنظمة المراقبة والتحكم الإشرافي وتجميع البيانات (SCADA) بالإضافة إلى أنظمة السلامة والحماية.

وقد تم تصميم النظام ليكون قادرًا على التشغيل والتغذية الكهربائية بصورة مستمرة على مدار ٢٤ ساعة يوميًا وفقًا لمتطلبات الجهة المستفيدة من الطاقة(Offtaker) .

كما يشتمل النظام على نظام إدارة البطاريات (BMS) المسؤول عن مراقبة أداء البطاريات والتحكم في تشغيلها وحمايتها وتحسين كفاءتها التشغيلية.

وسيتم توفير أنظمة التبريد، وأنظمة مكافحة الحرائق، والأنظمة المساعدة الأخرى لضمان التشغيل الآمن والموثوق للنظام.

المكون الثالث: شبكة التجميع الداخلية للجهد المتوسط (٣٣ كيلوفولت)

سيتم إنشاء شبكة داخلية للجهد المتوسط بقدرة ٣٣ كيلوفولت لتجميع الطاقة الكهربائية المنتجة من محطات مغيرات التيار ونقلها إلى محطة المحولات الرئيسية داخل الموقع.

ويتكون النظام من مجموعة من دوائر الجهد المتوسط المترابطة والمدعومة بواسطة منشآت وخطوط هوائية داخل حدود المشروع.

وقد تم تصميم الشبكة وفقًا لمعايير اللجنة الكهروتقنية الدولية (IEC) ومتطلبات كود الشبكة الكهربائية المصري، بما يضمن كفاءة وموثوقية تجميع ونقل الطاقة المنتجة من مختلف قطاعات المحطة.

ويقع كامل النظام داخل أراضٍ صحراوية غير مطورة ولا توجد بها مستقبلات دائمة.

General

المكون الرابع: البنية التحتية للربط بالشبكة الكهربائية

يتضمن المشروع إنشاء محطة محولات داخل الموقع بجهد ٥٥٠/٣٣ كيلوفولت لرفع الجهد الكهربائي وتصدير الطاقة المنتجة إلى الشبكة القومية للكهرباء.

وستشمل المحطة عددًا من المحولات الرئيسية بقدرة ٣٣٠ ميجافولت أمبير للمحول الواحد بما يوفر مستويات مناسبة من الاعتمادية والمرونة التشغيلية.

وتشمل المكونات الرئيسية للمحطة معدات الفصل والتشغيل الكهربائية(Switchgear) ، وأنظمة الحماية الكهربائية، وأنظمة التحكم والمراقبة (SCADA) .

وسيتم تصدير الطاقة الكهربائية المنتجة من المشروع إلى الشبكة القومية للكهرباء من خلال خطوط نقل هوائية بجهد ٥٠٠ كيلوفولت.

وتجدر الإشارة إلى أن خطوط النقل الخارجية سيتم تناولها ضمن دراسات تقييم أثر بيئي واجتماعي مستقلة.

المكون الخامس: طرق الوصول وأعمال تطوير الموقع

يتضمن المشروع إنشاء طريق وصول بطول يقارب ٣,٩ كيلومتر لربط موقع المشروع بطريق القاهرة–أسيوط الصحراوي. وسيدعم الطريق نقل المعدات والمواد والعمالة خلال مرحلتي الإنشاء والتشغيل.

كما ستشمل أعمال تطوير الموقع إنشاء شبكة الطرق الداخلية، وأنظمة تصريف مياه الأمطار، والمرافق المؤقتة اللازمة لدعم أنشطة الإنشاء.

وسيتم تنفيذ جميع الأعمال الإنشائية وفقًا للمعايير الوطنية ذات الصلة وأفضل الممارسات الهندسية الدولية.

٥. مرافق الإنشاء والتشغيل

مرافق مرحلة الإنشاء

ستشمل المرافق المؤقتة اللازمة خلال مرحلة الإنشاء مكاتب الموقع، ومناطق التخزين والتشوين، ومرافق إقامة العمالة، بالإضافة إلى المرافق الصحية المؤقتة والخدمات المساندة الأخرى لدعم أنشطة الإنشاء المختلفة، على أن يتم تفكيكها وإزالة آثارها بعد الانتهاء من الأعمال الإنشائية.

مرافق مرحلة التشغيل

سيتم تشغيل المشروع من خلال مجموعة من المرافق الدائمة التي تشمل مباني التشغيل والصيانة ، وغرف التحكم، والمخازن، ومرافق الأمن والخدمات المساندة.

General

كما ستضم مرافق التشغيل المكاتب الإدارية، وغرف الاجتماعات، والمرافق الخدمية للعاملين، بما في ذلك دورات المياه، وغرف الصلاة، ومناطق الاستراحة .وسيتم تشغيل وصيانة جميع المرافق وفقًا لمبادئ الممارسات الدولية الجيدة للصناعة (GIIP) والمتطلبات الوطنية ذات الصلة.

٦. الظروف البيئية الأساسية

البيئة الطبيعية

المناخ والأرصاد الجوية

يقع المشروع ضمن نطاق مناخ صحراوي شديد الجفاف، يتميز بارتفاع درجات الحرارة، وانخفاض معدلات هطول الأمطار إلى مستويات شبه معدومة (بمتوسط سنوي يبلغ نحو ١٢,٦ مم)، وارتفاع معدلات الإشعاع الشمسي، حيث يصل متوسط الإشعاع الشمسي الكلي إلى حوالي ٧٥٥ واط/م² خلال فصل الصيف. كما تسود المنطقة رياح شمالية إلى شمالية غربية معتدلة السرعة تتراوح عادةً بين ١٠ و٢٠ كم/ساعة، مع تعرضها لعواصف رملية متفرقة، يبلغ أقصى تكرار لها نحو ٢٢٧ ساعة خلال شهر مارس، بالإضافة إلى انخفاضٍ مستمر في الرطوبة النسبية على مدار العام.

جودة الهواء

تتمتع المنطقة بجودة هواء محيط جيدة بصورة عامة، ويُعزى ذلك إلى وقوع موقع المشروع في منطقة صحراوية نائية منخفضة الكثافة السكانية، مع عدم وجود مصادر صناعية رئيسية للانبعاثات في المناطق المجاورة. إلا أن تركيزات الغبار المحمول بالرياح والجسيمات العالقة PM_{10} و $PM_{2.5}$ قد ترتفع مؤقتاً أثناء فترات العواصف الرملية.

الجيولوجيا والجيومورفولوجيا

- **التكوينات الجيولوجية** :يقع موقع المشروع فوق هضبة جيرية متقطعة(Dissected Limestone Plateau) ، توفر أساساً جيولوجياً مستقراً لإنشاء محطة الطاقة الشمسية الكهروضوئية ونظام تخزين الطاقة بالبطاريات وتتكون التربة السائدة من تربة صخرية ضحلة (Lithosols) ذات محتوى صخري مرتفع وخصوبة طبيعية محدودة.
- **الطبوغرافية** :يتراوح منسوب سطح الأرض بين ٩٠ و١٧٠ متراً فوق مستوى سطح البحر في الجزء الشمالي من الموقع، وبين ١٧٠ و٢٦٥ متراً فوق مستوى سطح البحر في باقي أجزاء الموقع. وتتميز المنطقة بطبوغرافية منبسطة نسبياً، الأمر الذي يقلل من الحاجة إلى أعمال تسوية وحفر وردم واسعة النطاق.
- **الخصائص الجيومورفولوجية** :يغلب على الموقع الطابع الصحراوي الصخري المكشوف، ولا توجد به حقول للكثبان الرملية. ويقع أقرب حقل للكثبان الرملية على مسافة تقارب ٣٥ كم إلى الشمال الغربي من الموقع، على الجانب الآخر من نهر النيل.
- **الهيدرولوجيا والهيدروجيولوجيا** :لا توجد أي مسطحات مائية سطحية أو مجاري مائية دائمة داخل موقع المشروع، ويُعد نهر النيل أقرب مصدر للمياه السطحية، حيث يقع على بعد يقارب ١٣ كم إلى الغرب من الموقع. أما المياه الجوفية فتوجد على أعماق تتراوح بين ١٢٠ و١٨٠ متراً أسفل سطح الأرض. كما يمر في المنطقة الأوسع نظاما وادي عبادة ووادي البرشاوي، إلا أنهما لا يتقاطعان مع موقع المشروع، وبالتالي يُصنف مستوى تعرض الموقع لمخاطر السيول على أنه منخفض.

General

البيئة البيولوجية

يتكون موقع المشروع في معظمه من موائل صحراوية جرداء ومتجانسة، وقد تم تأكيد ذلك من خلال تحليل صور الأقمار الصناعية، والتحقق منه عبر المسوحات الميدانية التي أجرتها شركة انفايرونكس خلال شهر فبراير ٢٠٢٦، والتي شملت ١٨ نقطة مسح موزعة داخل موقع المشروع. ويتميز الموقع بانخفاض واضح في التنوع النباتي والغطاء النباتي، حيث تقتصر النباتات المعمرة على مجاري الأودية، والتي لا يمتد أي منها إلى داخل موقع المشروع. كما لا توجد أي موائل حرجة أو مناطق محمية ضمن منطقة التأثير الخاصة بالمشروع، وتقع أقرب منطقة محمية، وهي محمية وادي الأسيوطي، على بعد يقارب ١٠٣ كم إلى الجنوب الشرقي من موقع المشروع.

- **الموائل الطبيعية** :يقع موقع المشروع ضمن القطاع الأوسط من الصحراء الشرقية الداخلية، والتي تتميز بأراضٍ رملية منبسطة ومكشوفة، وتربة صخرية ضحلة(Lithosols) ، مع غطاء نباتي متناثر ومحدود الانتشار. وكانت أجزاء من الموقع قد استُخدمت سابقاً في أنشطة الاستصلاح الزراعي، إلا أنه تمت إزالة هذه الأنشطة بالكامل بواسطة محافظة المنيا. كما يخلو الموقع من أي مسطحات مائية أو أراضٍ رطبة أو موائل بيئية متميزة ذات أهمية إيكولوجية.
- **الغطاء النباتي :(Flora)** يكاد الموقع يخلو تماماً من الغطاء النباتي في المناطق غير المستصلحة، حيث سُجل عدد محدود من الأنواع النباتية الصحراوية المحلية خلال المسح الميداني المنفذ في فبراير ٢٠٢٦، مع ملاحظة نمو نباتي أكثر كثافة نسبياً بالمناطق المجاورة للأراضي التي سبق استصلاحها. ولم يتم تسجيل أي أنواع نباتية متوطنة أو مهددة بالانقراض داخل موقع المشروع.
- **الحياة البرية :(Fauna)** تشير خرائط التوزيع الجغرافي للأنواع إلى احتمالية تواجد ما لا يقل عن ١٠ أنواع من الزواحف ضمن النطاق الأوسع لمنطقة شرق المنيا، إلا أن أعمال المسح الميداني المنفذة في فبراير ٢٠٢٦ لم تسجل أي آثار أو دلائل على وجودها داخل موقع المشروع. كما يُحتمل تواجد بعض أنواع الثدييات في المناطق المحيطة، إلا أن تنوعها وكثافتها يُعدان منخفضين للغاية، ولم يتم رصد أي مؤشرات على وجود الثدييات أثناء أعمال المسح الميداني.
- **الطيور :(Avifauna)** استناداً إلى نتائج أداة تقييم الطيور المهاجرة المحلقة (Migratory Soaring Birds Tool – MSBT)، يُصنف موقع المشروع على أنه منخفض الحساسية جداً بالنسبة للطيور المهاجرة المحلقة، حيث بلغ مؤشر الحساسية المحتمل (٠,٠٠٠)، وتشير البيانات إلى احتمال ارتباط ١٣ نوعاً من الطيور المهاجرة بالمنطقة على نطاقها الأوسع. إلا أنه في ظل الظروف الطبيعية، يُتوقع أن يكون تواجد الطيور داخل موقع المشروع محدوداً للغاية، نظراً لافتقار الموقع إلى مقومات الجذب البيئي، بما في ذلك مصادر الغذاء والمياه، وموائل الإيواء، ومواقع الوقوف أو التعشيش. وبناءً على ذلك، لا يُعد موقع المشروع موطناً مناسباً للطيور المقيمة أو لأنشطة التكاثر والتعشيش.

البيئة الاجتماعية والاقتصادية

يقع موقع المشروع في منطقة غير مأهولة بالسكان، ويُعد مدينة المنيا الجديدة أقرب تجمع سكني، حيث تقع على مسافة تقارب ١١,٥ كم إلى الغرب من موقع المشروع.

- الكثافة السكانية والتوزيع السكاني :يقع موقع المشروع ضمن نطاق مركز المنيا بمحافظة المنيا، والتي يُقدر عدد سكانها بنحو ٦,٥١١,٣٧٧ نسمة وفقاً لتقديرات الجهاز المركزي للتعبئة العامة والإحصاء (CAPMAS) لعام

General

٢٠٢٥، ويقيم حوالي ٨١٪ من السكان في المناطق الريفية. وفي المقابل، تخلو منطقة شرق المنيا، التي يقع بها المشروع، من أي تجمعات سكانية دائمة.

- القوى العاملة والأنشطة الاقتصادية :يعتمد الاقتصاد المحلي بصورة رئيسية على النشاط الزراعي، والذي يمثل نحو ٣٢٪ من إجمالي القوى العاملة، إلى جانب أنشطة استخراج الخامات التعدينية، وصناعة المنسوجات، والصناعات الغذائية. كما يُقدر معدل البطالة على المستوى الإقليمي بأكثر من ١٠٪، في حين تسجل مشاركة الإناث في سوق العمل معدلات منخفضة نسبياً، تبلغ حوالي ٢٩٪ .
- استخدامات الأراضي :يقع موقع المشروع ضمن منطقة الامتياز المخصصة لهيئة الطاقة الجديدة والمتجددة بمنطقة شرق المنيا، والمخصصة لتطوير مشروعات الطاقة المتجددة. وكانت أجزاء من الموقع تُستخدم سابقاً في أنشطة زراعية غير رسمية، إلا أنه تمت إزالة هذه الأنشطة بالكامل بواسطة محافظة المنيا اعتباراً من يناير ٢٠٢٥ .وتوجد أراضٍ زراعية مستصلحة مباشرة إلى الغرب من حدود منطقة الامتياز.
- البنية التحتية والخدمات :لا تتوافر داخل موقع المشروع طرق وصول مخصصة أو شبكات للمياه أو الغاز الطبيعي أو الصرف الصحي أو الاتصالات. ويتم الوصول إلى الموقع عبر طريق القاهرة–أسيوط الصحراوي الذي يقع على بعد نحو ١,٤ كم شرق الموقع، وطريق القاهرة–أسوان الشرقي الصحراوي الذي يقع على بعد حوالي ٤,٤ كم إلى الغرب. كما تقع أقرب محطة محولات كهرباء، وهي محطة محولات المنيا الجديدة، على مسافة تقارب ٩,٧ كم من موقع المشروع.

واستناداً إلى نتائج دراسة خط الأساس الاجتماعي والاقتصادي، ومشاورات أصحاب المصلحة التي أُجريت خلال شهر فبراير ٢٠٢٦، يتبين أن المنطقة المحيطة تتمتع ببنية تحتية وخدمات مناسبة لدعم تنفيذ المشروع خلال مرحلتي الإنشاء والتشغيل، كما تتوافر قوة عاملة محلية يمكن الاستفادة منها لتعظيم فرص التوظيف المحلي. ولم تُسجل أي مطالبات قائمة بملكية الأراضي داخل نطاق امتياز هيئة الطاقة الجديدة والمتجددة.

التراث الثقافي المادي

لم تُسجل أي مواقع أثرية أو تاريخية أو عناصر للتراث الثقافي المادي، سواء كانت معروفة أو محتملة، داخل موقع المشروع أو ضمن نطاق عازل يزيد على ٥ كم حوله. وتقع أقرب المواقع ذات الأهمية الأثرية في مقابر بني حسن الصخرية على بعد نحو ١٤ كم إلى الجنوب الغربي، ومدينة تل العمارنة الأثرية على بعد حوالي ٤١,٥ كم إلى الجنوب الغربي، وكلاهما يقع على الضفة الشرقية لنهر النيل وخارج نطاق منطقة التأثير الخاصة بالمشروع.

٧. تحليل بدائل المشروع

يقيم هذا التحليل البدائل الرئيسية للمشروع، وذلك بما يتماشى مع التشريعات المصرية والمعايير الدولية المعمول بها.

أ. بديل عدم تنفيذ المشروع

في حالة عدم تنفيذ المشروع، لن تتحقق المساهمة المتوقعة في تحقيق أهداف مصر المتعلقة بالطاقة المتجددة وخفض انبعاثات غازات الاحتباس الحراري، كما ستُفقد الفوائد المرتبطة بالمشروع، بما في ذلك فرص العمل المحلية وفرص التوريد المحلي.

General

ولا يُعتبر بديل عدم تنفيذ المشروع مناسباً، ولذلك تم استبعاده..

ب. بديل اختيار موقع المشروع

يقع موقع المشروع داخل منطقة شرق المنيا بمساحة ٤١ كم^2، وقد تم تخصيصه رسمياً من قبل هيئة الطاقة الجديدة والمتجددة، وهو خالٍ من تعارضات استخدامات الأراضي، كما يتمتع بملاءمة فنية لتطوير مشروع للطاقة الشمسية الكهروضوئية على نطاق واسع.

ولم يتم النظر في أي موقع بديل، حيث تم التأكيد على أن الموقع المخصص مناسب لتنفيذ المشروع.

ت. بدائل أنواع الألواح الشمسية

- الألواح أحادية البلورة ثنائية الوجه :(Monocrystalline Bifacial) تتميز بأعلى كفاءة، ولا تحتوي على مواد خطرة، كما تتطلب أقل مساحة من الأراضي ٤–٥ أفدنة/ميجاوات. (وقد تم اختيارها)
- الألواح متعددة البلورات :(Polycrystalline) تتميز بانخفاض التكلفة، إلا أن كفاءتها أقل وتتطلب مساحة أكبر من الأراضي ٧,٥ – ٩ أفدنة/ميجاوات.
- الألواح رقيقة الأغشية (Amorphous Si / CdTe / CIS) (Thin–Film) تتميز بأداء جيد في درجات الحرارة المرتفعة، إلا أن كفاءتها أقل، كما أن تقنيتي CdTe و CISتحتويان على مواد خطرة (الكادميوم).

وقد تم اختيار الألواح أحادية البلورة ثنائية الوجه (Monocrystalline Bifacial) نظراً لكفاءتها العالية وأدائها البيئي الأفضل.

ث. بدائل أنظمة التتبع(Alternative Tracking Systems)

- النظام ثابت الميل (Fixed–Tilt) : يتميز بأقل تكلفة وأبسط متطلبات الصيانة، إلا أنه لا يتبع مسار الشمس، مما يؤدي إلى انخفاض إنتاج الطاقة.
- نظام التتبع أحادي المحور (Single–Axis Tracking) : يزيد من الإنتاج السنوي للطاقة بنسبة تتراوح بين ١٥ – ٢٥ % مقارنة بالنظام ثابت الميل، ويستخدم محركاً واحداً لكل صف من الألواح. وقد تم اختياره.
- نظام التتبع ثنائي المحور :(Dual–Axis Tracking) يحقق إنتاجية أعلى، إلا أنه أكثر تكلفة ويتطلب أعمال صيانة أكبر نتيجة استخدام محركين لكل وحدة.

وقد تم اختيار نظام التتبع أحادي المحور لتحقيق التوازن بين زيادة إنتاج الطاقة والتكلفة ومتطلبات الصيانة.

ج. بدائل تنظيف الألواح الشمسية(Alternative Module Cleaning)

- التنظيف الجاف اليدوي / شبه الآلي : لا يتطلب استخدام المياه، إلا أنه قد يؤدي إلى خدش الزجاج، وينتج عنه مخلفات من أقمشة التنظيف، كما يتطلب عمالة كثيفة.
- التنظيف الرطب (باستخدام الأقمشة أو الغسيل بالضغط) : يتميز بفعاليته في إزالة الأتربة، إلا أنه يتطلب ما بين ٠,٤ – ١,٠ لتر/لوح في كل دورة تنظيف، كما ينتج عنه مياه صرف، مما يجعله غير مناسب للمواقع الصحراوية الجافة.
- التنظيف الجاف الآلي باستخدام الروبوتات : لا يتطلب استخدام المياه، ولا يسبب أي تلف لسطح الزجاج، وينتج عنه أقل قدر من المخلفات، ويمكن التحكم فيه عن بُعد، ولا يحتاج سوى إلى عاملين لكل وردية .وقد تم اختياره.

وقد تم اختيار نظام التنظيف الجاف الآلي باستخدام الروبوتات، حيث يلغي الحاجة إلى استهلاك المياه ويمنع تولد مياه الصرف الناتجة عن تنظيف الألواح الشمسية.

ح. بدائل نظام تخزين الطاقة بالبطاريات(BESS Alternatives)

- بطاريات الليثيوم أيون (NMC / LFP) : تُعد التقنية الأكثر إثباتاً وموثوقية على مستوى مشروعات تخزين الطاقة المرتبطة بالشبكات الكهربائية، وتوفر توازناً بين كثافة الطاقة، ومستوى الأمان، والعمر التشغيلي، والتكلفة. وقد تم اختيارها.
- بطاريات تدفق الفاناديوم (Vanadium Redox Flow Batteries – VRFB) : تتميز بعمر تشغيلي طويل، إلا أن انخفاض كثافة الطاقة يتطلب مساحة كبيرة، بالإضافة إلى احتمالية انسكاب المحلول الإلكتروليتي ذي الطبيعة الأكالة.
- بطاريات المعادن المنصهرة (Molten Metal – AMBRI) : تتطلب تسخيناً مستمراً للحفاظ على الأقطاب في الحالة المنصهرة، مما يؤدي إلى استهلاك إضافي للطاقة.
- بطاريات أيونات الصوديوم (Sodium–Ion) : تتطلب الحفاظ على الأقطاب عند درجات حرارة تتراوح بين ٣٠٠ و٤٠٠ درجة مئوية، مما يستلزم وجود نظام تسخين دائم.

وقد تم اختيار **بطاريات الليثيوم أيون من نوع NMC أو LFP** لتطبيق نظام تخزين الطاقة بالبطاريات.(BESS)

خ. بدائل مصادر المياه(Water Sources Alternative)

تُستخدم المياه خلال مرحلة الإنشاء بواقع حوالي ٤ م³/يوم من مياه الشرب المعدنية المعبأة، و٩٧ م³/يوم من المياه البلدية للاستخدامات الصحية والمعيشية، بالإضافة إلى حوالي ٧٦ م³/يوم للأنشطة الإنشائية. أما خلال مرحلة التشغيل، فتبلغ الاحتياجات المائية حوالي ٧٥ – ١٠٠ م³/شهر للاستخدامات الصحية فقط، حيث سيتم تنظيف الألواح الشمسية باستخدام نظام التنظيف الجاف. وسيتم توفير مياه الشرب في صورة مياه معبأة.

- **استخراج المياه الجوفية :(Groundwater Abstraction)** تقع المياه الجوفية على أعماق تزيد على **١٢٠ متراً**، وتتميز بارتفاع ملوحتها، مما يستلزم إجراء معالجة مسبقة، والتخلص من المحلول الملحي الناتج، والحصول على التصاريح اللازمة من الجهات المختصة. ولذلك لم يُفضل هذا البديل.
- **نقل المياه بواسطة الصهاريج :(Water Trucking)** يتم نقل المياه من أقرب محطة معالجة إلى موقع المشروع بواسطة سيارات نقل المياه، ثم تخزينها في خزانات داخل الموقع. ويتميز هذا البديل بالبساطة والمرونة، ويتناسب مع الاحتياجات المائية المحدودة للمشروع. وقد تم تفضيله.

وقد تم اختيار **نقل المياه بواسطة الصهاريج** باعتباره البديل المفضل لتوفير المياه خلال مرحلتي الإنشاء والتشغيل.

General

٨. تقييم المخاطر والآثار البيئية والاجتماعية

يتناول هذا الفصل تقييم المخاطر والآثار البيئية والاجتماعية المحتملة للمشروع. ويتضمن تحليلاً تفصيلياً للمخاطر والآثار المرتبطة بالمشروع، مع التأكيد على تطبيق التسلسل الهرمي للتخفيف، والذي يشمل تجنب الآثار، وتقليلها، والتخفيف من حدتها.

تشمل الآثار الإيجابية للمشروع إنتاج طاقة شمسية نظيفة ومتجددة من محطة بقدرة ١٩٥٠ ميجاوات ذروة(تيار مستمر)، مما يساهم في خفض انبعاثات غازات الاحتباس الحراري بنحو ١,٢٢ مليون طن من مكافئ ثاني أكسيد الكربون سنوياً مقارنة بإنتاج الكهرباء المعتمد على الوقود الأحفوري، بالإضافة إلى تجنب انبعاث ملوثات الهواء. كما يساهم المشروع في الحفاظ على الموارد المائية في هذه المنطقة الصحراوية، ويدعم دمج الطاقة المتجددة في الشبكة الكهربائية القومية من خلال نظام تخزين الطاقة بالبطاريات . كذلك، يوفر المشروع نحو ٥٠٠٠ فرصة عمل مباشرة خلال ذروة مرحلة الإنشاء، مع استهداف أن تزيد نسبة العمالة المحلية من مجتمعات محافظة المنيا على 50%، بالإضافة إلى حوالي ٣٠ وظيفة دائمة خلال مرحلة التشغيل، وأكثر من ٥٠٠ فرصة عمل غير مباشرة ضمن سلسلة التوريد.

ويرد ملخص بالآثار البيئية والاجتماعية السلبية المحتملة للمشروع خلال مراحل الإنشاء والتشغيل وإيقاف التشغيل في الجدول التالي:

جدول ٢ : ملخصاً للجوانب البيئية وتدابير التخفيف والآثار المتبقية كما تم تقييمها لمراحل المشروع المختلفة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
مرحلة الانشاء			
جودة الهواء			
• انبعاثات الهواء	ضئيل	• تنفيذ سياسات لتقليل أوقات الخمول للمركبات والآلات؛ • الحفاظ على الآلات والمركبات في ظروف عمل جيدة لتقليل الانبعاثات والعادم الهاربين؛ • تقييد السرعة في الموقع لتقليل انبعاثات الغبار؛ • ضمان وعي العمال بالقيادة الآمنة والحفاظ على ممارسات جيدة في استخدام الآلات؛ و، • إجراء قياسات دورية لمداخن المولدات لضمان التزامها بالقانون ١٩٩٤/٤ • تنفيذ إجراءات الحد من انبعاثات الغبار (مثل رش المياه، وتغطية المواد السائبة، والحد من الأنشطة المسببة للغبار) .	غير ملحوظة
الضوضاء المحيطة			
• المعدات والآلات • حركة المركبات • مولدات الطاقة	ضئيل	• ضمان الصيانة الدورية لمعدات الانشاء والآلات لتقليل انبعاثات الضوضاء؛ • استخدام آلات ومعدات منخفضة الضوضاء حيثما أمكن؛ • جدولة الأنشطة عالية الضوضاء لتجنب العمليات المتزامنة التي قد تزيد من مستويات الضوضاء؛ • توفير معدات حماية السمع للعمال المعرضين لمستويات ضوضاء عالية.	غير ملحوظة
التأثيرات على التربة			
• خزانات مياه الصرف المنزلية، تخزين المواد والمخلفات، والتسرب والانسكابات العرضية	ضئيل	• إجراء صيانة للمركبات والشاحنات ومعدات الانشاء خارج الموقع لتقليل الانبعاثات والانسكابات في الموقع؛ • جمع والتخلص من التسربات الناتجة عن تعبئة الخزانات أو تشغيل المولدات كمخلفات خطرة؛ • تطوير وتنفيذ خطة لإدارة التسربات. • الحفاظ على ممارسات تنظيف جيدة لضمان موقع نظيف ومنظم • جمع ونقل مياه الصرف الصحي بواسطة المقاولين المعتمدين لضمان التخلص السليم ومنع التلوث • توفير احتواء ثانوي مناسب لخزانات تخزين الوقود، وكذلك للتخزين المؤقت للسوائل الأخرى مثل زيوت التشحيم والسوائل الهيدروليكية • المخلفات الصلبة غير الخطرة:	غير ملحوظة

General

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
		○ جمع المخلفات في نقاط الجمع المخصصة وتخزينها في الحاويات المناسبة وفقا للتشريعات المنظمة؛ و ○ استخدم مقاولين مرخصين لجمع والتخلص من المخلفات غير الخطرة. • المخلفات الخطرة: ○ إنشاء مناطق تخزين محددة ومنفصلة للمخلفات الخطرة؛ و ○ استخدم المقاولين المرخصين لجمع والتخلص من المخلفات الخطرة.	
التأثيرات على البيئة البيولوجية			
• فقدان الموائل، التعديل، والتجزئة	ضئيل	• تقتصر أنشطة الإنشاء على حدود موقع المشروع المعتمدة، لتجنب التأثير غير الضروري على المناطق المحيطة. • تطبيق ممارسات نظافة عامة الجيدة داخل وخارج الموقع لمنع تدهور الموائل المجاورة. • تجنب التأثير على المناطق خارج الموقع، خاصة في حال وجود أي غطاء نباتي. • الالتزام بحدود السرعة لجميع المركبات المرتبطة بالمشروع للحد من إزعاج الكائنات الحية وتقليل مخاطر الاصطدام بها. • تنفيذ برامج توعية بيئية للعاملين حول أهمية حماية الموائل الطبيعية وتجنب الإضرار بالحياة البرية. • حيثما أمكن، استخدام أسوار صديقة للحياة البرية تسمح بمرور الكائنات الصغيرة بأمان، بما في ذلك استخدام أسوار مرئية وترك فراغات مناسبة أسفل السور.	***غير ملحوظ***
• إزعاج الحياة البرية	ضئيل	• تنفيذ وتحديث خطط إدارة المخلفات ومياه الصرف الصحي؛ • توعية العمال؛ • ضمان التنظيف والترتيب المناسب؛ • ضمان التحكم في السرعة ومنع القيادة خارج المسار ؛ و • التأكد من الصيانة الصحيحة لمعدات الانشاء.	غير ملحوظة
• جذب الآفات وانتشار الأنواع الغريبة	ضئيل	• إعداد وتنفيذ خطة إدارة المخلفات الصلبة والخطرة ومياه الصرف الصحي، بما يشمل عمليات الجمع والتخزين والنقل والتخلص النهائي. • التأكد من أن مناطق تخزين وحفظ الطعام ومناطق تناول الطعام مؤمنة وغير متاحة للحيوانات. • تطبيق ممارسات صارمة للنظافة العامة (Housekeeping) في جميع مناطق العمل ومناطق الإقامة.	غير ملحوظة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
		• توفير برامج توعية للعاملين حول المخاطر البيئية الناتجة عن سوء إدارة المخلفات ومياه الصرف الصحي.	
التأثيرات على البيئة الاجتماعية			
• الموارد المائية	غير ملحوظ	• يقوم المقاول بتوفير المياه فقط من مصادر مرخصة ومعتمدة، ونقلها إلى الموقع باستخدام ناقلات مياه معتمدة. • تنفيذ خطة لإدارة المياه ضمن خطة الإدارة البيئية والاجتماعية لمرحلة الإنشاء، بما يشمل إجراءات التوريد والتخزين والمتابعة وإعداد التقارير. • متابعة وتسجيل استهلاك المياه بشكل منتظم. • تطبيق ممارسات ترشيد استهلاك المياه خلال أنشطة الإنشاء، بما في ذلك الاستخدام المنضبط للمياه في التحكم في الأتربة وتنظيف المعدات. • إجراء فحص دوري لخزانات المياه وخطوط التوزيع لمنع التسرب أو فقد المياه	**لا يوجد**
• تدفق العمال	ضئيل	• إعطاء الأولوية لتوظيف العمال المحليين لتقليل عدد العمال الجدد وتقليل الاضطرابات الاجتماعية؛ • حظر التوظيف المباشر "عند باب المنشأة" للحد من الباحثين عن عمل بشكل عشوائي، على أن يتم الإعلان عن الوظائف واستلام طلبات التقديم من خلال مكتب العمل التابع للمحافظة. • توفير مرافق إقامة كافية في الموقع للعمال لمنع تحميل البنية التحتية المحلية بشكل زائد. • تنفيذ ومتابعة إجراءات إدارة المخلفات الخاصة بالموقع في سكن العاملين، بما يشمل الفصل والتخزين الآمن والتخلص السليم من المخلفات من خلال مقاولين معتمدين. • إعداد مدونة سلوك للعاملين لضمان التعامل باحترام مع المجتمعات المحلية، والالتزام بمتطلبات السلامة والصحة المهنية، ومنع حوادث العنف القائم على النوع الاجتماعي والتحرش.	غير ملحوظة
البنية التحتية			
• استخدام الأراضي	غير ملحوظة	• لا توجد مطالبات ملكية أرض أو أنواع أخرى من استخدامات الأراضي في موقع المشروع.	لا يوجد تأثيرات متبقية
• حركة المرور	**متوسط**	• سيتم تطوير وتنفيذ خطة إدارة المرور والإجراءات المرتبطة بها، بما في ذلك تلك الخاصة بالمقاولين والمتعاقدين من الباطن. وتحدد هذه الإجراءات الحد الأدنى من متطلبات السلامة لأنشطة النقل الخاصة بالمشروع، على أن تكون مكملة للاشتراطات التنظيمية الوطنية و/أو متطلبات التأمين. • كما سيتم التنسيق مع إدارة المرور لتحديد توقيتات النقل بما يساهم في تجنب الطرق أو المقاطع ذات الكثافة المرورية العالية، وكذلك أوقات الذروة قدر الإمكان	ضئيل

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
الصحة والسلامة المهنية			
• تأثيرات على صحة وسلامة القوى العاملة	متوسط	• سيتم إحاطة مواقع الحفر بعلامات تحذيرية تمنع الوصول إلى هذه الأماكن؛ • سيضمن المقاولون أن عمال الانشاء سيخضعون للإشراف المستمر من خلال الحضور المستمر لمشرفين في الموقع للفحص الدقيق/الإدارة لأنشطة الانشاء؛ • ضمان التدريب المناسب للمشغلين، والصيانة الدورية للمعدات، وتنفيذ بروتوكولات السلامة. • استخدام معدات الحماية الشخصية (PPE)، والتخزين المناسب ووضع العلامات على المواد الكيميائية، والتدريب على التعامل مع المواد الخطرة. • توفير أدوات حماية السمع، وتنفيذ إجراءات للتحكم في الضوضاء، وجدولة فترات راحة منتظمة للعمال. • تقديم تدريبا على تقنيات رفع الأشياء الثقيلة الصحيحة، واستخدام الروافع الميكانيكية المساعدة. • تنفيذ إجراءات الوقاية من الحرائق، وصيانة طفايات الحريق في الموقع، وإجراء تدريبات على السلامة من الحرائق. • توفير الترطيب الكافي، وتحديد جدولة للعمل خلال الأوقات الباردة من اليوم، والسماح بفترات راحة منتظمة في المناطق المظللة. • تقييد سرعة المركبات حتى لا تتجاوز الحد الأقصى للسلامة داخل الموقع (١٥-٢٠ كم/س). • سيتم فحص جميع المعدات قبل بدء العمل لضمان سلامة العمال؛	ضئيل
امن الموقع	ضئيل	• تدريب أفراد الأمن بشكل مناسب، وضمان التزامهم بسلوك مهني ملائم تجاه العاملين والمجتمع، والعمل وفقا للتشريعات المعمول بها. كما سيتم إعداد آلية لتلقي الشكاوى تتيح للمجتمعات المتأثرة التعبير عن أي مخاوف تتعلق بإجراءات التأمين أو تصرفات أفراد الأمن.	غير ملحوظة
التراث الثقافي	ضئيل	• تطبيق إجراء الاكتشافات العرضية بما يتماشى مع التشريعات الوطنية ومعيار الأداء رقم ٨ لمؤسسة التمويل الدولية.، وذلك في حال العثور على أي بقايا أثرية أو مواد ذات قيمة ثقافية أثناء أعمال الإنشاء. • التأكد من توعية وتدريب جميع المقاولين والعاملين بالموقع على إجراء الاكتشافات العرضية قبل بدء أي أعمال تتضمن تحريك التربة. • في حال حدوث اكتشاف عرضي: • إيقاف الأعمال فورا في موقع الاكتشاف؛ • تأمين وتحديد المنطقة لمنع أي تلف أو وصول غير مصرح به؛ • إخطار الجهات المختصة؛	غير ملحوظة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
		• عدم استئناف الأعمال إلا بعد الحصول على الموافقة والتوجيهات من الجهات المختصة. • قصر أعمال الحفر وتحريك التربة بشكل صارم على المناطق والأعماق المعتمدة.	
مرحلة التشغيل			
جودة الهواء			
• الانبعاثات الناتجة عن مولد الطوارئ • الانبعاثات المحتملة ل SF٦، إذا استخدمت لعزل معدات التبديل	ضئيل	• تحسين تشغيل المولدات الاحتياطية لتقليل الاستخدام والانبعاثات. • إجراء قياسات سنوية لانبعاثات المداخن لمولدات الطوارئ • إذا تم استخدام سداسي فلوريد الكبريت كعازل بدلا من عزل الهواء، ستشمل إجراءات التخفيف اكتشاف التسربات وإصلاحها، واستخدام تفريغ مناسب للحجرات أثناء تعبئة غاز سداسي فلوريد الكبريت في نظام GIS ، وتوعية وتدريب الموظفين.	غير ملحوظة
الضوضاء المحيطة والاهتزاز			
• تشغيل المحولات والمكونات التشغيلية الأخرى لأنظمة تخزين طاقة البطاريات. • استخدام المولدات الاحتياطية أثناء انقطاع الكهرباء	ضئيل	• تم تصميم الآلات والمعدات التي ينتج عنها ضوضاء محتملة لتلبية اللوائح القانونية المتعلقة بالضوضاء. • سيتم تزويد العاملين في أماكن وجود آلات ومعدات مولدة للضوضاء بمعدات الحماية الشخصية المناسبة.	غير ملحوظة
التأثير على البيئة البيولوجية			
• الإزعاج للحياة البرية (باستثناء الطيور)	ضئيل	• تطوير وتنفيذ وتحديث خطة إدارة المخلفات الصلبة والمخلفات الخطرة ومياه الصرف الصحي؛ • توعية العمال حول الآثار السلبية لإزعاج أي حيوانات برية؛ • ضمان ممارسة الترتيب والتنظيف المناسب؛ • التأكد من عدم إمكانية وصول الحيوانات الى مناطق تخزين الطعام؛ • تجنب الضوء عالي الشدة الذي قد يزعج الحيوانات خارج الموقع؛ • ضمان التحكم في السرعة ومنع القيادة خارج المسار ؛ • ضمان الصيانة المناسبة للمعدات وأي معدات أخرى ذات قدرة عالية على الضوضاء والاهتزاز ؛	غير ملحوظة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
		• التأكد من أن المولدات معزولة بشكل صحيح لتجنب انبعاثات الضوضاء؛ و • تأكد من أن العمال لا يزعجون الحيوانات المحلية التي قد تواجهها.	
• احتمالية اصطدام الطيور بخطوط نقل الجهد المتوسط الداخلية (٣٣ ك.ف) أثناء التشغيل	غير ملحوظ	• تطبيق الإدارة السليمة للمخلفات الصلبة ومياه الصرف الصحي لتجنب جذب الطيور إلى الموقع. • مراقبة حالات نفوق الطيور (إن وجدت) وتطبيق الإجراءات التصحيحية اللازمة عند الحاجة. | ضئيل (غير ذي أهمية)	غير ملحوظ
• الصعق الكهربائي خطر تعرض الطيور للصعق الكهربائي في محطات التحويل والبنية التحتية الكهربائية الداخلية	متوسط	• توفير مسافات فصل كافية بين المكونات الحاملة للتيار والأجزاء المؤرضة وفقاً لأفضل الممارسات الدولية. • زيادة استخدام الموصلات والوصلات المعزولة في المواقع التي يُحتمل أن تقف عليها الطيور. • تغطية العناصر الموصلة المكشوفة بمواد عازلة عند الحاجة ووفقاً لاعتبارات التصميم الهندسي. • تنفيذ عمليات تفتيش وصيانة دورية لضمان استمرار فعالية تدابير حماية الطيور..	***ضئيل إلى غير ملحوظ***
التأثير على البيئة الاجتماعية			
• الموارد المائية	غير ملحوظ	• لا تُتطلب إجراءات تخفيف محددة نظراً لانخفاض استهلاك المياه وكميات مياه الصرف الناتجة خلال مرحلة التشغيل. ومع ذلك، يتم تطبيق إجراءات إدارة، حيث يتم جمع مياه الصرف الناتجة خلال التشغيل بواسطة مقاول مرخص ونقلها إلى محطات معالجة معتمدة ومخصصة لهذا الغرض.	لا يوجد تأثيرات متبقية
• توليد المخلفات	غير ملحوظ	لا تُتطلب إجراءات تخفيف محددة نظراً لانخفاض كميات المخلفات المتولدة خلال مرحلة التشغيل. ومع ذلك، يتم تطبيق إجراءات إدارة بيئية تشمل ما يلي: • جمع المخلفات غير الخطرة في نقاط مخصصة داخل حاويات مناسبة والتخلص منها من خلال مقاولين مرخصين . • إنشاء مناطق تخزين منفصلة وواضحة التحديد للمخلفات الخطرة، مع جمعها والتخلص منها عبر مقاولين مرخصين . • إعادة البطاريات في نهاية عمرها التشغيلي والألواح الشمسية التالفة إلى الموردين أو نقلها إلى مرافق إعادة تدوير معتمدة، وفقاً لاستراتيجيات إعادة التدوير المستدامة حيثما أمكن .	غير ملحوظة
• التأثيرات البصرية	غير ملحوظة	• لا توجد حاجة إلى إجراءات تخفيف إضافية بخلاف ممارسات التشغيل والصيانة المعتادة	غير ملحوظة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
• اللمعان والانعكاس		• لا توجد حاجة إلى إجراءات تخفيف إضافية بخلاف ممارسات التشغيل والصيانة المعتادة، مثل الحفاظ على نظافة الألواح وضمان بقاء الطبقات المضادة للانعكاس في حالة جيدة طوال العمر التشغيلي للمشروع.	غير ملحوظة
تأثيرات على الصحة والسلامة المهنية			
• التأثيرات على بيئة العمل	ضئيلة	• إعداد وصيانة خطة شاملة لإدارة الصحة والسلامة المهنية (OHS)، بما يشمل تقييم المخاطر، والإبلاغ عن الحوادث، والاستعداد للطوارئ. • تطبيق سياسة رسمية للصحة والسلامة المهنية. • الالتزام بجميع القوانين واللوائح الوطنية ذات الصلة بالصحة والسلامة المهنية، بما في ذلك قانون العمل رقم ١٢ لسنة ٢٠٠٣ ورقم ١٤ لسنة ٢٠٢٥. • توفير معدات الوقاية الشخصية المناسبة (PPE) لجميع العاملين أثناء التشغيل.	لا يوجد تأثيرات متبقية
المخاطر المحتملة للحريق والانفلات الحراري (Thermal Runaway)			
• مخاطر الحريق والانفلات الحراري المرتبطة بأنظمة بطاريات الليثيوم أيون.(BESS)	طفيف	• الالتزام بتصميم وتشغيل نظام تخزين الطاقة بالبطاريات (BESS) وفقًا لمتطلبات NFPA 855 و UL 9540 والمعايير الدولية ذات الصلة. • تركيب نظام إدارة البطاريات (Battery Management System – BMS) لمراقبة أداء البطاريات والتحكم في تشغيلها. • تطبيق أنظمة المراقبة الحرارية المستمرة وأنظمة الإيقاف التلقائي عند اكتشاف أي ظروف تشغيل غير طبيعية. • تركيب أنظمة متكاملة للكشف المبكر عن الحريق والإطفاء الآلي. • إعداد وتنفيذ خطة الاستجابة للطوارئ الخاصة بالبطاريات. • تدريب العاملين وفرق الاستجابة للطوارئ على التعامل مع حوادث البطاريات. • تنفيذ برامج الفحص والصيانة الوقائية الدورية لجميع مكونات نظام البطاريات.	غير ملحوظة
تأمين الموقع(Site Security)			

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
• وجود أفراد الأمن المتعاقد معهم وسلوكهم أثناء تعاملهم مع العاملين والمجتمع المحيط.	غير ملحوظة	• التأكد من حصول أفراد الأمن على التدريب المناسب والالتزام بالقوانين السارية وإجراءات الشركة ومدونات السلوك المعتمدة. • إنشاء آلية فعالة لتلقي الشكاوى تُمكّن العاملين وأفراد المجتمع من الإبلاغ عن أي ملاحظات أو شكاوى تتعلق بإجراءات الأمن أو سلوك أفراد الأمن. • تنفيذ أعمال المراقبة والإشراف المستمر على الأنشطة الأمنية لضمان الالتزام بالإجراءات والمعايير المعتمدة.	لا يوجد تأثيرات متبقية
التأثيرات على التغيرات المناخية (Impacts on Climate Change)			
• الانبعاثات المحدودة الناتجة عن حركة المركبات داخل الموقع • انبعاثات مولدات الديزل الاحتياطية المستخدمة في حالات الطوارئ.	غير ملحوظة	• استخدام معدات GIS الحديثة مع تطبيق إجراءات صارمة لإدارة غاز SF_6 تشمل منع التسرب، والكشف المبكر عنه، وتنفيذ برامج الصيانة الدورية. • تنفيذ برامج الصيانة الوقائية لجميع الأنظمة الكهربائية والميكانيكية للحد من مخاطر الانبعاثات غير المقصودة. • تحسين كفاءة تشغيل المركبات وتقليل الحركة غير الضرورية داخل الموقع. • تطبيق أنظمة السلامة المعترف بها دوليًا لأنظمة تخزين الطاقة بالبطاريات (BMS، المراقبة الحرارية، أنظمة الكشف عن الحرائق والإطفاء الآلي.) • الالتزام بمنهجيات **IPCC** ومتطلبات الإفصاح المعمول بها، بما في ذلك حدود الإبلاغ الخاصة بالمؤسسات التمويلية الدولية (مثل معيار **EBRD** البالغ ٢٠,٠٠٠ طن مكافئ ثاني أكسيد الكربون سنويًا، عند الاقتضاء.)	غير ملحوظة
تأثيرات البيئة على المشروع(Impacts of the Environment on the Project)			
• الغبار والعواصف الرملية	متوسطة	• تنفيذ برامج دورية لتنظيف الألواح الشمسية وإجراء الصيانة الوقائية. • اختيار ألواح شمسية ذات مقاومة عالية للتآكل الناتج عن الرمال. • تعديل زاوية أنظمة التتبع أثناء العواصف الرملية والرياح الشديدة لتقليل التعرض المباشر للرمال.	غير ملحوظة
• درجات الحرارة المرتفعة	ضئيل	• استخدام أنظمة تبريد نشطة تعتمد على السوائل مع حساسات لقياس درجات الحرارة بشكل لحظي في نظام BESS.	غير ملحوظة

الجوانب البيئية والاجتماعية	التأثيرات المتوقعة	ملخص إجراءات التخفيف	التأثيرات المتبقية
		• تطبيق إجراءات إدارة الإجهاد الحراري للعاملين، بما يشمل توفير مناطق مظللة ومياه الشرب وفترات راحة مناسبة. • تنفيذ برامج مراقبة مستمرة للأداء للكشف المبكر عن أي انخفاض في كفاءة التشغيل نتيجة ارتفاع درجات الحرارة.	
• السيول المفاجئة	ضئيل	• تصميم الأساسات مع مراعاة نتائج دراسات مخاطر النحر (Scour) ، وبعمق لا يقل عن **٠,٥ متر** حيثما ينطبق ذلك. • تنفيذ أعمال تصريف داخلي محدودة للتحكم في مياه الجريان السطحي المحلية.	غير ملحوظة
التأثيرات التراكمية (مرحلة الإنشاء والتشغيل)			
• المرور، وجودة الهواء، والموارد المائية، وتدفق العمالة.	غير ملحوظة	• التنسيق بين جداول تنفيذ المشروع والمشروعات الأخرى المتوقعة لتجنب تزامن الأنشطة الرئيسية. • استخدام الطرق الصحراوية الإقليمية منخفضة الكثافة المرورية. • الالتزام بخطط إدارة النقل وإدارة العمالة المعتمدة على مستوى البرنامج.	غير ملحوظة
مرحلة إغلاق المشروع (Decommissioning Phase)			
• التربة، والمياه، والهواء، والضوضاء، والصحة والسلامة المهنية.	**طفيف**	• –ضمان الإدارة السليمة وجمع ونقل والتخلص الآمن من جميع المخلفات الخطرة وغير الخطرة وفقًا للتشريعات المعمول بها. • إعادة تأهيل الموقع وإعادته إلى أقرب حالة ممكنة لوضعه الأصلي، حيثما كان ذلك ممكنًا من الناحية الفنية.	غير ملحوظة
إدارة المخلفات بطاريات نهاية العمر الافتراضي والمخلفات الخطرة.	**طفيف**	• إعداد وتطبيق إجراءات خاصة بإدارة مخلفات البطاريات. • التخزين المؤقت للبطاريات المستهلكة في مناطق مخصصة للمخلفات الخطرة. • نقل البطاريات والمخلفات الخطرة بواسطة شركات مرخصة إلى منشآت إعادة التدوير أو التخلص المعتمدة. • تطبيق برامج استرجاع البطاريات (Take-back Programs) بالتنسيق مع الموردين كلما كان ذلك ممكنًا.	غير ملحوظة

General

٩. التشاور مع أصحاب المصلحة

تم تنفيذ برنامج التشاور مع أصحاب المصلحة وفق نهج تدريجي شمل تحديد أصحاب المصلحة منذ المراحل المبكرة للمشروع، واستمرار التواصل معهم خلال مراحل إعداد دراسة تقييم الأثر البيئي والاجتماعي(ESIA) ، والإفصاح عن المعلومات ذات الصلة بصورة شفافة، وذلك بهدف ضمان مشاركة فعّالة وذات مغزى في عملية تقييم المشروع واتخاذ القرار.

أنشطة تحديد نطاق الدراسة البيئية والاجتماعية(Scoping)

عُقدت اجتماعات تحديد نطاق الدراسة (Scoping Meetings) خلال الفترة من **يناير إلى مارس ٢٠٢٦**، حيث تناولت المناقشات مختلف الجوانب البيئية والاجتماعية والاقتصادية المرتبطة بالمشروع.

وأبدى غالبية أصحاب المصلحة تأييدهم للمشروع، لما يتوقع أن يحققه من مساهمة في دعم إنتاج الطاقة النظيفة، وتعزيز أمن الطاقة، وخلق فرص عمل مباشرة وغير مباشرة، بما يتماشى مع أهداف التنمية المستدامة.

وشملت أبرز الموضوعات والقضايا التي أثارها أصحاب المصلحة ما يلي:

- توفير فرص العمل أثناء مرحلتي الإنشاء والتشغيل .
- إعطاء الأولوية لتوظيف العمالة المحلية كلما أمكن ذلك .
- ترتيبات إقامة العمال وآثارها الاجتماعية على المجتمعات المحلية .
- احتياجات المشروع من المرافق والخدمات الأساسية .
- المنافع التنموية المتوقعة للمجتمع المحلي .
- برامج التدريب وبناء القدرات ونقل الخبرات .
- آلية استقبال الشكاوى والتظلمات .(Grievance Mechanism)
- استمرار التواصل والتشاور مع المجتمع المحلي وأصحاب المصلحة طوال دورة حياة المشروع .

الإفصاح عن دراسة تقييم الأثر البيئي والاجتماعي(ESIA Disclosure)

على الرغم من أن الإرشادات الوطنية الخاصة بالمشروعات المصنفة ضمن **الفئة (B)** لا تشترط عقد جلسات إفصاح عامة رسمية، إلا أنه سيتم تنفيذ برنامج للإفصاح والتشاور بما يتوافق مع متطلبات جهات التمويل الدولية، وبما يضمن إتاحة المعلومات لأصحاب المصلحة وتمكينهم من إبداء آرائهم وملاحظاتهم.

وسيشمل برنامج الإفصاح ما يلي:

- توجيه دعوات موجهة إلى أصحاب المصلحة على المستويات المحلية والبلدية ومستوى المحافظة، مع ضمان إشراك الفئات الأكثر تأثراً أو الفئات الأولى بالرعاية .
- الإعلان عن موعد جلسة الإفصاح قبل انعقادها بفترة تتراوح بين **10و١٥ يوماً** باستخدام وسائل الإعلان المناسبة .
- اعداد **الملخص غير الفني للدراسة (Non–Technical Summary – NTS)** باللغة العربية، مع إتاحته إلكترونياً للاطلاع .

General

- توفير استمارات لتلقي الملاحظات والتعليقات أثناء جلسة الإفصاح، مع استمرار استقبال التعليقات لمدة تصل إلى **أسبوعين** بعد انعقاد الجلسة .
- عقد جلسة الإفصاح بمحافظة **المنيا** ويُحدد الموقع النهائي لاحقاً .

وسيتم توثيق جميع مخرجات عملية التشاور، بما في ذلك سجلات الحضور، والملاحظات الواردة من أصحاب المصلحة، وآلية التعامل معها، وإدراجها ضمن ملاحق دراسة تقييم الأثر البيئي والاجتماعي.

١٠. خطة الإدارة البيئية والاجتماعية

سيتم إعداد وتنفيذ **خطة الإدارة البيئية والاجتماعية (ESMP)** للمشروع، والتي تتضمن إجراءات محددة للتخفيف والرصد لضمان الالتزام بجميع المتطلبات القانونية والمؤسسية المعمول بها، بالإضافة إلى تطبيق أفضل الممارسات الدولية في مجال الإدارة البيئية والاجتماعية طوال مراحل الإنشاء والتشغيل وإنهاء المشروع.

الترتيبات المؤسسية

سيتم تحديد الأدوار والمسؤوليات الخاصة بتنفيذ خطة الإدارة البيئية والاجتماعية بصورة واضحة، بما يشمل المطور، والمقاولين، والمقاولين من الباطن، والجهات الحكومية المختصة، بما يضمن المساءلة، ووضوح خطوط المسؤولية، والتنسيق الفعال بين جميع الأطراف المعنية.

تتضمن خطة الإدارة البيئية والاجتماعية، على سبيل المثال لا الحصر، الخطط والإجراءات التالية:

- خطة الصحة والسلامة والبيئة.(HSE)
- خطة إدارة النقل والمرور.
- خطة إدارة الضوضاء.
- خطة إدارة المخلفات الخطرة وغير الخطرة.
- خطة إدارة المياه ومياه الصرف.
- إجراءات الاكتشافات الأثرية العرضية.(Chance Find Procedure)
- برنامج الصيانة الوقائية والتصحيحية.
- خطة إدارة مياه الصرف.
- إجراءات النظافة العامة والمحافظة على الموقع.(Housekeeping and Cleanliness)
- خطة الإدارة الاجتماعية، والتي تتضمن خطة شركة **Energy Valley** لمنع الاستغلال والانتهاك والتحرش الجنسي(SEAH) ، وخطة مكافحة العنف القائم على النوع الاجتماعي.(GBV)

بناء القدرات

سيتم تنفيذ برامج للتدريب وبناء القدرات تستهدف العاملين بالمشروع والمقاولين، بهدف تعزيز معارفهم ومهاراتهم في مجال الإدارة البيئية والاجتماعية، وضمان التطبيق الفعال لخطة الإدارة البيئية والاجتماعية، والالتزام بأفضل الممارسات والمعايير المعمول بها طوال دورة حياة المشروع.

و يوضح الجدول التالى ملخص خطة الإدارة البيئية والاجتماعية لجميع مراحل المشروع

General

جدول ٣: ملخص خطة الإدارة البيئية والاجتماعية لجميع مراحل المشروع

العنصر	القضايا محل الاهتمام	الإجراءات	الجهة المسؤولة عن التنفيذ	مؤشر الإنجاز	التكلفة التقديرية (دولار أمريكي)	موعد التنفيذ
جودة الهواء	انبعاثات الأتربة والغبار	تقليل فترات تشغيل المركبات والمعدات في وضع الخمول.– المحافظة على – .المعدات والمركبات في حالة تشغيل جيدة.– فرض حدود السرعة داخل الموقع توعية العاملين بممارسات القيادة الآمنة والاستخدام السليم للمعدات.– إجراء قياسات .دورية لانبعاثات مداخن المولدات	مقاول الإنشاء	.خطة الرصد – .قياسات جودة الهواء	15,000–20,000 سنويًا	طوال مرحلة الإنشاء
	الحالة التشغيلية للمعدات	إجراء فحوصات وصيانة دورية لجميع معدات الإنشاء.– تطبيق خطة الصحة – .(OHS) والسلامة المهنية	مقاول الإنشاء	سجلات الصيانة وخطة الصحة والسلامة المهنية	50,000–70,000 (ضمن مخصصات EPC/O&M)	طوال مرحلة الإنشاء
الضوضاء	الحالة التشغيلية للمعدات	.–الصيانة الدورية للمعدات.– استخدام المعدات منخفضة الضوضاء كلما أمكن – جدولة الأنشطة عالية الضوضاء لتجنب تزامنها.– تنفيذ الأنشطة مرتفعة الضوضاء .خلال ساعات النهار.– تطبيق خطة الصحة والسلامة المهنية	مقاول الإنشاء	خطة الصحة والسلامة المهنية، وقياسات الضوضاء، وسجلات الصيانة	10,000–15,000 سنويًا	طوال مرحلة الإنشاء
	معدات الوقاية الشخصية	.توفير معدات الوقاية الشخصية المناسبة للعاملين –	مقاول الإنشاء	—	20,000–40,000 (طوال فترة المشروع)	—
التربة	النظافة العامة بالموقع	،إعداد وتنفيذ خطة إدارة الموقع، وخطة إدارة المخلفات، وخطة إدارة مياه الصرف – وخطة الاستجابة ومنع الانسكابات.– جمع واحتواء والتخلص الآمن من مياه الصرف الصحي.– تخزين ومناولة المواد الخطرة وفقًا لإرشادات البنك الدولي للصحة نقل المخلفات والتخلص منها –.(WBG EHS Guidelines) والسلامة والبيئة .بواسطة متعهدين معتمدين	مقاول الإنشاء والمطور	خطط إدارة المخلفات ومياه الصرف، عقود ،التخلص من المخلفات سجلات متابعة المقاولين	6,000–80,000 (وفقًا لكميات المخلفات)	طوال مرحلة الإنشاء
الصحة والسلامة المهنية	سلامة العاملين بالموقع	وفقًا للتشريعات الوطنية HSE إعداد خطة الصحة والسلامة المهنية وإجراءات – .والمعايير الدولية	المقاول	خطة وإجراءات الصحة والسلامة المهنية	60,000–80,000	قبل بدء أعمال الإنشاء
	الاستجابة للطوارئ	.إعداد خطة وإجراءات الاستجابة للطوارئ –	المقاول	خطة الطوارئ	30,000–80,000	قبل تشغيل المشروع

العنصر	القضايا محل الاهتمام	الإجراءات	الجهة المسؤولة عن التنفيذ	مؤشر الإنجاز	التكلفة التقديرية)دولار أمريكي)	موعد التنفيذ
إدارة المخلفات	صحة العاملين	–.إعداد خطة لإدارة المخلفات الخطرة وغير الخطرة وفقًا لإرشادات البنك الدولي – تطبيق خطة الصحة والسلامة المهنية.– تخزين المخلفات في أماكن مخصصة ونقلها بواسطة شركات مرخصة.	مقاول الإنشاء	،عقود إدارة المخلفات ،سجلات نقل المخلفات خطة الصحة والسلامة المهنية	يورو/طن 600–200 ،(مخلفات خطرة) و80–150 يورو/طن (غير خطرة)	طوال مرحلة الإنشاء
البيئة البيولوجية	الآفات والأنواع الغازية	– المحافظة على النظافة العامة والإدارة السليمة للمخلفات.	مقاول الإنشاء	عقد إدارة المخلفات	10,000–25,000 (مرة واحدة)	طوال مرحلة الإنشاء
	إزعاج الحياة الفطرية	– تنفيذ برامج التوعية البيئية.– تطبيق إجراءات التخفيف.– الإشراف المستمر على تنفيذ التدابير الوقائية.	مقاول الإنشاء	الالتزام بمتطلبات العقود	—	طوال مرحلة الإنشاء
البيئة الاجتماعية	تدفق العمالة	– إعطاء الأولوية لتوظيف العمالة المحلية.– تطبيق آلية لتلقي الشكاوى المجتمعية.– اختيار أماكن إقامة العمال بعيدًا عن التجمعات السكنية وإنشاء معسكر عمالي عند الحاجة.– إعداد سياسات الموارد البشرية بما يشمل خطط مكافحة العنف ومنع الاستغلال والانتهاك والتحرش الجنسي (GBV) القائم على النوع الاجتماعي (SEAH).	المطور /مقاول الإنشاء	،خطة إدارة العمالة تقارير تفتيش سكن العمال، سياسات GBV وSEAH، برامج التوعية	50,000–150,000 سنويًا	طوال مرحلة الإنشاء
	صحة وسلامة المجتمع (حوادث المرور)	– إعداد وتنفيذ خطة إدارة المرور (TMP).	مقاول الإنشاء	خطة وإجراءات إدارة المرور	40,000–100,000	طوال مرحلة الإنشاء
	التراث الثقافي	– إعداد وتطبيق إجراءات الاكتشافات الأثرية العرضية (Chance Find Procedure).	المطور /مقاول الإنشاء	الإجراءات المعتمدة	5,000–15,000	قبل بدء أعمال الإنشاء

العنصر	القضايا محل الاهتمام	الإجراءات	الجهة المسؤولة عن التنفيذ	مؤشر الإنجاز	التكلفة التقديرية)دولار (أمريكي	موعد التنفيذ
مرحلة التشغيل						
جودة الهواء	انبعاثات مولدات الديزل الاحتياطية	تحسين تشغيل المولدات الاحتياطية للحد من فترات التشغيل – والانبعاثات.– تنفيذ أعمال الصيانة الدورية وإجراء قياسات دورية .لانبعاثات المولدات لضمان كفاءة التشغيل وتقليل الانبعاثات الهوائية	المطور	قياسات الانبعاثات.سجلات الصيانة.	سنويًا 15,000–20,000	بشكل دوري طوال مرحلة التشغيل.
الضوضاء	المحولات الكهربائية وأنظمة تخزين الطاقة بالبطاريات (BESS)	للعاملين (PPE) توفير معدات الوقاية الشخصية المناسبة – المعرضين لمصادر الضوضاء.– تطبيق آلية لتلقي الشكاوى .المتعلقة بالضوضاء والتحقيق فيها ومعالجتها	المطور	.قياسات الضوضاء	سنويًا 10,000–15,000	بشكل دوري طوال مرحلة التشغيل.
البيئة البيولوجية	نفس القضايا المحددة خلال مرحلة الإنشاء	تطبيق نفس إجراءات التخفيف والرصد المعتمدة خلال مرحلة – .الإنشاء	المطور	.التقارير الدورية	مرة) 10,000–25,000 (واحدة	طوال العمر التشغيلي .للمشروع
التأثيرات على البيئة الاجتماعية	استهلاك المياه	ستكون احتياجات المشروع من المياه محدودة خلال مرحلة – التشغيل، كما ستكون كميات مياه الصرف الناتجة محدودة، وسيتم جمعها بواسطة مقاول معتمد ونقلها إلى محطات المعالجة المعتمدة.– التنسيق مع شركة مياه الشرب لتأمين مصادر المياه .اللازمة للمشروع	المطور	.خطة إدارة المياه	سنويًا 10,000–30,000 تشمل بشكل رئيسي رسوم) .(المقاول	طوال العمر التشغيلي .للمشروع
	إدارة مياه الصرف	جمع مياه الصرف الصحي الناتجة خلال مرحلة التشغيل بواسطة – .مقاول معتمد ونقلها إلى محطات المعالجة المعتمدة	المطور	.خطة إدارة مياه الصرف	—	طوال العمر التشغيلي .للمشروع
حقوق العمال ورفاهيتهم	ظروف العمل	إعداد وتطبيق سياسة للموارد البشرية بما يضمن حقوق العاملين – .وظروف عمل مناسبة	المطور	.عقود العاملين	ضمن تكاليف التشغيل دون تكلفة ،(OPEX) إضافية مباشرة تُذكر لخطة .الإدارة البيئية والاجتماعية	طوال العمر التشغيلي .للمشروع

General

التدريب والتوعية	كفاءة العاملين بالمشروع	تنفيذ برامج تدريبية للعاملين وفقًا لمسؤولياتهم وطبيعة مهامهم – الوظيفية.	المطور	خطط التدريب.	سنويًا 10,000–25,000	طوال العمر التشغيلي للمشروع.
الصحة والسلامة المهنية	سلامة العاملين وموقع العمل	إعداد وتطبيق إجراءات الصحة والسلامة والبيئة – (HSE).	المطور	اعتماد سياسات وإجراءات الصحة والسلامة والبيئة.	سنويًا 15,000–40,000	قبل تشغيل المشروع.
الاستعداد والاستجابة للطوارئ	إدارة المخاطر التشغيلية	تطبيق منهجية تقييم المخاطر الاحتمالية – (Probabilistic Risk Assessment) وإعداد خطة الاستجابة للطوارئ.	المطور	خطة الاستجابة للطوارئ.	سنويًا 5,000–20,000	قبل تشغيل المشروع.
صحة وسلامة المجتمع وأمن الموقع	مخاطر حوادث المرور – أمن الموقع.	إعداد وتنفيذ خطة أمن وسلامة الموقع – إنشاء وتطبيق آلية فعالة لتلقي ومعالجة الشكاوى.	المطور	خطة أمن الموقع – خطة إشراك أصحاب المصلحة وسجل وآلية الشكاوى (SEP).	سنويًا 25,000–70,000	طوال العمر التشغيلي للمشروع.

General

العنصر	القضايا محل الاهتمام	الإجراءات	الجهة المسؤولة عن التنفيذ	مؤشر الإنجاز	التكلفة التقديرية (دولار أمريكي)	موعد التنفيذ
مرحلة إنهاء المشروع						
التخطيط لإنهاء المشروع	عدم كفاية التخطيط والتنسيق	– إعداد وتنفيذ خطة متكاملة لإنهاء المشروع (Decommissioning Plan).	**Energy Valley**	اعتماد خطة إنهاء المشروع.	40,000–80,000	قبل بدء أعمال إنهاء المشروع.
جودة الهواء	الأتربة والانبعاثات الناتجة عن أعمال التفكيك والهدم	– تطبيق إجراءات الحد من الأتربة والغبار أثناء أعمال التفكيك والهدم.	مقاول إنهاء المشروع	قياسات الانبعاثات.	20,000–40,000	طوال مرحلة إنهاء المشروع.
الضوضاء	الضوضاء الناتجة عن أعمال الهدم وإزالة المعدات	– الحد من الأنشطة مرتفعة الضوضاء، والمحافظة على المعدات في حالة تشغيل جيدة، وتوفير معدات الوقاية الشخصية عند الحاجة.	مقاول إنهاء المشروع	قياسات الضوضاء.	15,000–30,000	طوال مرحلة إنهاء المشروع.
إدارة المخلفات	تولد المخلفات الخطرة وغير الخطرة	– فرز المخلفات، وإعادة استخدامها أو تدويرها كلما أمكن، والتخلص منها من خلال منشآت وشركات مرخصة.	مقاول إنهاء المشروع	عقود إدارة المخلفات.	150,000–300,000	طوال مرحلة إنهاء المشروع.
الصحة والسلامة المهنية	إصابات العاملين أثناء أعمال التفكيك والهدم	– تطبيق إجراءات الصحة والسلامة المهنية، وتوفير معدات الوقاية الشخصية، وتنفيذ برامج التدريب، وضمان الاستعداد والاستجابة للطوارئ.	مقاول إنهاء المشروع	– عدم تسجيل حوادث جسيمة – سجلات ونتائج التفتيش على الصحة والسلامة المهنية.	60,000–120,000	طوال مرحلة إنهاء المشروع.
إعادة تأهيل الموقع	التلوث المتبقي والأراضي المتأثرة	– إزالة جميع المنشآت المتبقية، وتنظيف الموقع، وتنفيذ أعمال المعالجة البيئية عند الحاجة، وإعادة تأهيل الموقع وإعادته إلى أقرب حالة ممكنة لوضعه الأصلي كلما كان ذلك ممكنًا.	مقاول إنهاء المشروع / شركة **Energy Valley**	استكمال واعتماد أعمال إعادة تأهيل الموقع.	500,000–1,500,000	قبل الإغلاق النهائي للمشروع.

General

الميزانية السنوية التقديرية المجمعة للرصد البيئي والاجتماعي

البيان	مرحلة الإنشاء	مرحلة التشغيل	مرحلة إنهاء المشروع
إجمالي التكلفة السنوية التقديرية (دولار أمريكي)	حوالي **845,000دولار أمريكي**	حوالي **380,000دولار أمريكي سنويًا**	حوالي **785,000إلى ٢,٠٧٠,٠٠٠ دولار أمريكي**
إجمالي التكلفة السنوية التقديرية (جنيه مصري)	حوالي **42,250,000جنيه مصري**	حوالي **19,000,000جنيه مصري سنويًا**	حوالي **39,250,000إلى ١٠٣,٥٠٠,٠٠٠ جنيه مصري**

General

١١. الخلاصة

يمثل مشروع **شركة انرجي فالي** للطاقة الشمسية ونظام تخزين الطاقة بالبطاريات مساهمةً استراتيجية في دعم الأهداف الوطنية لجمهورية مصر العربية المتعلقة بتنويع مصادر الطاقة، وتعزيز أمن إمداداتها، وزيادة الاعتماد على مصادر الطاقة المتجددة، بما يسهم في الحد من الاعتماد على الوقود الأحفوري المستورد. وفي هذا السياق، لا يُعد بديل عدم تنفيذ المشروع خيارًا مناسبًا، نظرًا لما سيترتب عليه من فقدان للفوائد البيئية والاجتماعية والاقتصادية المهمة التي يوفرها المشروع.

وقد حددت دراسة تقييم الأثر البيئي والاجتماعي (ESIA) وقيمت الآثار البيئية والاجتماعية المحتملة المرتبطة بالمشروع خلال مراحل الإنشاء والتشغيل وإنهاء المشروع. ولضمان تحقيق الاستدامة البيئية والاجتماعية، سيقوم المشروع بتطبيق مجموعة من إجراءات التخفيف، تشمل تنفيذ برامج فعالة للحد من انبعاثات الأتربة والغبار، والإدارة السليمة للمخلفات، وتطبيق إجراءات منع الانسكابات والتعامل معها طوال مرحلة الإنشاء.

أما خلال مرحلة التشغيل، فسيتم الحد من المخاطر المحتملة من خلال تطبيق إجراءات متخصصة لحماية الطيور، بما في ذلك استخدام التجهيزات والعوازل المناسبة للحد من مخاطر الصعق الكهربائي، بالإضافة إلى تطبيق أنظمة متقدمة لسلامة نظام تخزين الطاقة بالبطاريات(BESS) ، والتي تتضمن المراقبة الحرارية المستمرة، وأنظمة الكشف المبكر عن الحرائق، وأنظمة الإطفاء الآلي. كما سيحرص المشروع على تعزيز المنافع الاجتماعية والاقتصادية من خلال إعطاء الأولوية لتوظيف العمالة المحلية للحد من آثار تدفق العمالة الوافدة، وضمان التواصل الفعال مع أصحاب المصلحة من خلال تطبيق آلية شكاوى شفافة ومتاحة وسهلة الوصول.

ولدعم التنفيذ الفعال لجميع إجراءات التخفيف والرصد والإدارة والإبلاغ البيئي والاجتماعي المحددة ضمن خطة الإدارة البيئية والاجتماعية(ESMP) ، فقد خصص المشروع الموارد المالية اللازمة لتنفيذ هذه الإجراءات. وتبلغ الميزانية التقديرية لتنفيذ خطة الإدارة البيئية والاجتماعية حوالي **845,000دولار أمريكي** خلال مرحلة الإنشاء، وحوالي **380,000دولار أمريكي سنويًا** خلال مرحلة التشغيل، وتشمل تكاليف الرصد البيئي، والصحة والسلامة المهنية، وإدارة المخلفات، والحفاظ على التنوع البيولوجي، وإشراك أصحاب المصلحة، والاستعداد والاستجابة للطوارئ، وبرامج التدريب، وغيرها من متطلبات الإدارة البيئية والاجتماعية.

وبناءً على تنفيذ خطط الإدارة البيئية والاجتماعية المقترحة، وبرامج الرصد البيئي والاجتماعي، وإجراءات التخفيف الواردة في هذه الدراسة، فمن المتوقع أن تظل الآثار المتبقية ضمن الحدود المقبولة ووفقًا للمعايير البيئية والاجتماعية المعمول بها.

وعليه، يُعد المشروع قابلًا للتنفيذ من الناحيتين البيئية والاجتماعية، شريطة الالتزام الكامل بتنفيذ جميع التدابير والالتزامات الواردة في دراسة تقييم الأثر البيئي والاجتماعي، مع الاستمرار في أعمال الرصد والمتابعة طوال دورة حياة المشروع.

Executive Summary

1. Introduction

Energy Valley is planning to develop the Energy Valley Solar Power and Battery Storage Project in the East Minya Region of Minya Governorate, Egypt. The project represents a strategic contribution to Egypt's renewable energy transition and supports the objectives of Egypt Vision 2030 through the promotion of low-carbon energy generation and sustainable industrial development.

The proposed development comprises a utility-scale photovoltaic (PV) power plant with a total installed capacity of approximately 1,950 MWp (DC) and an estimated 1,700 MWac export capacity, integrated with a Battery Energy Storage System (BESS) with a storage capacity of approximately 1,500 MWh. The project will utilize high-efficiency mono-crystalline bifacial PV modules mounted on single-axis tracking systems to maximize energy generation and operational efficiency.

The project is located on government-owned desert land within the East Minya renewable energy concession area allocated by the New and Renewable Energy Authority (NREA). The total project usufruct area is approximately 41 km², situated in a remote desert setting east of Minya Governorate, with no permanent residential settlements within the project footprint.

The generated electricity will be collected through an internal medium-voltage network and transmitted to an on-site 33/500 kV pooling substation, from which power will be evacuated to the national transmission grid through a new 500 kV overhead transmission line connection. The project is designed to provide a continuous renewable electricity supply to support the green industrialization of the Sarirya Industrial Zone and enhance grid reliability while reducing dependence on fossil-fuel-based power generation.

Environics has been commissioned by Energy Valley and Scatec to prepare the Environmental and Social Impact Assessment (ESIA) for the East Minya Hybrid Facility in accordance with the requirements of the Egyptian Environmental Affairs Agency (EEAA), as well as the environmental and social requirements of international financial institutions, including the International Finance Corporation (IFC) Performance Standards, the European Bank for Reconstruction and Development (EBRD) Performance Requirements, the African Development Bank (AfDB) Integrated Safeguards System, and the European Investment Bank (EIB) Environmental and Social Standards.
This ESIA specifically addresses the East Minya Hybrid Facility, while associated facilities located in Nagaa Hammadi and Abu Qir are being assessed under separate ESIA studies in accordance with applicable national and international requirements.

Goals and Specific Objectives
The project aims to contribute to Egypt's renewable energy goals by generating clean electricity and enhancing grid stability through the integration of BESS.

The broad goal of the Environmental and Social Impact Assessment (ESIA) is to provide decision-makers and project proponents with information on potentially significant

environmental and social impacts and risks associated with the proposed PV Power Plant and BESS project in Nagaa Hammadi.

The specific objectives are:

- To identify potential positive and negative impacts of the proposed project.
- To suggest mitigation and enhancement measures for the identified significant adverse and beneficial impacts.
- To provide management and monitoring plans.
- To ensure that the proposed project complies with the national environmental regulations and international funding institutions' requirements.

2. Institutional and Legal frameworks

This framework includes both national legislation and international standards and guidelines.

National Legislation

The project must comply with Egyptian environmental and social laws and regulations, including:

Environmental Impact Assessment (EIA): The national Environmental Law 4/1994 (as amended by Laws 9/2009 and 105/2015) and its Executive Regulations require an EIA study for new projects. The EIA is to be submitted to the environmental authority for review and approval. According to the national regulations, this project is categorised as a Category Scoped-B projects.

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.

Air Quality and Atmospheric Emissions: Law 4/1994 and its associated regulations set maximum limits for ambient air pollutants and exhaust gases. The project will need to comply with these limits during both construction and operation.

Noise and Vibration: Environmental Law No. 4/1994 specifies maximum permissible noise levels for occupational and ambient environments.

Waste Management: The Waste Management Law 202/2020 and its Executive Regulations set requirements for managing non-hazardous and hazardous waste generated from the different activities.

Biodiversity Protection and Nature Conservation: Article 28 of Environmental Law 4/1994 prohibits activities that harm specific wild animals and plants and their habitats. Annex 4 of this law lists protected species. The project site is located within a desert environment of relatively low ecological sensitivity; however, biodiversity protection measures will be implemented where required.

Cultural Heritage: Law No. 117 of 1983 for the Protection of Antiquities, as amended by Law No. 3 of 2010, protects archaeological and cultural heritage resources. Chance-find procedures will be implemented during construction, and coordination with the Ministry of Tourism and Antiquities will be maintained where necessary.

Occupational Health and Safety: Labour Law No. 14 of 2025 and its associated ministerial decrees establish requirements for worker welfare, occupational health and safety, working hours, emergency preparedness, and the prevention of occupational hazards. These requirements apply to all project contractors and subcontractors.

Land Allocation and Renewable Energy Development: The project is being developed on land allocated by the New and Renewable Energy Authority (NREA) in accordance with national regulations governing renewable energy projects and land use in desert areas.

Community Health and Safety: Relevant provisions of Environmental Law No. 4/1994, Labour Law No. 14/2025, and other applicable legislation establish requirements for protecting nearby communities and road users from construction-related risks, traffic impacts, dust, noise, and emergency situations.

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.

International Standards and Guidelines

In addition to national legislation, the project will align with international standards and guidelines, particularly those of international financing institutions:

IFC Performance Standards (PS): The project will align with the International Finance Corporation's Performance Standards on Environmental and Social Sustainability, covering environmental and social assessment and management, labour and working conditions, resource efficiency, community health and safety, land acquisition, biodiversity conservation, cultural heritage, and stakeholder engagement.

EBRD Performance Requirements: The project will adhere to the EBRD Environmental and Social Policy and associated Performance Requirements governing environmental and social management, labour, resource efficiency, biodiversity, cultural heritage, and stakeholder engagement.

African Development Bank Group's Operational Safeguards (AFDB OS): The project will comply with the African Development Bank's Operational Safeguards and Environmental and Social Assessment Procedures, including requirements relating to environmental and social risk management, labour conditions, biodiversity conservation, pollution prevention, community health and safety, and stakeholder engagement.

European Investment Bank (EIB) Environmental and Social Standards: The project will be designed and implemented in accordance with applicable EIB Environmental and Social Standards, including those relating to environmental assessment, biodiversity, climate action, labour standards, and community health and safety.

World Bank EHS Guidelines: The General EHS Guidelines and relevant sector-specific guidance will be applied as Good International Industry Practice (GIIP) throughout the project lifecycle.

International Labour Organization (ILO) Conventions: The project will respect applicable ILO conventions ratified by Egypt, including those relating to occupational health and safety, non-discrimination, forced labour, child labour, freedom of association, and collective bargaining.

3. Project Description

Project location

The usufruct land allocated for the Energy Valley PV Plant covers an area of approximately 41 km² and is located in the eastern part of Minya Governorate, Egypt. The Project Site is situated within an undeveloped desert environment characterized by flat to gently undulating terrain, with no significant existing land use, permanent settlements, or infrastructure.

For spatial definition and accurate georeferencing of the Project boundary, the coordinate system used is Africa_Lambert_Conformal_Conic, as presented below.

Table 1: Coordinates of the Project Site (Africa_Lambert_Conformal_Conic)

Point	Easting (Longitude)	Northing (Latitude)
1	632032.4921602416	3035807.5252274573
2	624695.9596219833	3035706.2761660814
3	624414.0993877718	3034922.366002381
4	624483.9767640651	3033605.109857768
5	624537.3388341365	3033527.9947473705
6	624689.2237992727	3033096.5491323173
7	624938.7207172832	3032878.0961324275
8	625291.5657612912	3032878.325832367
9	626828.8022436886	3031715.6398382485
10	626834.7831908315	3030485.2029592395
11	635075.9186972552	3030596.964916587
12	635039.9421693081	3033316.4403622746

Figure 1 below illustrates the surrounding land uses and activities in the vicinity of the proposed Project Site.

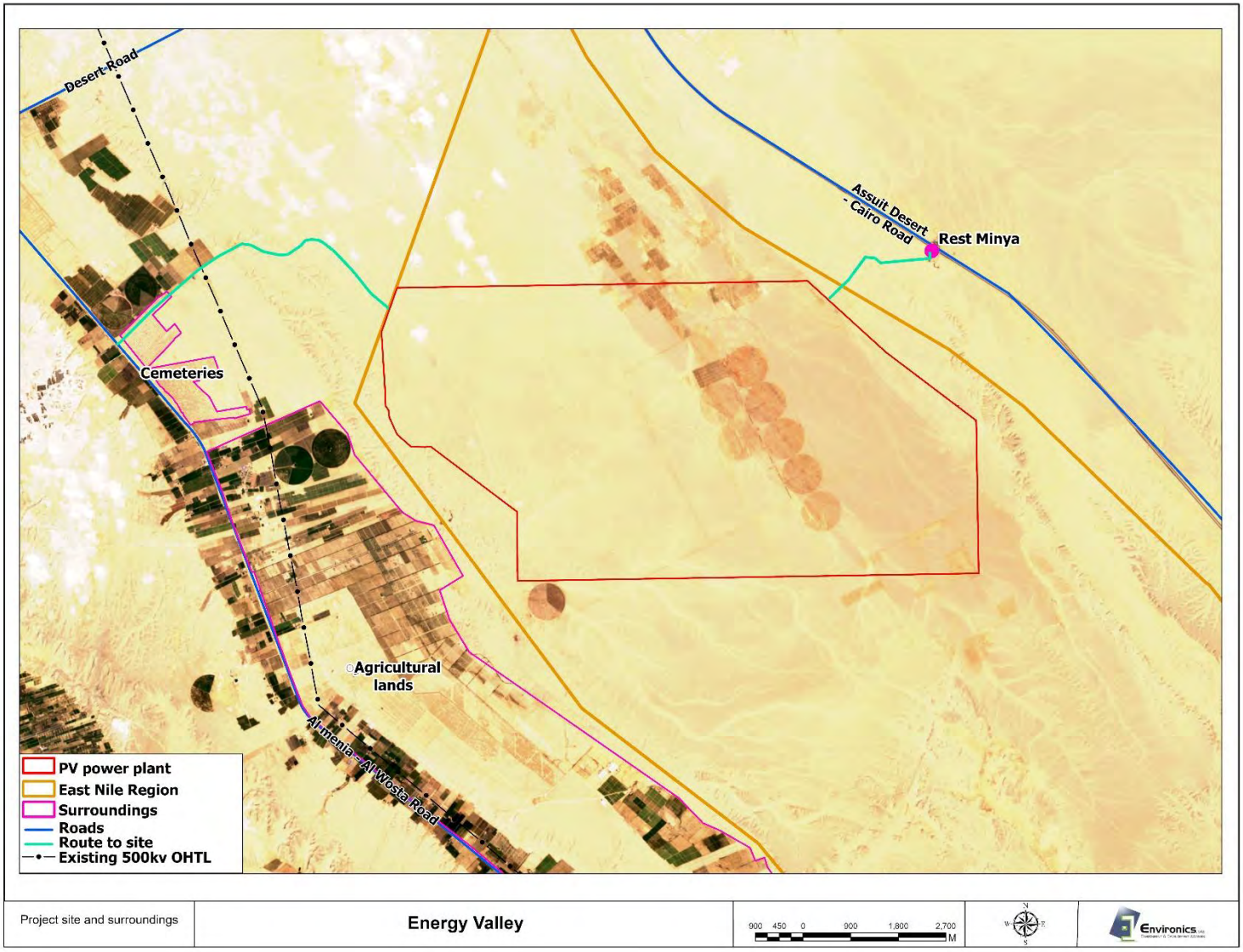


Figure 1: Activities/land uses surrounding the proposed site

Access to the Project Site is provided via the regional road network serving Minya Governorate, primarily the Cairo–Assiut Desert Road located approximately 1.2 km east of the site and the Ras Gharib–Minya Road approximately 4 km to the north, which will facilitate the transport of materials, equipment, and personnel during construction and operation phases.

Project components and main activities

The proposed Minya Hybrid Facility comprises four main integrated components, including a large-scale photovoltaic (PV) power plant, a battery energy storage system (BESS), internal electrical infrastructure, and grid evacuation facilities, supported by access and site development works.:

Solar Field (PV Modules): The Project includes a 1,950 MWp (DC) solar PV plant using mono-crystalline bifacial PV modules mounted on single-axis tracking systems (1P) to maximize energy generation.

The system comprises approximately 3 million PV modules (640–660 Wp each) connected through 2,496 inverters across 208 inverter/MV stations.

A 33 kV MV collection network aggregates power from PV blocks before step-up to a higher voltage.

The PV system represents the primary electricity generation source of the Project.

Battery Energy Storage System (BESS): The Project includes a 1,500 MWh lithium-ion (LFP) BESS designed to enhance grid stability and enable energy shifting.

The system consists of containerized battery units equipped with thermal management, SCADA, and safety systems.

It is designed for continuous 24-hour dispatch operation in line with the offtaker requirements.

The BMS provides monitoring, protection, and performance optimization of battery operation.

Cooling, fire suppression, and auxiliary systems ensure safe and reliable operation.

Internal Medium Voltage (33 kV) Collection System: An internal 33 kV MV network collects power from inverter stations and transfers it to the on-site substation.
The system consists of interconnected MV circuits supported by overhead structures within the Project boundary. It is designed in accordance with IEC and Egyptian grid standards.
The MV network ensures efficient aggregation of PV-generated electricity across the site. The entire system is located within undeveloped desert land with no permanent receptors.

Grid Connection Infrastructure: A 33/500 kV on-site substation steps up electricity for evacuation to the national grid. The substation includes multiple 330 MVA transformers providing redundancy and operational flexibility.
Key components include switchgear, protection systems, and SCADA control.
Electricity will be exported via 500 kV OHTLs to the national transmission network.
External transmission lines are covered under separate ESIA studies.

Access Roads and Site Development: A 3.9 km access road connects the Project Site to the Cairo–Assiut Desert Road. The road supports the transport of materials, equipment, and personnel during construction and operation. Internal roads, drainage systems, and

temporary facilities will be developed within the site. Construction will follow national and international engineering standards.

Construction and Operational Facilities
Temporary construction facilities include offices, storage areas, worker accommodation, and sanitary units.

These facilities will support construction activities and will be dismantled after completion.

During operation, permanent O&M buildings, control rooms, and warehouses will be established.

Facilities will include security, administrative, and support services such as kitchens and prayer rooms. All structures will comply with Good International Industry Practice (GIIP) and applicable labor standards

4. Baseline conditions

Physical Environment:

- ***Climate and Meteorology:***
  The Project Site is located within an extremely arid desert climate characterised by high temperatures, negligible rainfall (annual average ~12.6 mm), abundant solar radiation (peak global radiation 755 W/m² in summer), moderate northerly winds (10–20 km/h), occasional sandstorms (up to 227 hours of events in March), and persistently low humidity.
- ***Air Quality:***
  Ambient air quality is generally good owing to the remote, sparsely inhabited setting and the absence of nearby industrial emission sources; however, windblown dust and particulate matter (PM_{10}, $PM_{2.5}$) can be elevated during sandstorm events.
- ***Geology and Geomorphology:***
  - Geological Formations: The Project Site is underlain by a dissected limestone plateau providing a stable foundation for the PV plant and BESS; soils are predominantly shallow, stony lithosols of limited fertility.
  - Topography: Elevations range from 90–170 m amsl in the northern part to 170–265 m amsl across the remainder of the site; the generally flat terrain minimises the need for extensive earthworks.
  - Geomorphological Features: The landscape is characterised by bare rocky desert with no sand dune fields onsite; the nearest dune field is approximately 35 km to the northwest across the Nile River.
  - Hydrology and Hydrogeology: Surface water is absent, with no perennial rivers or streams; the nearest surface water is the Nile River ~13 km to the west. Groundwater lies at depths of 120–180 m below ground. Two wadi systems (Wadi Ibadah and Wadi Al-Birshawi) traverse the wider region but do not intersect the Project Site; flash flood risk to the site is therefore low.

Biological Environment:

The Project Site is largely composed of bare, homogeneous desert habitat. This was confirmed by satellite image analysis and validated by field surveys conducted by Environics in February 2026 across 18 survey points. The site is poor in terms of plant diversity and vegetation cover. Perennial plant life is confined to wadi systems, none of which extend to the Project Site. No critical habitats or protected areas are present within the Project's Area of Influence; the nearest protected area is Wadi El Assiuty, approximately 103 km to the southeast.

- Habitats: The Project Site falls within the Middle Section of the Inland Eastern Desert, characterised by flat, bare sandy soil and lithosolic substrate with sparse and highly localised vegetation. Portions of the site were formerly used for agricultural reclamation but have been fully dismantled by Minya Governorate. No significant water bodies, wetlands or ecologically distinct micro-zones are present.
- Flora: The site is almost entirely devoid of vegetation in non-reclaimed areas; a small number of native desert species were recorded during the February 2026 survey, with slightly more vigorous growth adjacent to previously reclaimed zones. No endemic or threatened plant species were recorded.
- Fauna: Based on species distribution maps, at least 10 reptile species may occur in the wider East Minya Region; no reptile signs were recorded during the February 2026 survey. Mammals potentially present in the site vicinity; however, mammal diversity and density are very low, and no signs of mammal presence were detected during the survey.
- Avifauna: Based on the Migratory Soaring Birds Tool (MSBT), the sensitivity of the Project Site to soaring migratory birds is very low (potential score: 0.000). Thirteen migratory species are potentially associated with the area. Under normal conditions, bird presence at the Project Site is expected to be extremely low as the site provides no food, water, shelter, perching or nesting resources. The Project Site is not suitable for resident breeding birds.

Socio-Economic Environment:

The Project Site is uninhabited, with the nearest residential community, New Minya City, located approximately 11.5 km to the west..

- **Population Density and Distribution:** The Project Site lies within Markaz El Minya, Minya Governorate, which has an estimated population of 6,511,377 (2025 CAPMAS estimate), 81% of whom reside in rural areas; the East Minya Region itself contains no settlements.
- **Labor Force and Economic Activities:** The local economy is predominantly agricultural (approximately 32% of the workforce) supplemented by mineral extraction, textiles and food processing; regional unemployment is estimated to exceed 10%, with low female labour force participation (~29%).
- **Land Use:** The Project Site is within the NREA East Minya concession designated for renewable energy development. Informal agricultural activities previously conducted within the site have been dismantled by Minya Governorate since January 2025; reclaimed agricultural lands exist immediately west of the concession boundary.
- **Infrastructure and Services:** No dedicated access roads, water supply network, natural gas, sewerage or communications infrastructure exist at the Project Site; access is via the Cairo–Assiut Road (~1.4 km east) and Cairo–Aswan Eastern Desert Road (~4.4 km west). The nearest power substation is New Al-Minya, approximately 9.7 km from the site.

Based on the review of the socio-economic baseline and stakeholder consultations conducted in February 2026, the wider area presents adequate infrastructure and services to support

the Project during construction and operation, and there is an available local labour force with the capacity to support maximisation of local hiring. No current land ownership claims exist within the NREA concession.

Tangible Cultural Heritage

No known or potential archaeological, historical or cultural heritage sites are present within the Project Site or within a surrounding buffer of more than 5 km. The nearest significant sites are Beni Hassan Rock-Cut Tombs (~14 km southwest) and the ancient capital of Tal El Amarna (~41.5 km southwest), both located along the Nile's eastern bank and outside the Project's Area of Influence.

5. Analyses of Project Alternatives

The analysis evaluates key project alternatives, in line with Egyptian legislation and applicable international standards.

I. **No Project Alternative** :Under the No-Project Alternative, the anticipated contributions to Egypt's renewable energy and GHG emission reduction targets would not be realized, and associated local employment and procurement benefits would be lost.

The no-project alternative is not considered suitable and has been rejected.

II. **Alternative Site Location** : The Project Site (41 km², East Minya) has been formally allocated by NREA, is free of conflicting land uses, and is technically suitable for large-scale solar PV development.

No alternative site has been considered; the allocated site is confirmed as appropriate.

III. **Alternative PV Types**

- **Monocrystalline bifacial:** Highest efficiency, no hazardous substances, lowest land requirement (4–5 acres/MW). Selected.
- **Polycrystalline:** Lower cost but reduced efficiency and larger land footprint (7.5–9 acres/MW).
- **Thin-Film (Amorphous Si / CdTe / CIS):** Good temperature performance but lower efficiency; CdTe and CIS contain hazardous substances (cadmium).

Monocrystalline bifacial modules selected for superior efficiency and environmental profile.

IV. **Alternative Tracking Systems**

- **Fixed-Tilt:** Lowest cost and simplest maintenance; cannot follow the sun's path, yielding less energy.
- **Single-Axis Tracking:** Increases annual output by 15–25% over fixed-tilt; one motor per row. Selected.
- **Dual-Axis Tracking:** Higher yield but significantly more expensive and maintenance-intensive due to two motors per unit.

Single-axis tracking selected, balancing energy yield with cost and maintenance requirements.

V. **Alternative Module Cleaning**

- **Manual / Semi-Automated Dry:** No water required but risks glass scratching, generates cloth waste, and demands high labour input.
- **Wet Cleaning (cloth or pressure washing):** Effective but requires 0.4–1.0 L/module per cycle, generates wastewater; not suitable for arid sites.
- **Automated Robotic Dry Cleaning (ARCS):** Waterless, no glass damage, minimal waste, remote-controlled, only 2 workers/shift required. Selected.

Automated robotic dry cleaning selected; eliminates water consumption and wastewater generation from module cleaning.

VI. **BESS Alternatives**

- **Lithium-Ion NMC / LFP:** Best-proven grid-scale technology; balanced energy density, safety, cycle life and cost. Selected.
- **Vanadium Redox Flow (VRFB):** Long cycle life but low energy density requires a large footprint and poses corrosive electrolyte spill risk.
- **Molten Metal (AMBRI):** Requires continuous heating to maintain electrode melt state, resulting in parasitic energy consumption.
- **Sodium-Ion (Na-ion):** Electrodes must be kept at 300–400°C, necessitating a permanent heating system.

Lithium-ion NMC or LFP is selected for the BESS.

VII. **Water Sources Alternative**

Water is required during construction approximately 4 m^3/day of bottled mineral drinking water, 97 m^3/day of municipal water for sanitary and domestic uses, and approximately 76 m^3/day of water for construction-related activities. And for the operation (75–100 m^3/month, sanitary use only; PV cleaning will be dry). Drinking water will be supplied as bottled water.

- **Groundwater Abstraction:** Occurs at >120 m depth with high salinity , requiring pre-treatment, brine disposal and Ministry permits. Not preferred.
- **Water Trucking:** Water is trucked from the nearest treatment plant and stored in on-site tanks; simple, flexible and consistent with the modest project demand. Preferred.

Water trucking was selected as the preferred supply option for construction and operation.

6. Assessment of Environmental and Social Risks and Impacts

This chapter evaluates the potential environmental and social risks and impacts of the project. It includes a detailed analysis of the project's risks and impacts and emphasizing the mitigation hierarchy: avoiding, minimizing, mitigating for impacts.

Positive impacts include the production of a clean, renewable solar energy from a 1,950 MWp (DC) plant, reducing GHG emissions by approximately 1.22 million tCO_2e per year compared to fossil fuel-based grid generation, and avoiding air pollutants Additionally, the project conserves water resources in this desert area, integrates renewable energy into the national grid via a BESS, and provides approximately 5,000 direct construction jobs at peak, with more than 50% targeted from local Minya communities, approximately 30 permanent operational positions, and more than 500 indirect jobs in the supply chain .

Summary of the potential negative impacts on the environment and society during the construction, operation and decommisioning phases of the project illustrated in table below.

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

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Construction Phase			
Air Quality			
• Air Quality	MINOR	- Implement policies/procedures to reduce idling times for vehicles and machinery. - Maintaining machinery and vehicles in good working conditions to minimize fugitive emissions and exhaust. - Ensuring workers are aware of safe driving and maintain good practices in machinery usage. - Emissions from power generator stacks will comply with Law 4/1994 and its relevant ERs. - Implement dust suppression measures	INSIGNIFICANT
Ambient Noise			
• Equipment and machinery • Vehicle Movement • Power Generators	MINOR	- 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.	INSIGNIFICANT
Impacts on Soil			
• Domestic wastewater tanks, material and wastes storage, and accidental spills	MINOR	- Maintain good housekeeping practices to ensure a clean and organized construction site. - Conduct maintenance of vehicles, trucks, and construction equipment off-site to reduce on-site effluents and spills. - Collect and dispose of spillages from tank filling or generator operation through licensed/authorized waste contractors. - Develop and implement a spill management plan - Collect and transport wastewater by authorized contractors to ensure proper disposal and prevent contamination. - Collect 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.	INSIGNIFICANT

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Establish marked and physically separated storage areas for hazardous waste. - Use licensed contractors for the collection and disposal of hazardous waste	
Impacts on the Biological Environment			
• Habitat loss, modification, and fragmentation	MINOR	- Limit construction activities strictly to the approved project footprint to avoid unnecessary disturbance of surrounding areas. - Implement strict housekeeping practices onsite and offsite to prevent degradation of adjacent habitats. - Avoid disturbance of offsite areas where any vegetation may be present. - Enforce speed limits for all project-related vehicles to minimize fauna disturbance and collision risks. - Provide environmental awareness training to workers on the importance of protecting natural habitats and avoiding wildlife disturbance. - Where feasible, implement wildlife-friendly fencing designed to allow the safe movement of small fauna, including visible fencing and clearance at the lower fence line.	***Insignificant***
Disturbance to wildlife	MINOR	- Develop and implement solid waste, hazardous waste, and wastewater management plans to prevent attraction of fauna. - Maintain good housekeeping practices across all construction areas. - Provide environmental awareness training to workers on minimizing wildlife disturbance. - Enforce speed limits and prohibit off-track driving by construction vehicles. - Ensure regular maintenance of construction equipment to minimize noise and vibration emissions	***Insignificant***
• Attraction of pests and propagation of invasive species	MINOR	- Develop and implement a solid waste, hazardous waste, and wastewater management plan covering collection, storage, transport, and disposal. - Ensure food storage and eating areas are secured and inaccessible to animals. - Enforce strict housekeeping practices across all construction and accommodation areas. - Provide worker awareness training on the environmental risks associated with improper waste and wastewater management	***Insignificant***

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Impacts on the Social Environment			
• Water Resources	INSIGNIFICANT	- The Contractor will source water only from licensed and approved water supply facilities and transport it to the site using authorized tanker trucks. - A Water Management Plan will be implemented as part of the Construction Environmental and Social Management Plan (CESMP), including procedures for water supply, storage, monitoring, and reporting. - Water consumption will be regularly monitored and recorded . - Water-saving practices will be applied during construction activities, including controlled use of water for dust suppression and equipment cleaning - Storage tanks and distribution lines will be regularly inspected to prevent leakage or water losses.	**No Residual impacts**
• Worker Influx	MINOR	- Prioritise hiring local workers not only to increase benefits to local communities, but also to reduce the number of incoming workers and minimize social disruption. - Prohibit "hiring at the door" to control speculative job seekers. Job advertisement and applications receipt will be through the governorate labour office. - Provide adequate on-site accommodation facilities for workers to prevent overburdening local infrastructure. - Implement and monitor site-specific waste management procedures for on-site camp, including segregation, safe storage, and proper disposal of waste through licensed contractors. - Develop Workers' Code of Conduct to ensure respectful behavior toward local communities, compliance with health and safety standards, and prevention of GBV/SH incidents	INSIGNIFICANT
Infrastructure			
• Land use	INSIGNIFICANT	No land ownership claims or other types of land uses exist at the project site. This was confirmed during stakeholders' meetings with local government representatives and nearby land uses and no risks are perceived in this regard	**No Residual impacts**
• Traffic	MODERATE	Scatec shall develop Transportation Management Procedures that apply to Scatec projects and operations, as well as their contractors and subcontractors. The procedure defines the minimum safety requirements for Scatec's transportation	MINOR

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		activities. The requirements are supplementary to national regulatory specifications and project or business unit specifications and/or insurance requirements	
Occupational Health and Safety			
• Impacts on workforce health and safety	MODERATE	- The excavation sites will be surrounded with warning signs to prohibit access to these places; - Contractors will ensure that construction workers will be continuously supervised through the continuous presence of on-site supervisor(s) for close inspection and management of the construction activities; - Ensure proper training for operators, regular maintenance of equipment, and implementation of safety protocols. - Provide adequate hydration, schedule work during cooler parts of the day, and allow for regular breaks in shaded areas. - Restrict vehicles speed so that they do not exceed the safety limit inside the site premises (15-20 km/h) - All equipment will be inspected before the start of the job to ensure the safety of the workers; - Use of personal protective equipment (PPE) - Provide hearing protection, implement noise control measures, and schedule regular breaks for workers. - Provide training on proper lifting techniques, and the use of mechanical aids. - Implement fire prevention measures, maintain fire extinguishers on-site, and conduct fire safety training.	MINOR
• **Site Security**	MINOR	The security personnel will be adequately trained, have appropriate conduct toward workers and the 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	INSIGNIFICANT
• **Impact on Cultural Heritage**	MINOR	- Implement a Chance Find Procedure consistent with national legislation and IFC Performance Standard 8, to be applied in the event that any archaeological remains or culturally significant materials are discovered during construction. - Ensure that all construction contractors and site personnel are informed and trained on the Chance Find Procedure prior to the commencement of ground-disturbing activities.	INSIGNIFICANT

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- In the event of a chance find: o Immediately suspend work in the vicinity of the discovery; o Secure and demarcate the area to prevent damage or unauthorized access; o Notify the relevant competent authorities; and o Resume work only after clearance and guidance are provided by the competent authority. - Limit excavation and ground disturbance activities strictly to approved areas and depths	
Operation Phase			
Air Quality			
• Emissions from emergency generator	MINOR	- Optimize the operation of backup generators to reduce usage and emissions. - Conduct annual stack emission measurements for the emergency generators - If SF6 is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair, use proper chamber vacuums during filling the SF6 into the GIS, and employee education/training.	INSIGNIFICANT
Ambient Noise & Vibration			
• Operation of Transformers, and other operational components of battery energy storage systems. • Use of backup generators during power outages	MINOR to Insignificant	- Potential noise-generating machines and equipment are designed to meet statutory regulations concerning noise. - Workers at noise-generating machinery and equipment will be provided with suitable personal protective equipment (PPEs).	INSIGNIFICANT
Impact on the Biological Environment			
• ***Disturbance to wildlife (excluding avifauna)***	MINOR	- Utilize motion sensors, timers, and smart lighting controls. Use lighting with reduced blue-spectrum emissions to minimize nocturnal fauna disorientation - Develop, implement and update a solid waste, hazardous waste and wastewater management plan ;	INSIGNIFICANT I

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Provide awareness to the workers on the negative impacts of disturbing any wild fauna; - Ensure proper housekeeping practice; - Ensure that food storage areas are inaccessible to animals; - Avoid high intensity light that may disturb offsite fauna; - Ensure speed control and the prohibition of off-track driving; - Ensure the proper maintenance of equipment and any other equipment with high noise and vibration potential; - Ensure that the generators are properly insulated to avoid noise emissions; and - Ensure that workers do not disturb native fauna potentially encountered.	
Risks and Impacts on Avifauna			
• Bird collision with internal 33 kV MV OHTL conductors during operation	Insignificant	- Proper waste and wastewater management to avoid attracting birds to the site. - Monitoring of bird mortality incidents and implementation of corrective measures if required.	Insignificant
Electrocution Bird electrocution at substations and internal electrical infrastructure	MODERATE	- Adequate separation distances between energized components and earthed structures, in line with international good practice; - Increase the use of insulated conductors and fittings at locations where birds could potentially perch; - Cover exposed conductive elements with insulating materials where required, subject to engineering design constraints; and - Conduct regular inspections and maintenance to ensure the continued effectiveness of avifaunal protection measures	MINOR to INSIGNIFICANT
Impact on the Social Environment			
• Water Resources	INSIGNIFICANT	No specific mitigation measures are required given the limited water consumption and wastewater generation during the operational phase. However, management measures are implemented, whereby wastewater generated during operation will be collected by a licensed contractor and transported to designated and approved treatment plants	No residual impact

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
• Waste generation	INSIGNIFICANT	No specific mitigation measures are required given the low volumes of waste generated during operation. However, the following management measures are implemented : - Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors. - Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors. - End-of-life batteries and damaged PV modules will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available	
• Visual effects/ Glint and Glare	INSIGNIFICANT	No visual or ocular hazards are expected under the current system design and operational parameters. Therefore, no additional mitigation measures are required beyond standard operational and maintenance practices, such as ensuring the cleanliness of panels and maintaining their anti-reflective coatings	No residual impact
Impacts on Occupational Health and Safety			
• Impacts on the workplace	INSIGNIFICANT	- Development and maintenance of a comprehensive OHS Management Plan, including risk assessment, incident reporting, and emergency preparedness. - Implementation of a formal Health and Safety Policy. - Compliance with all relevant national occupational health and safety regulations, including Labour Law 12/2003 and 14/2025. - Provision of appropriate personal protective equipment (PPE) to all operational staff	No Residual Impacts
Potential Fire and Thermal Runaway Risks			
Presence and conduct of contracted security personnel and their interaction with workers and the surrounding community.	INSIGNIFICANT	- Ensure security personnel are adequately trained and act in accordance with the law, company procedures, and appropriate codes of conduct. - Develop a grievance mechanism to allow any affected community members to raise concerns regarding security arrangements or personnel conduct. - Continuous monitoring and supervision of security operations to maintain compliance with established protocols.	No Residual Impacts

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Impacts of Site Security			
• Presence and conduct of contracted security personnel and their interaction with workers and the surrounding community.	INSIGNIFICANT	- Ensure security personnel are adequately trained and comply with applicable laws, company procedures, and recognized codes of conduct. - Establish a grievance mechanism for workers and community members to report concerns regarding security personnel or operations. - Implement continuous monitoring and supervision of security activities to ensure compliance with procedures and standards.	No Residual Impacts
Impacts On Climate Change			
• Minor vehicle emissions • Emergency backup diesel generator emissions	• INSIGNIFICANT	- Use modern GIS equipment with strict SF_6 handling, leakage prevention, and maintenance protocols. - Implement preventive maintenance for all electrical and mechanical systems to minimize emissions risks. - Ensure efficient operation of vehicles and limit unnecessary site movements - Apply internationally recognized battery safety systems (BMS, thermal monitoring, fire detection and suppression) for BESS. - INSIGNIFICANTComply with IPCC methodologies and applicable reporting thresholds (e.g., EBRD 20,000 tCO_2e criteria).	No Residual Impacts
Impacts of the Environment on the Project			
• **Dust and Sand**	**MODERATE**	- Implement periodic PV module cleaning and preventive maintenance. - Select abrasion-resistant modules. - Adjust tracking system tilt during high wind/sand events to reduce exposure	MINOR
• **Extreme Heat**	**MINOR**	- Use liquid-based active cooling and real-time temperature sensors for BESS. - Implement heat stress management for workers (shaded areas, hydration). - Continuous performance monitoring to identify efficiency losses	INSIGNIFICANT
• **Flash Floods**	**MINOR**	- Design foundations to account for mapped scour risk (depth ≥ 0.5 m). - Implement minor internal drainage interventions to manage localized runoff.	INSIGNIFICANT

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Cumulative Impacts (Construction & Operation)			
• **Traffic, Air, Water, Worker Influx)**	INSIGNIFICANT	- Coordinate construction schedules with other foreseeable projects to avoid peak overlaps. - Utilize regional desert roads with low traffic density. - Adhere to the Program-wide Transportation and Labor Management Plans	INSIGNIFICANT
Decommissioning Phase			
Soil, Water, Air, Noise, OHS	MINOR	- Focus on proper handling, management, and disposal of hazardous and non-hazardous waste streams - ·Restore the site to its original condition where feasible	Insignificant
Waste Management End-of-Life Batteries and Hazardous Waste	MINOR	- Development of Battery Waste Management Procedure. - Temporary storage in dedicated hazardous waste areas. - Use of licensed hazardous waste transporters and recyclers. - Battery take-back arrangements with suppliers where feasible.	Insignificant

7. Stakeholders' Consultation

The process included early stakeholder identification, continuous engagement during ESIA preparation, and transparent information disclosure to ensure meaningful participation.

E&S Scoping Activities
Scoping meetings were held between January and March 2026, with discussions covering environmental, social, and economic aspects of the Project. Stakeholders broadly expressed strong support for the Project, particularly due to its contribution to renewable energy, improved energy security, and job creation.
Key issues raised included: Employment opportunities, prioritization of local labor, Worker accommodation and social impacts, Utility demand, Community benefits, training, and capacity building, grievance mechanism and community engagement

ESIA Disclosure
Although national guidelines for Category scoped B projects do not require formal public disclosure meetings, a disclosure process will be implemented in line with lender requirements.
The disclosure approach includes:

- Targeted invitations to local, municipal, and governorate-level stakeholders, including vulnerable groups
- Public announcement of the meeting 10–15 days in advance
- Distribution of an Arabic Non-Technical Summary (NTS) and online access
- Availability of comment forms for feedback during and after the meeting (up to 2 weeks)
- A disclosure venue in Minya Governorate (to be confirmed)

All stakeholder feedback, attendance records, and meeting outcomes will be documented and included in the ESIA Annexes.

8. Environmental and Social Management Plan

The project will develop and implement an Environmental and Social Management Plan (ESMP) outlining specific mitigation and monitoring measures to ensure compliance with all applicable legal and institutional requirements.

Institutional Arrangements:
Defined roles and responsibilities for implementing the ESMP, involving the project proponent, contractors, and relevant government agencies to ensure accountability and effective coordination among stakeholders.
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.

Environmental and Social Management Plans include the following:

- Health, Safety and Environment (HSE) Plan
- Transportation Management Plan
- Noise Management plan
- Hazardous and Non-hazardous waste management plan
- Water and wastewater management
- Chance Find Procedure
- Preventive and corrective maintenance
- Wastewater Management Plan
- Housekeeping and Cleanliness
- Social Management Plan includes Energy Valley 's SEAH and GBV Management Plan

Capacity Building:

- Provisions for training and capacity building for project staff and contractors on best practices in environmental and social management, enhancing their ability to effectively implement the ESMP.

Overview of the ESMP Plans

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Construction Phase						
Air Quality	Dust emissions	- Reduce idling times for vehicles and machinery; - Maintaining machinery and vehicles in good working order - Speed restriction on sites; - Ensuring workers are aware of safe driving and maintaining good practices in machinery usage; and - Periodic measurements for stacks of generators	Construction contractor	- Monitoring plan - Air quality measurements	15,000 – 20,000 / year	Throughout the construction phase period
	working conditions of machinery	- Ensure good working conditions through frequent inspection of all construction equipment - Implementation of OHS plans	Construction contractor	Maintenance logs OHS plan	50,000 – 70,000 (included in EPC O&M allowance)	
Noise Level	working conditions of machinery	- Regular maintenance of construction equipment - Use low-noise equipment, where possible; - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels; - Schedule high-noise activities to take place in morning hours - Implementation of OHS plans	Construction contractor	OHS plan Noise measurements and Maintenance logs	10,000 – 15,000 / year	Throughout the construction phase period
	Provision of PPEs	- Providing necessary PPE for workers	Construction contractor		20,000 – 40,000 (PPE supply - total project period)	
Soil	housekeeping practices	- Develop and implement site management plan, solid waste management and wastewater	Construction contractor Developer (include provisions in the construction contracts.	- Waste and wastewater management plans	6,000 – 80,000 (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						
	Waste/wastewater management	management plans and spill prevention plan - Proper collection, containment, and disposal of sanitary wastewater - Proper collection, containment, and disposal of sanitary wastewater - hazardous materials storage and handling according to the WBG General EHS Guidelines, - Transportation and disposal to be carried out through authorized waste contractors	Developers to ensure contractors' compliance)	- Solid/hazardous waste and wastewater management contract - Contractor follow-up documents - Contracts with authorized waste contractors		
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	60,000 – 80,000	Before construction activities
Emergency Response plans	Site Staff and Workplace Safety	- Develop procedures for emergency control	Contractor	Emergency response plan	30,000 – 80,000	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	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)	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						
Biological Environment	Pests and invasive species	- Good housekeeping and proper waste management	Construction contractor	Waste management contract	10,000 – 25,000 (one-time)	Throughout the construction phase
	Disturbance to wildlife	- Awareness (toolbox talks and awareness signs) - Implementation of mitigation measures - Supervision and implementation of deterring measures	Construction contractor	Requirements specified in contracts		Throughout the construction phase
Social Environment	Workers influx	- Prioritize hiring local workers - Implement and maintain a community grievance mechanism; and, - Selection of labour accommodation, away from existing communities, as possible, and considering establishing a labour camp on site. - Develop HR policies including GBV and SEAH plans	Developer/Construction contractors	Labour management plan, workers accommodation inspection checklist GBV and SEAH policies Workers Awareness	50,000 – 150,000 / year	Throughout the construction phase period
	Community health, safety and security- risks from road traffic accidents	- Develop Traffic Management Plan (TMP) and associated procedures	Construction contractors	TMP and procedures	40,000 – 100,000	
	Cultural heritage	- develop chance find procedure	Developer/Construction contractors	Developed procedures	5,000 – 15,000	Before construction activities

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
Operation Phase						
Air quality	Backup generator emissions	- Optimize the operation of backup generators to reduce usage and emissions. - Conducting regular maintenance and periodic emissions monitoring of generators to ensure efficient operation and minimize air emissions	Developer	Emission measurements Maintenance records	15,000 – 20,000 / year	Periodically throughout the operation stage
Noise	Transformers and BESS	- Workers at noise generating machinery and equipment will be provided with suitable (PPEs). - A grievance mechanism will be adopted for assessing complaints	Developer	Noise measurements	10,000 – 15,000 / year	Periodically throughout the operation stage
Biological Environment	Same as for the construction phase	- Same as for the construction phase	Developer	Reports	10,000 – 25,000 (one-time)	Throughout the project lifetime
Impact on the social environment	Water consumption	- Water demand stewater generated during the operation phase is minimal and will be collected coordination between the project and the water company to plan the sources of waterby an approved contractor and discharged to designated treatment plants	Developer	Water management plan	10,000–30,000 / year (mainly contractor fees)	Throughout the project lifetime
	Wastewater management	- Wastewater generated during the operation phase is minimal and will be collected by an approved contractor and discharged to designated treatment plants	Developer	Wastewater management plan		Throughout the project lifetime
Labour rights and welfare	working conditions	Develop Human Resources policy	Developer	Contracts (with workers)	Included in OPEX (negligible direct ESMP cost)	Throughout the project lifetime

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
Training and Awareness	competence of the project personnel	training for the personnel according to their particular responsibilities	Developer	Training plans	10,000–25,000 / year	Throughout the project lifetime
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing HSE procedures	Developer	Development of HSE policies	15,000–40,000 / year	Before project commissioning
Emergency Preparedness and Response	Operational risk management	- Adopt a probabilistic risk assessment framework	Developer	Emergency response plan	5,000–20,000 / year	Before project commissioning
Community health, safety, and site security	- risk of road traffic accidents - Site security	- Develop site security and safety plan - Develop a grievance mechanism	Developer	- security plan - SEP and grievance mechanism and register	25,000–70,000 / year	Throughout the project lifetime
Decommissioning Phase						
Decommissioning Planning	- Inadequate planning and coordination	- Prepare and implement a Decommissioning Plan .	Energy Valley	- Approved Decommissioning Plan	40,000 – 80,000	Prior to decommissioning
Air Quality	- Dust and air emissions from dismantling and demolition	- Apply dust suppression measures	Decommissioning Contractor	Emission measurements	20,000 – 40,000	Throughout decommissioning
Noise	- Noise from demolition and equipment removal	- Limit noisy activities, maintain equipment in good working condition, and provide PPE where required.	Decommissioning Contractor	- Noise measurements	15,000 – 30,000	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	-Waste management contracts	150,000 – 300,000	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	60,000 – 120,000	Throughout decommissioning
Site Restoration	- Residual contamination and disturbed land	- Remove remaining structures, clean up the site, remediate if	Decommissioning Contractor / Energy Valley	- Site restoration completed and approved	500,000 – 1,500,000	Before project closure

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	**Estimated Cost (USD)**	Required completion Date
			required, and restore the site where feasible.				
Consolidated Estimated Annual Environmental and Social Monitoring Budget							
		Construction Phase	Operation Phase	Decommissioning Phase			
Estimated Total Annual Cost	(USD)	≈ 845,000 USD	≈ 380,000 USD / year	≈ 785,000–2,070,000 USD			
	(EGP)	≈ 42,250,000 EGP	≈ 19,000,000 EGP / year	≈ 39,250,000–103,500,000 EGP			

9. Conclusion

The Energy Valley Solar Power and 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 ESIA has identified and evaluated the potential environmental and social impacts associated with the Project across its construction, operation, and decommissioning phases. To ensure environmental and social sustainability, the project will implement rigorous dust suppression, waste management, and spill prevention protocols throughout the construction phase.

Operational risks are mitigated through specialized avifaunal protection, such as insulated fittings, alongside BESS safety systems featuring continuous thermal monitoring and automated fire suppression. Furthermore, socio-economic integrity is maintained by prioritizing local labor to minimize influx disruption and ensuring transparent communication through a robust, accessible grievance mechanism.

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 845,000 during the construction phase and approximately USD 380,000 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.

1. Introduction

1.1 Project Overview

The Energy Valley Project represents a strategic step in Egypt's efforts to transition to a low-carbon economy and promote the use of renewable energy in industrial sectors, in line with Egypt Vision 2030 and the Sustainable Development Goals.

Scatec company intends to establish Valley Solar Power Plant, which comprises a 1,950 MWp (DC) photovoltaic power plant with an estimated 1,700 MW AC export capacity, a power plant coupled with a Battery Energy Storage System (BESS) with a capacity of 1,500 MWh in East Minya.

The proposed project is located in the east of Minya governorate, in the vacant desert land.

The project site has been allocated by the Egyptian government, through the New and Renewable Energy Authority (NREA), for the project and does not conflict with other land uses. The total usufruct area allocated for the project is approximately 41 km².

Valley Project will deliver a continuous output of 100 MWac, 24 hours a day, to the Egyptian Electricity Transmission Company (EETC). This will enable EETC to utilize renewable energy to support the green industrialization of the Saririya Industrial Zone, reduce reliance on fossil fuels, and enhance grid reliability. The overall project also includes the development of the consumer (Naseeg Sarirya) substation in Minya, which will facilitate the provision of the required energy demand of the Saririya Industrial Zone, ensuring reliable access to electricity and supporting broader economic development. In addition, the project comprises the establishment of Battery Energy Storage System (BESS) and substation facilities at two other locations in Naga Hammadi and Abu Qir to further enhance grid stability.

This ESIA specifically covers the **Minya Hybrid Facility**, while the remaining project components are subject to separate ESIAs currently under preparation for environmental approval by the Egyptian Environmental Affairs Agency (EEAA).

The project is being implemented in collaboration with the European Bank for Reconstruction and Development (EBRD),), the African Development Bank Group (AfDB) and European Investment Bank (EIB). 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 the Energy Valley Minya Hybrid Facility in the study area and the substation at Sarirya Industrial Zone.

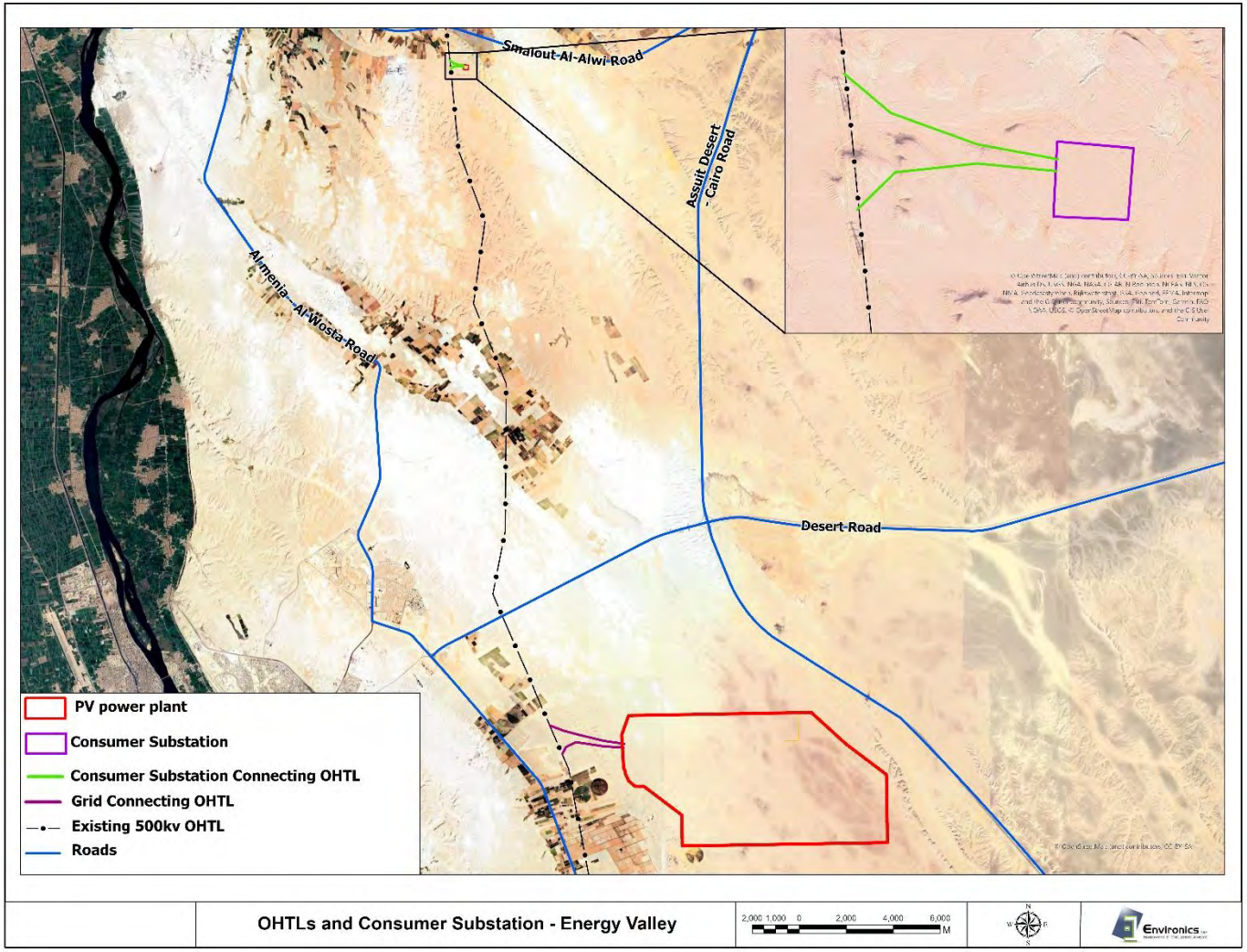


Figure 1–1: Proposed Project Location and Surrounding Activities, including the Overhead Transmission Line (OHTL)

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 PV Plant.

According to the initial meeting conducted with the EEAA on 6 January 2026 and as per the EEAA's project categorization lists issued in June 2023, Minya Hybrid Facility have been classified as Category Scoped-B projects.

However, according to the Lenders' categorization, the project is a Category A project (High E&S risk), requiring a full-scale Environmental and Social Impact Assessment ESIA including public disclosure activities.

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 legal environmental requirements, addressed in the Environment Law No. 4 of 1994, amended by Law No. 9 of 2009 and Law No. 105/2015, and the up-to-date ERs.

Moreover, the ESIA is also intended to satisfy the environmental and social requirements of the international funding institutions, including specifically the EBRD, AfDB, EIB, as well as the multilateral development banks.

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, covering air, water, soil, biodiversity, noise, waste, land use, and socio-economic aspects.

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.

Stakeholder engagement will be an integral part of the ESIA. A Stakeholder Engagement Plan (SEP) will guide consultations with affected communities, regulatory authorities, and other relevant stakeholders. Feedback received during consultations will be incorporated into project design and mitigation measures, ensuring transparency and alignment with international requirements.

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 PV plant 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 PV plant
- **Chapter 8:** Stakeholders Consultation

2. Project Description

Scatec plans to develop Minya Hybrid Facility, comprising a 1,950 MWp (DC) photovoltaic power plant with an estimated 1,700 MW AC export capacity, combined with an approximately 1,500 MWh battery energy storage system (BESS). The Project will be located in the eastern part of Minya Governorate, south of the Sarirya Industrial Zone.

The project will supply renewable electricity to EETC national grid under a long-term Power Purchase Agreement (PPA). The project will contribute to reducing greenhouse gas emissions, improving energy efficiency, and supporting Egypt's national renewable energy and climate targets.

2.1 Project Location

The usufruct land allocated for the Energy Valley PV Plant covers an area of approximately 41 km² and is located in the eastern part of Minya Governorate, Egypt. The project site lies within an undeveloped desert environment characterized by flat to gently undulating terrain.The Project site is located within a designated NREA renewable energy concession and was transferred as vacant state land. Based on satellite imagery, land records, and field verification, no permanent infrastructure, settlements, or organized agricultural or industrial activities existed within the Project footprint prior to the land allocation and handover.

The land was officially designated for renewable energy development in March 2016, which is considered the cut-off date for land use eligibility. Any informal or temporary activities identified in the wider concession area occurred after 2023–2024 and are considered post cut-off date and not attributable to the Project. Accordingly, no pre-existing land use, physical structures, or economic activities were present within the Project boundary prior to handover.

Access to the project site is through the regional road network serving Minya Governorate. Key access routes include the Cairo–Assiut Desert Road, located approximately 1.2 km eastward from the project boundary, as well as the Ras Gharib–Minya Road, situated at an approximate distance of 4 km northward from the site. These routes will support the transport of construction materials, equipment, and personnel during both the construction and operational phases of the project.

There are no permanent settlements within the immediate vicinity of the project site. The nearest residential receptor is New Minya City, located approximately 11 km to the northwest of the project boundary.

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

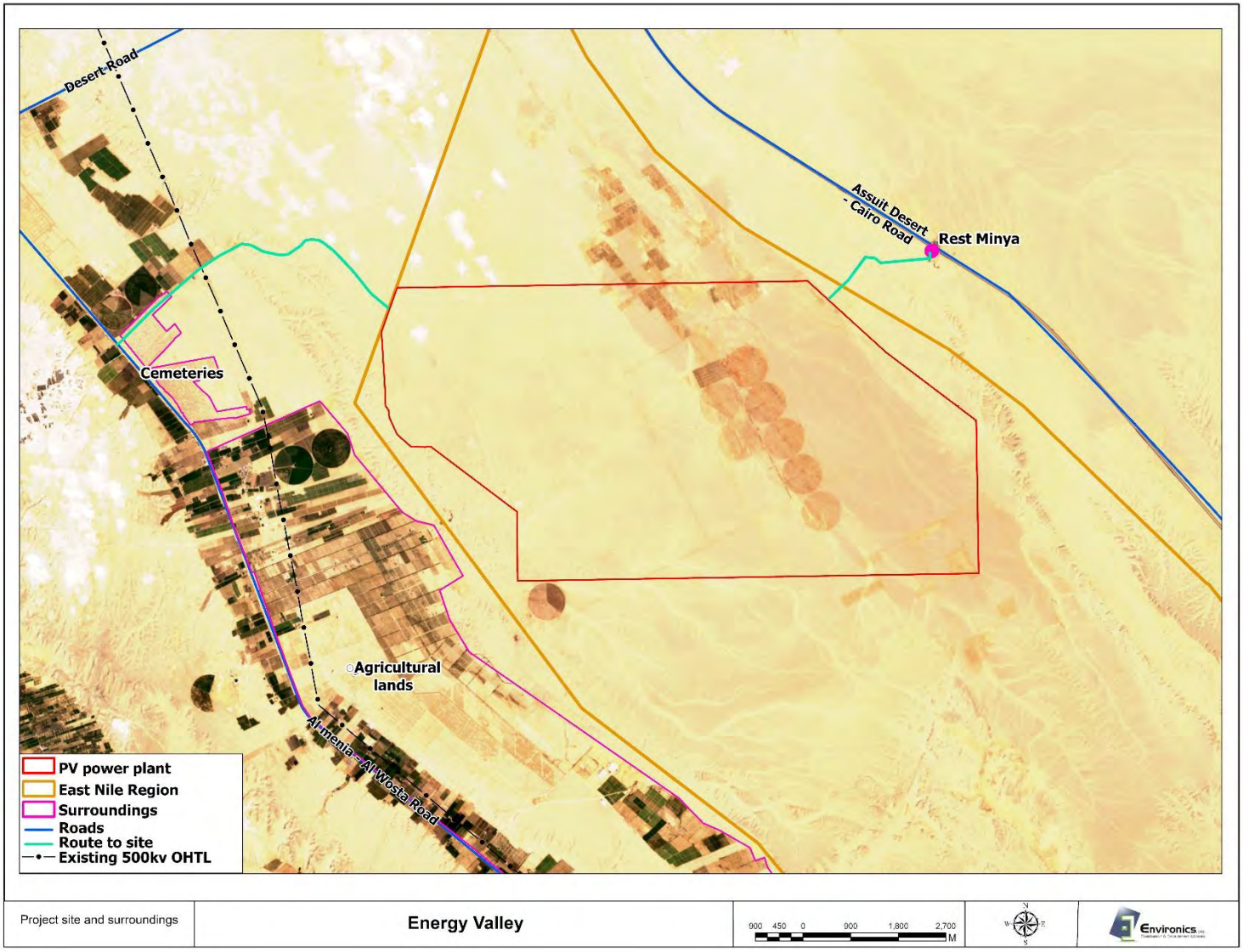


Figure 2–1: Activities/land uses surrounding the proposed site

2.2 Process Description

2.2.1 General Outline

Energy Valley project will utilize high-efficiency mono-crystalline silicon solar panels along with single-axis tracking systems (horizontal single-axis tracker -1P) to maximize energy capture. Additionally, a BESS using lithium-ion battery modules will be integrated to store and manage the generated energy.

The project will be connected to an on-site step-up substation (500/33 kV). From this substation, power will be transmitted through an approximately 2.5 km long 500 kV OHTL connecting the project to the existing national 500 kV transmission network.

In addition, a 500/22 kV step-down substation will be constructed at the Sarirya Industrial Zone, which represents the main power receiving area. This substation will be connected to the existing 500 kV OHTL west of the proposed project site via an additional approximately 1 km long 500 kV OHTL.

All OHTLs and substations in Nagaa Hammadi and Abu Qir mentioned above will be assessed within separate ESIA studies in accordance with Egyptian regulatory requirements and international lender standards.

2.2.2 Project Components

a) Component 1: Solar field Photovoltaic modules: High-efficiency mono-crystalline silicon solar panels

- **Solar Panels**

  PV Plant using approximately three million photovoltaic modules, each with a typical peak power output of 640-660W, totalling a plant DC capacity of around 1,950 MWp. These modules are known for their high efficiency and bifacial technology, which allows them to generate electricity from both sides, maximizing energy production.

  Mono-crystalline silicon PV panels will be connected in series to produce DC output from incident irradiance. The Key design parameters include the orientation, row spacing, tilt angle.

- **Mounting structures**

  For optimal performance, PV systems aim to maximize the time they face the sun.

  PV modules will be installed at a single-axis horizontal tracking system that has a maximum height of approximately 3 meters and a tracking range of +/-55^{o} the following table describes some preliminary equipment quantities.

Table 2–1: Preliminary Description (1,959 MWp (DC)

No	Item Description	Unit	Total Qty for 1950MWp
1.	PV Modules (640Wp)	Nos	Approximately 3,050,000
2.	Inverter	Nos	2496 Inverters (208 central inverter stations x 12 inverters per station)
3.	No. of blocks/ MV transformer station	Nos	208
4.	Technology	----	Bifacial n-type modules Single Axis Trackers LFP Batteries
5.	BESS Container	Nos	210

The PV arrays will be spaced appropriately, considering local topographic conditions. This spacing is designed to minimize shading effects and optimize solar exposure, ensuring maximum efficiency and environmental compatibility.

- **Inverter systems**

  Inverter systems are used for converting the direct current (DC) generated by photovoltaic modules into alternating current (AC) and can be fed into the grid. The components of the inverter system are as follows:

  - ***Inverters***

    The project will utilize 2496 inverters to convert the DC generated by the photovoltaic modules into AC for use in the power grid. These inverters will handle the conversion process, ensuring efficient energy transmission. The project will employ PV inverters with a total capacity of 2 054 MVA (45 °C), and ± 558.8 MVAr of reactive power will be supplied by both the BESS and PV Inverters together.

  - ***Switchgear***

    The electrical equipment used to manage and protect the medium voltage (33kV) circuits before the voltage is stepped up to 500 kV for transmission. This switchgear is crucial for ensuring the safe and efficient operation of the electrical system within the substation.

b) Component 2: BESS

A solid-state battery consists of multiple battery cells assembled into modules. Each cell contains a positive electrode, a negative electrode, and an electrolyte. The lithium-ion BESS uses lithium iron phosphate (LFP) for its cathodes.

The BESS will comprise multiple battery units or modules housed in shipping containers or suitable housing structures, delivered pre-assembled to the project site. These containers are typically elevated slightly off the ground and arranged in rows.

Supplementary infrastructure and equipment include temperature control equipment, which may be positioned between the battery containers. The solid-state batteries under consideration are Lithium-ion systems. Figure 2–2 illustrates the BESS.

Key Components of the BESS

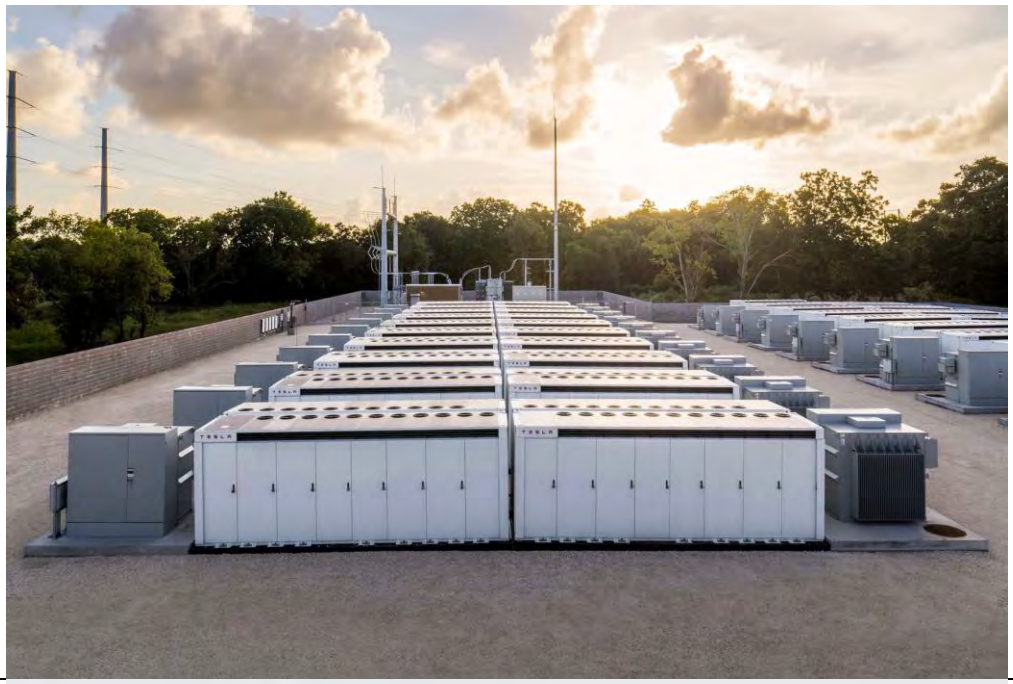
1. Battery Modules
   - The battery modules form the core of the BESS and comprise lithium-ion battery technology. The system is designed with a total nameplate energy capacity of approximately 1,500 MWh and a maximum dispatchable power output of 100 MW (AC) through an AC-coupled configuration.
   - The BESS is designed to be available for dispatch on a continuous, 24-hour basis in accordance with the offtaker's requirements, subject to its energy capacity and operational strategy. Battery capacity is expected to degrade gradually over the project lifetime; therefore, the system incorporates a planned battery augmentation strategy to maintain the contracted performance levels.
   - The battery units are electrically connected in series and parallel configurations to achieve the required overall energy storage capacity and fully dispatchable power output consistent with baseload operation.
   - The battery units are housed in weatherproof and thermally insulated containers to protect from environmental conditions.
   - The BESS is designed to deliver a continuous 100 MW AC output capacity on a 24-hour operational basis, in line with the agreed baseload energy delivery profile.
   - The battery units enable the storage of electrical energy and its controlled release in accordance with predefined, continuous dispatch schedules (i.e., 24 hours per day), as agreed with the offtaker. While the primary function of the BESS is baseload power delivery, a portion of the capacity may be allocated to ancillary services, subject to grid operator requirements, without affecting the system's core baseload performance.

2. Battery Management System (BMS)
   The BMS is a critical component of the BESS, responsible for monitoring, controlling, and protecting the battery units to ensure safe, reliable, and efficient operation throughout the project lifetime. The main functions of 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, and short circuits.
   - Diagnostics and Maintenance: Provision of real-time diagnostics and performance data, supporting preventive maintenance and early detection of potential faults.

3. Cooling and Ventilation Systems
   Batteries generate heat during charging and discharging. Cooling systems ensure that the temperature remains within safe limits to prevent overheating, which could degrade battery performance or even cause fires.
   They use a liquid-cooled temperature control system to optimize the auxiliary power consumption for fans required to circulate air and to absorb heat from the batteries.

4. Control and Monitoring Systems
   - Provides real-time data on the performance of the BESS.
   - Components include Supervisory Control and Data Acquisition SCADA systems, sensors, and communication interfaces.

5. Auxiliary Systems
   - Includes lighting, emergency power supplies, and fire suppression systems.
   - Supports the safe and reliable operation of the BESS.



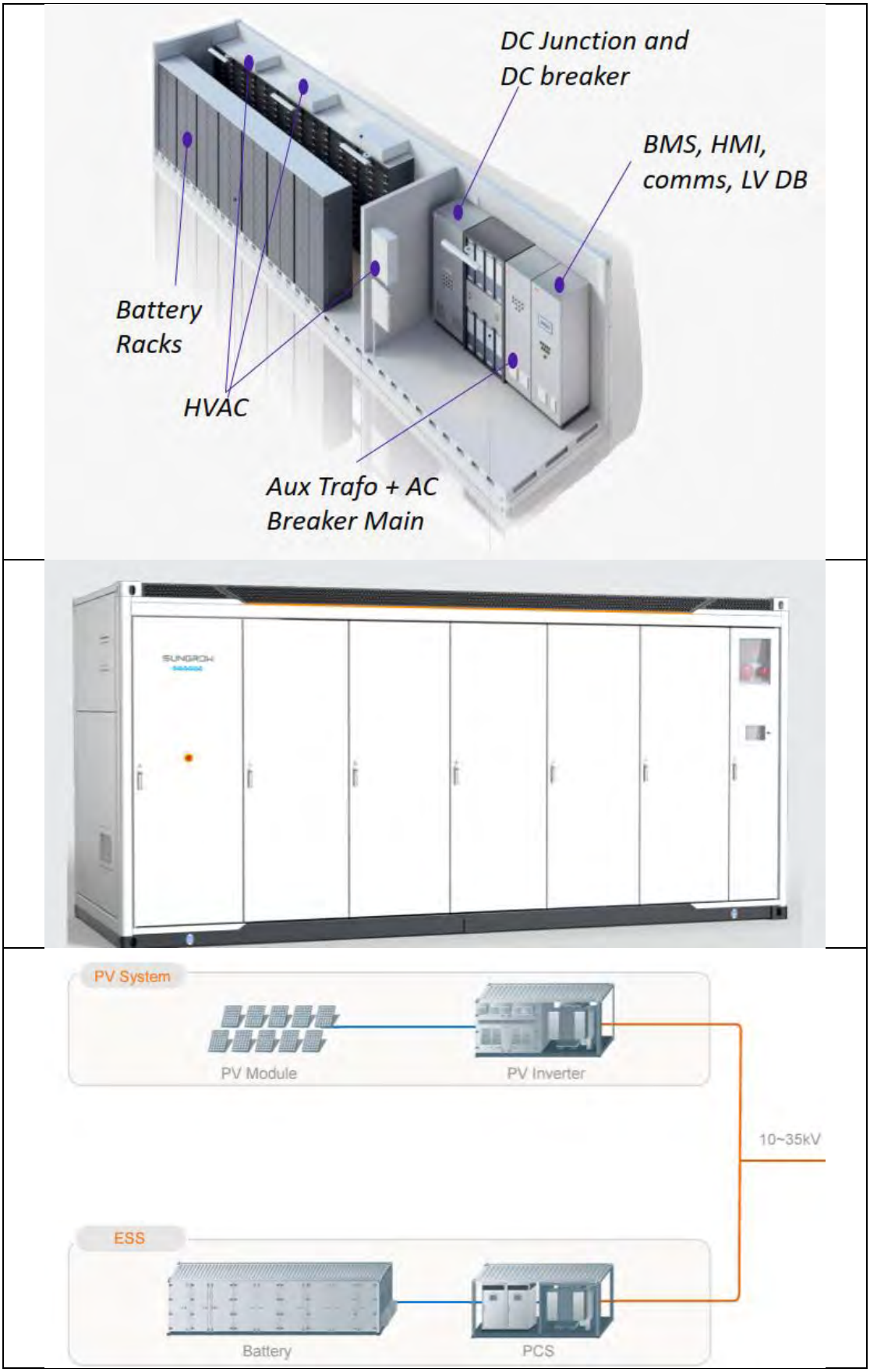


Figure 2–2: Battery Energy Storage System (BESS

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.

All these standards are mentioned in Chapters 5 and 6 of study.

c) Component 3: Internal Medium Voltage Overhead Transmission Line (MV OHTL) Corridor

Within the project site boundaries, an internal 33 kV MV OHTL corridor will be established to collect and transmit electrical power generated by the distributed photovoltaic (PV) arrays to the on-site step-up substation.

The internal MV OHTL constitutes a key element of the project's power collection and evacuation system, interconnecting the inverter–transformer stations with intermediate MV collector points and ultimately with the 33/220 kV substation located within the project footprint.

The internal MV 33 kV OHTL comprising preliminary 12 parallel OHTLs ranging from 24 to 60 towers network depending on the distance between towers. The MV corridor will extend over an area of 5.8 kilometers. The lines will be supported on steel towers averaging 30 meters in height, with a potential maximum of up to 32 meters depending on the terrain and technical design requirements.

The proposed MV OHTL corridor is located entirely within the project boundary and traverses predominantly undeveloped desert terrain. Baseline investigations confirmed the absence of structures, infrastructure, or land uses within the corridor. Any previously existing agricultural activities within the project area had ceased, and associated temporary infrastructure was dismantled prior to site handover.

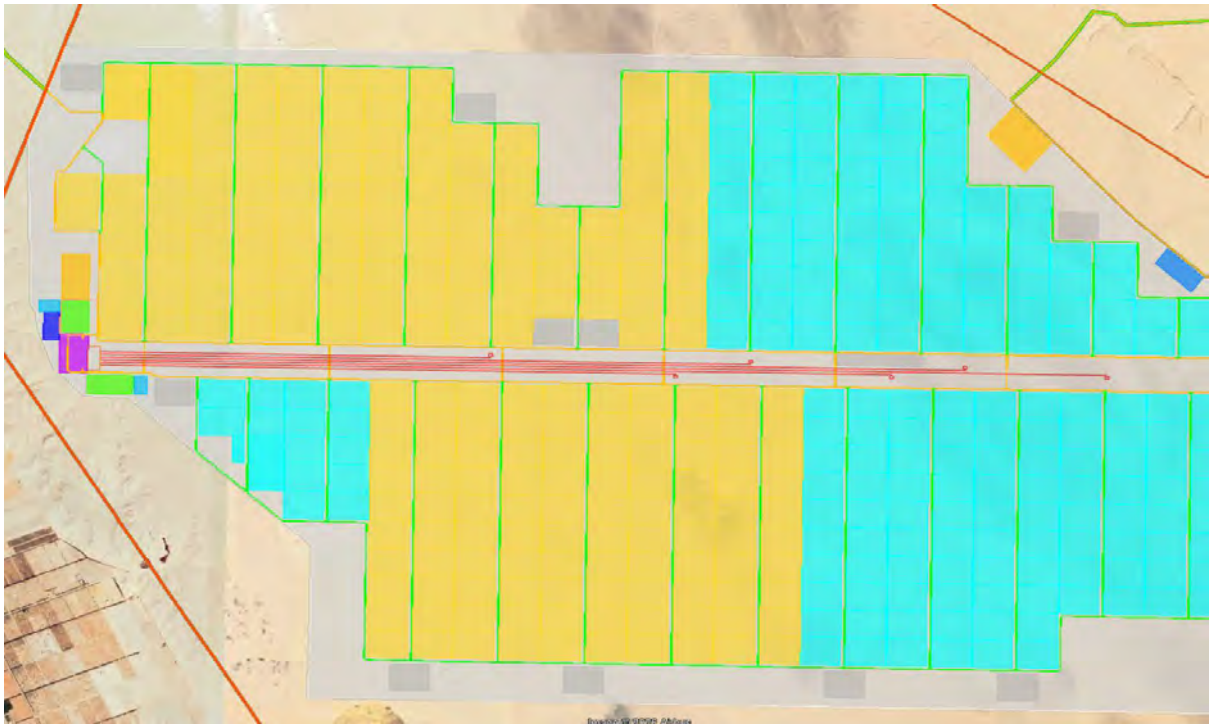


Figure 2–3: MV Corridor Concept (Red Lines)

Structural Design

All structural components, including poles, towers, crossarms, foundations, insulators, conductors, earthing systems, and associated hardware, will be designed in accordance with IEC 60826 (Design of Overhead Lines) and IEC 61936 (Power Installations Exceeding 1 kV AC), in addition to relevant Egyptian national standards for structural integrity and safety.

Where feasible, standard tower designs already approved and utilized within Egypt will be adopted to ensure local compatibility, construction efficiency, and ease of maintenance.

Electrical Design

The electrical design of the MV OHTL will comply with IEC 60850 (Nominal Voltage Ratings) and other relevant IEC and Egyptian Grid Code standards, ensuring proper conductor selection, insulation coordination, and voltage regulation. The design will also integrate the Optical Ground Wire (OPGW) circuits, including all necessary junction boxes and splice enclosures, to facilitate secure communication and system protection.

All installations will adhere to Egyptian Electricity Transmission Company (EETC) standards and applicable international electrical safety and environmental codes.

d) Component 4: Connection to the grid

This component involves the development of one main step-up substation within the project boundaries to enable efficient evacuation of generated power, maintain operational flexibility, and ensure stability and reliability for integration into the national grid.

A 33/500 kV pooling substation will be constructed on-site to step up the electrical output from the project's 33 kV medium-voltage collection system to 500 kV for long-distance transmission and integration into the national grid.

The substation will house Six step-up transformers, each rated at 330 MVA, providing a total installed capacity of 1980 MVA. This multi transformer configuration ensures operational flexibility, redundancy, and reliability of power evacuation.

Each power transformer will be of the Oil Natural Air Forced ONAF type featuring oil-filled tanks for insulation and cooling. Externally forced Air cooling, provided by multiple fans, will be employed to maintain optimal operating temperatures, thereby enhancing transformer efficiency and extending service life.

Core substation components will include switchgear, circuit breakers, and instrument transformers (Current Transformers (CTs) and Voltage Transformers (VTs). The substation will be connected to the existing 500 kV OHTL between two substations "Beni Suef generation plant – east Assiut Substation" via a newly constructed Loop-In Loop-Out (LILO) overhead transmission line (OHTL).

e) Component 5: Access Road

A dedicated access road will be developed to provide safe and reliable access to the project site. The access road will extend for approximately 3.9 km and will connect the project site to the Cairo–Assiut Desert Road, located to the east of the site.

The access road alignment traverses predominantly undeveloped publicly owned desert land. Site surveys did not identify any permanent land uses, buildings, utilities, or infrastructure within the proposed road corridor.

The access road will be designed and constructed in accordance with relevant national standards and international good engineering practices to accommodate construction-phase traffic, including heavy vehicles and equipment, as well as operational and maintenance requirements during the project's lifetime.

The road structure will comprise multiple layers to ensure adequate strength, durability, and long-term performance. The subgrade will be properly prepared, compacted, and, where necessary, stabilized to provide a stable foundation. A base course consisting of high-quality aggregate material will be installed to enhance load-bearing capacity and resistance to deformation.

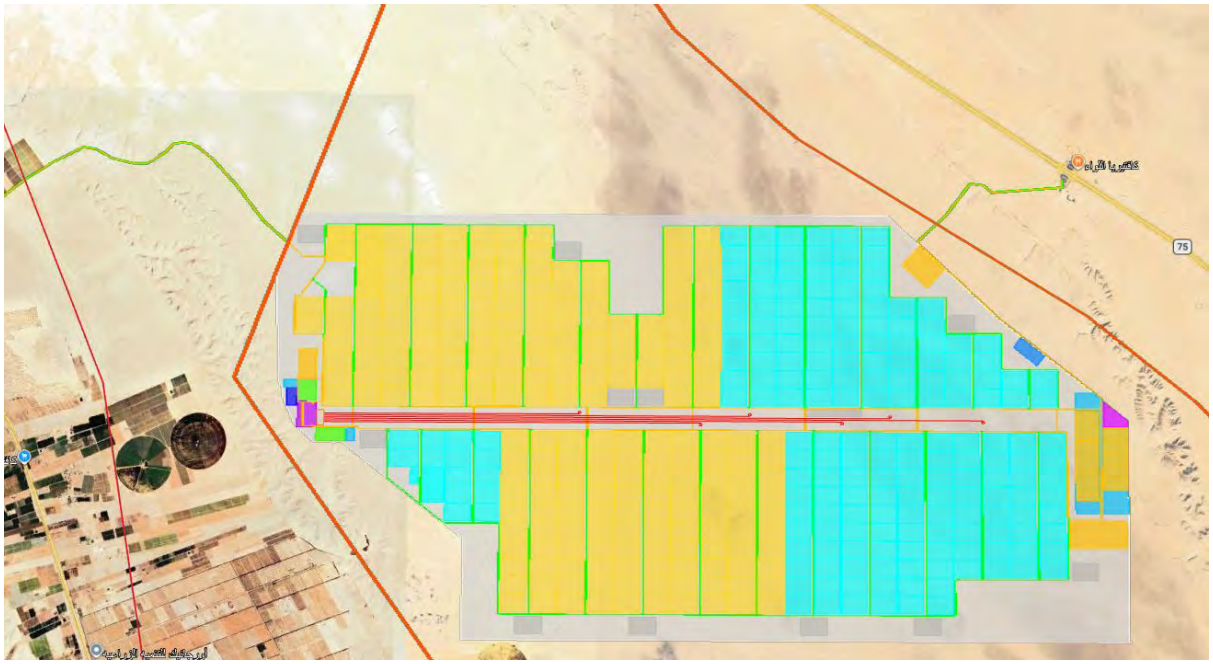


Figure 2–4: Layout of the project

2.3 Construction Phase

2.3.1 Project Schedule

The project is planned to be implemented between Q1 2026 and Q4 2028, following the receipt of all required permits, approvals, and contractual awards. The Project comprises two main components implemented in parallel:

2.3.2 Description of Construction Phase

Prior to the commencement of main construction activities, topographical surveys and geotechnical investigations will be carried out across the project site.

- Site preparation clearing:
  - Clearing of surface rocks, debris, and vegetation.
  - Localized grading and levelling to achieve required formation levels.
  - Establishment of temporary facilities, including site offices, warehouses, laydown areas, and temporary storage areas.
  - Construction of foundations and concrete works required for PV structures, BESS platforms, equipment pads, and ancillary facilities
  - Installation of temporary utilities, including water supply and wastewater management systems, to support construction activities.

- Construction of PV plant and access road
  - PV mounting structures will be installed using either direct rammed or predrilling in case of harder layers of soil/ gravel beneath to fix them on the ground. The selection of the installation method will be confirmed following detailed geotechnical investigations to ensure structural stability and minimize ground disturbance.
  - PV modules, inverters, and electrical equipment will be installed progressively in designated blocks, followed by internal cabling and connection to the internal medium-voltage collection system.
  - Construction of an access road connected to the existing tarmac/asphalt Cairo–Assiut Desert Road. The total length of this new gravel surface Eastern access road is estimated at 3,900 meters. The total width of this new access road is estimated at 6.0m, with 0.5m shoulders on either side.
  - An internal road network will be established within the project site to support the safe and efficient movement of construction equipment, materials, and personnel, constructed from compacted site material and gravel and designed to accommodate anticipated construction and operational transit loads.

- BESS Construction and Installation:
  - Site grading and preparation for BESS container platforms and equipment.
  - Foundations for BESS containers, transformers, and PCS units.
  - Installation of earthing systems and internal roads within the BESS compound.

  - Delivery, installation, and interconnection of BESS containers, PCS units, and auxiliary equipment.
  - Integration of BESS with the SCADA System and energy management system.
- Storm water and site drainage system
  - Implementation of drainage channels along access roads and PV/BESS platforms
  - Temporary sediment and erosion control during construction
  - Permanent channels designed for a 100-year return period event, maintaining natural stream paths and discharge velocities

- Fencing and gates
  Perimeter fencing with main gates and emergency gates enclosing the entire project area. Also, the HV substation area and O&M building shall be separately fenced for improved security and safety reasons.

- Testing and Commissioning:
  - Phased commissioning of PV capacity blocks (195 MW per block)
  - Progressive commissioning of BESS systems aligned with PV commissioning schedule
  - Grid compliance testing and handover to operations following successful commissioning.

2.4 Service Units

- **Temporary structures (during construction phase)**
  Workers Accommodation
  During the construction phase, workforce accommodation will be arranged through a combination of temporary on-site facilities and off-site accommodation, depending on workers' roles, duration of engagement, and place of permanent residence.

  The primary accommodation will be a dedicated camps within the project site. Subcontractors may also arrange off-site accommodation for part of the workforce, if needed, in rented housing within nearby towns or urban centres, subject to availability and capacity, and in a manner that avoids pressure on local housing markets and community services. Priority will be given to the employment of local workers from Minya Governorate and surrounding areas, particularly for unskilled and semi-skilled positions, subject to the availability of suitably qualified personnel. Skilled and specialized workers may be sourced from other regions, as required.

  All accommodation facilities will be designed and constructed, operated, and decommissioned in accordance with Good International Industry Practice (GIIP) and in compliance with EBRD Performance Requirement 2 (PR2), IFC Performance Standard 2 (PS2), and the IFC/EBRD "Workers' Accommodation: Processes and Standards" (2009) guidelines. Compliance with Egyptian Labour Law No. 14/2025, relevant Occupational Safety and Health decrees (Nos. 126/2003, 134/2003, and 211/2003), and Civil Defence fire and safety requirements will be ensured.

  For the cases of on-site accommodation, these will consist of prefabricated modular units manufactured off-site and assembled on-site to enable efficient installation, operation, and dismantling once construction is completed. Key design features will include:

- Walls: Galvanized steel frames with insulated sandwich panel walls (mineral wool or polystyrene).
- Roofs: Lightweight corrugated metal sheets providing thermal insulation.
- Floors: Raised concrete or timber platforms with non-slip, water-resistant finishes.
- Windows: Aluminium or uPVC frames with insect screens.
- Doors: Solid wood or metal with secure locking mechanisms.

Workers' accommodation will be designed to provide safe, hygienic, and dignified living conditions. Core amenities will include:

- Adequate living space per worker in line with international benchmarks.
- Separate sanitary facilities for male and female workers, equipped with sufficient toilets, showers, and handwashing stations.
- Dining and catering facilities supplied with potable water and hygienic food preparation areas.
- Adequate Ventilation, air conditioning, and lighting to ensure comfort and safety.
- Fire detection, firefighting systems, and emergency exits and evacuation signage in compliance with Civil Defense requirements.
- First-aid and medical facilities, including a fully stocked kit at the contractor's office.
- Prayer areas and culturally appropriate amenities, including meal schedules adapted to Ramadan fasting hours.
- Communication and basic recreation facilities to support worker wellbeing.
- Waste management systems, including segregation, collection, and septic tank–soak pit systems for domestic sewage.

All Requirements will be embedded in the ESMS/ESMP and contracts with contractors/subcontractors that house workers, with regular inspections, corrective actions, and engagement with local authorities and nearby communities

Labour and Working Conditions

The project will strictly comply with the Egyptian Labour 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 is also 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 Organise Convention, 1948 (No. 87)" and the "Right to Organise and Collective Bargaining Convention, 1949 (No. 98)".

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

  During the construction phase, the following facilities are required on site to service employees, contractors, and employer's representatives (laydown areas).
  - Air-conditioned offices.
  - Mess / eating facilities
  - Sanitary facilities

Once construction is completed, most temporary structures will be dismantled.

- **Permanent buildings (during Operation phase)**
  For the operational phase, permanent buildings will be constructed at the site to house employees and operation and maintenance (O&M) activities.

  The buildings will either be prefabricated or brick constructed. Some facilities set up within the construction phase will be used in the operation phase as well. The following facilities will be constructed;
  - Warehouse facilities.
  - Secured control room.
  - Secured server room.
  - Security gate facilities
  - Meeting rooms
  - Air-conditioned offices
  - Kitchen/mess area
  - Segregated sanitary facilities with provisions for disabled persons
  - Prayer room.

2.5 Utilities

2.5.1 Water and Wastewater Tanks

A. Water Supply and Storage

Construction Phase:

- Water for construction activities and sanitary purposes will be primarily supplied through water tankers from the closest water source (water treatment plant) and stored in constructed or prefabricated tanks on site, located near sanitary and catering facilities. The nearest water plant has the capacity to provide the required quantity of water during construction and operation.
- Drinking water for workers will be provided as bottled mineral water, sourced from licensed suppliers.
- Daily water consumption during peak construction is estimated at approximately 4 m^3/day of bottled mineral drinking water, 97 m^3/day of municipal water for sanitary and domestic uses, and approximately 76 m^3/day of water for construction-related activities. The supplying water treatment facilities have sufficient capacity to meet these demands without affecting existing users.

Operation & maintenance Phase:

- O&M consumption is expected to be 75-100 m^3/month only for office sanitary purposes and will be trucked to the site through water tankers, as required. The project will not require water for cleaning purposes since only dry cleaning is anticipated for the PV modules.
- Bottled drinking water will be provided for workers.

B. Wastewater

Construction Phase:

- Wastewater volumes are estimated at 75-100 m^3/day. This includes water from sanitation facilities, welfare facilities, such as kitchens, and other amenities provided for construction workers.
- Sewage tanks will be used for collection and will be located near the O&M building and catering facilities.
  External contractors authorized by the governorate will handle wastewater disposal, as wastewater shall be collected from the sewage tanks at the site, trucked for discharge at the nearest wastewater treatment facility.

Operation Phase:

- Wastewater volumes are expected to be 8-12m^3/day.
- Wastewater is planned to be pumped out of the septic tanks and trucked for discharge by authorized contractors at the appropriate wastewater treatment plant near the site.
- There will be no discharge from the PV cleaning process.

2.5.2 Electricity supply

- Electricity will be supplied primarily through diesel generators, particularly during construction activities and in the event of interruptions to the public electricity supply. The generators will provide power for site caravans, temporary facilities, and the operation of construction equipment.

2.5.3 Fuel supply

- Diesel will be used for power generators as a backup during construction works, as well as equipment operation. It will be provided through a contractor.
- During Operation, fuel required for the emergency generator during operation will be sourced from the nearest fuel station from the project site, within the surrounding area.
- Moreover, a portion of the generated energy will be allocated to the lighting system, buildings, and the tracking system.

2.5.4 Labour

The direct labour force required for the project construction could reach 5,000 workers at peak construction months, including skilled and unskilled labour. The company will encourage contractors to maximize hiring workers from the local communities to above the 50 % threshold set by the project.

During the construction period, the construction subcontractors will provide the food & transportation to workers as per the IFC Standard.

Permanent employees during operation are expected to be up to 30 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. Solar Panel and Mounting Structure Deactivation:
   - Careful detachment of solar panels from their mounting structures.
   - Systematic disassembly of single-axis tracking systems.

B. Inverter and Electrical Component Deactivation:
   - Safe isolation and deactivation of inverters, transformers, and switchgear.
   - 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. BESS Deactivation:
   - 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.
   - Proactive management of any potential electrolyte leakage or contamination.
   - Follow the standard decommission procedure provided by the BESS equipment supplier, where applicable and available.

2.7 Expected Environmental Outputs and Emissions of Construction, Operation, and Decommissioning Phases

A. Construction Phase

- **Air Emissions**
  - Emissions from construction equipment exhaust, such as nitrogen oxides, sulphur oxides, and carbon monoxide.
  - Greenhouse gas (GHG) emissions from construction vehicles and machinery.
  - Emissions from the use of power generators where applicable.
  - Dust/particulate matter, and emissions from soil leveling, construction equipment, and transport vehicles.

- **Noise**
  - The primary sources of noise during construction are transport vehicles, ramming machines, heavy equipment/machinery, cutting machines, and vehicle movement.

- **Wastes**
  - Construction Debris: Includes concrete, metals, plastics, and packaging materials.
  - Hazardous Wastes: Potentially includes solvents, paints, and other chemicals used during construction.
  - Soil and Vegetation: Excavation and land clearing can result in soil and (potential) vegetation waste.
  - Wastewater: mainly domestic wastewater from the workforce.

B. Operation Phase

- **Emissions**
  Emissions resulting from the use of backup generators during emergency power outages.
- **Noise at the workplace**
  - Continuous operation of inverters and transformers.
  - Noise from backup diesel generators used during power outages
- **Wastes**
  - End-of-Life Panels and Batteries: At the end of their lifecycle.
  - Maintenance Wastes: Include used lubricants, cleaning agents, and replaced components
  - Wastewater: mainly domestic wastewater from the workforce

C. Decommissioning phase

The decommissioning process, while expected to have a minimal environmental footprint, will generate some waste streams. These include materials from solar panels, mounting structures, inverters, electrical components, and battery modules. Dust emissions and noise pollution are expected to be temporary and localized during the dismantling and removal of infrastructure.

2.8 Environmental and Social Aspects

The construction and operation of PV systems have specific environmental and social aspects (E&S) resulting from specific project activities. These aspects may lead to potential risks and impacts, that need to be identified, assessed, and managed effectively through appropriate mitigation measures to minimize adverse effects and enhance positive outcomes.

Based on the project components described in section 2.2, the key environmental and social aspects of the PV project are summarized in Table 2-2 for both construction and operation phases:

Table 2–2: Project Environmental and Social E&S aspects

Environmental & Social Aspects		Source(s)	
		Construction phase	**Operation phase**
Land Uptake	**Land Access Restriction**	- Project infrastructure and assets (e.g., laydown areas, temporary facilities, and site security Access restriction applies only to prevent unauthorized entry.	- Project infrastructure and asset (e.g., fenced PV field, substations, BESS) security - Unauthorized access and trespassing into the project site by external individuals..
	Land Transformation	- Site clearing, leveling, grading - Excavation for foundation construction - Lay down area - Substation construction - Construction of temporary facilities (e.g., construction workforce camps)	Permanent transformation of the project footprint, fully stripped of its natural state.
	Land Acquisition	- N/A	- N/A
Transportation Demand		- Transportation of project components - Transportation of machinery & equipment - Transportation of water, fuel, and other materials for construction activities - Transportation of workers to and from project sites and accommodation camps	- Limited transportation needs for O&M workforce, spare parts, and maintenance equipment.
Workers Influx		- Skilled and non-skilled construction workers (site preparation activities, assembly, technical installations, etc.)	- Limited workforce
Worker welfare		- In the work environment - In the workers' camp	- In the work environment - In the workers' camp, if any
Water Demand		- Construction activities (preparation of concrete) - Potable (drinking) water - workers (workforce accommodation, sanitation, catering & other facilities) - Dust suppression	- Limited O&M workforce, sanitation, and other facilities. - Panel cleaning.
Noise & Vibration		- Site preparation grading, levelling, clearing, concrete mixing, trucks, deliveries, piling/ramming works. - moving machines (mixers, tippers, communicating workers) - Incoming vehicles to deliver construction materials, components, and workers to the site - Installation of the components (especially ramming machines)	- Limited activities from O&M (inverters, transformers, cooling fans, and trackers) - Limited Worker's transportation and maintenance activities
Dust/Particulate Matter/Gaseous Emissions		- Site preparation (site clearance, excavation, and spreading of the topsoil) - Movement of vehicles across dirt/unpaved roads, topsoil, and excavated soil handling	- Negligible – only workforce transport and minor maintenance vehicles.

Environmental & Social Aspects	Source(s)	
	Construction phase	**Operation phase**
	- Increased traffic flows (vehicle emissions) - Emissions from onsite diesel power generators	
Wastewater Generation	- Domestic waste from a large number of workers	- Limited generation from sanitation facilities
Waste Generation (Hazardous and non-hazardous)	***Non-hazardous*** - Construction material packaging, debris. and waste - Non-hazardous off-cuts - Domestic waste from workforce (e.g., food waste, plastic bottles & cans, Paper, and Glass) ***Hazardous*** - Empty containers of hazardous substances - waste paints, coatings, adhesives, cleaning solvents - Spent lubricating oils and hydraulic fluid	***Non-hazardous:*** Limited quantities of - O&M material packaging (e.g., spare parts) - Domestic waste from workforce (e.g., food waste, plastic bottles & cans, glass, and mud) - Paper & other office supplies - Cardboard. ***Hazardous*** - Absorbent material, waste oil from machinery, and lubricants - Empty containers of hazardous substances - Waste cleaning solvents - End-of-life lithium batteries
Visual Aspects	- Heavy construction machinery, equipment, and vehicles	- PV panels are alien to the desert landscape
Glare	N/A	- Sunlight reflected off the modules and the metal mounting structure
Electromagnetic waves	N/A	- Substation and Transformer - Switch gears - Transmission Lines (associated facility)
Lake effect	N/A	- Large-scale PV arrays present a smooth and uniform surface that can resemble a sheet of water, an effect sometimes referred to as the 'lake effect.' This analogy is descriptive in nature, and there is no conclusive evidence that it affects bird behaviour. - For PV panels with a tracking system, this will happen only during a short portion of the day

2.9 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 AOI are described in the tables below. Impacts within the potential indirect area of influence, if any, would be addressed in the impact assessment section.

The project site and the surrounding land uses within the defined area of influence, including key environmental and social receptors.

Table 2–3: Environmental and Social Aspects AoI during the construction phase

Environmental & Social Aspects		Area of Influence (AoI)
		Construction phase
Land uptake	Land Access Restriction	The project footprint
	Land Transformation	The project footprint
	Land Acquisition (for the transmission line)	The project area and the transmission line are on government-owned desert land (1km to the substation)
Transportation Demand		The project site is accessible via the national and regional road network linking the Red Sea ports with Upper Egypt, with Ain Sokhna Port serving as the primary entry point for imported equipment and materials. The main transport corridor follows the Sokhna–Zaafarana Road, continuing through the Ras Gharib–Minya Road, with an approximate total distance of 215 km to the project site.
Workers Influx		The nearest communities are located in New Minya City, approximately 9 km from the project site.
Water Demand		To be trucked from the nearest water supply plant.
Wastewater		To be trucked to the nearest wastewater plant
Waste Generation		To be trucked from project site to the nearest waste management facility
Noise & Vibration		The immediate project footprint and construction areas
Dust/Particulate Matter/Gaseous Emissions		The immediate vicinity of the project area (A general default distance of 350 m to be considered for dust effects, (IAQM, 2012)
Biodiversity Disturbance		Desert habitat along the site footprint
Community Health & Safety		New Minya City (nearest settlement), roadside communities along transport routes.

Table 2–4: Environmental and Social Aspects AoI during the operation phase

Environmental & Social Aspects		Area of Influence (AoI)
		Operation phase
Land Uptake	Land Access Restriction	Project footprint
	Land Transformation	Project Footprint
	Land Acquisition	N/A - no new land anticipated during O&M.
Transportation Demand		Limited needs for the same roads as for construction for transportation during O&M
Workers Influx		N/A .
Water Demand		Limited needs during O&M; supply to be secured either through trucking .
Noise & Vibration		Limited to the workplace - Localized within the project footprint, primarily from inverters, transformers, and occasional vehicle movements.
Dust/Particulate Matter/Gaseous Emissions		N/A
Visual Aspects		The project site boundaries
Glare		- The nearest airport is Minya Military Airbase (~21 km away) . - Potential glare toward the Assuit –Cairo desert Road, and the extension of Ras Gharb Minya Road,

Environmental & Social Aspects	Area of Influence (AoI)
	Operation phase
Electromagnetic waves	- Project footprint.

Based on the two tables above, the AoI during the construction phase extends to encompass transportation routes, nearby urban centers and worker accommodation areas. During operation, although the IFC standards do not define a specific extent of the AoI for solar panels' projects, previous studies proposed best practices that consider a buffer area of 1 km from the project site boundaries (ERM, 2018; Masdar, 2022).

3. Environmental and Social Baseline

The Project Site is located in the northern part of the East Minya NREA concession, hereinafter referred to as the "East Minya Region", situated in the eastern part of Minya Governorate, east of the Nile River, approximately 18 km east of Minya city. The site lies within a remote and uninhabited part of the governorate. The nearest residential settlement is New Minya City, situated at approximately 11.5 km west of the Project Site.

3.1 Physical Baseline

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 are based on the Digital Elevation Model extracted from global mapper. Regional geology is acquired from Alsayyad et al. (2024). Groundwater information is obtained from the Geotechnical Encyclopedia (2003) and other local sources.

3.1.1 Climate and Meteorology

An extremely arid climate prevails in the Eastern desert, characterized by high temperatures, low relative humidity, and negligible rainfall. Climatic aridity gradually increases towards the east away from the Nile Valley. However, there is no access to meteorological stations in the desert. Therefore, the information in this section relies on data from Meteoblue database and CAPMAS Statistical Yearbook - Geography & Climate (2020) based on the nearest meteorological station, El Minya Station which is located about 12 km west of the Project Site. The expected climatic features in East Minya Region are as follows.

a) Temperature

Air temperature recorded at Minya meteorological station over a period of 30 years, and the average monthly temperature reaches its maximum value in July and August(37°C) and its minimum value in January (8°C), while the annual average is 20°C (Meteoblue, 2026).

b) Solar Radiation

For global solar radiation G, the highest G values in El-Minya are in summer (months of June, July and August) with a mean value (mean of 9 h) of 755 W/m2, while the lowest intensity value is in winter (months of December, January and February) with a mean value of 487 W/m^2. The before-noon hours from 8:00–11:00 are lower than the after-noon hours from 13:00–16:00 due to the intensive water vapor caused by the evaporation of the water from the Nile River and El-Ebrahimia canal. (Shaltout et al., 2001)

c) Day Length

The Project lies within Egypt's subtropical desert zone and experiences typical day-length variations for its latitude, which are critical for solar energy generation modeling, construction logistics, and operational planning.

Based on sunrise and sunset data compiled from MAPLOGS solar tables for Minya Governorate, the region experiences the following daylight characteristics across the year.

Table 3–1: Seasonal Daylight Duration at West Minya Project Site

Date	Daylight Duration	Comment
21 December (Winter Solstice)	~10 hours 35 minutes	Shortest day of the year
21 March / 21 September (Equinoxes)	~12 hours 10 minutes	Equal day and night globally
21 June (Summer Solstice)	~13 hours 54 minutes	Longest day of the year

The data shows that the difference between the shortest and longest days in West Minya is approximately 3.3 hours. This seasonal variation in day length—between winter and summer—is considered normal and expected at latitude 28° North (where the project site is located).

d) Rainfall

Rainfall is very limited. The distribution of rainfall in Egypt shows a maximum over the Mediterranean coast with a rapid decrease towards the south. The average monthly rainfall is about 1.05 mm and the annual rainfall is about 12.6 mm. The rainfall reaches its maximum value in March (11.8 mm) followed by February (0.8 mm). While the rainfall is almost null over the rest of the year (CAPMAS, 2020).

e) Wind Speed and Direction

According to Meteoblue's wind data for a period of 30 years, the wind direction in the Minya Region is northern and north-northwest most of the year, while it is Northeast in few periods, (Figure 3–1). As for wind speed rates, The average highest wind speed blows in a speed ranging from 10 to 20 km/h.

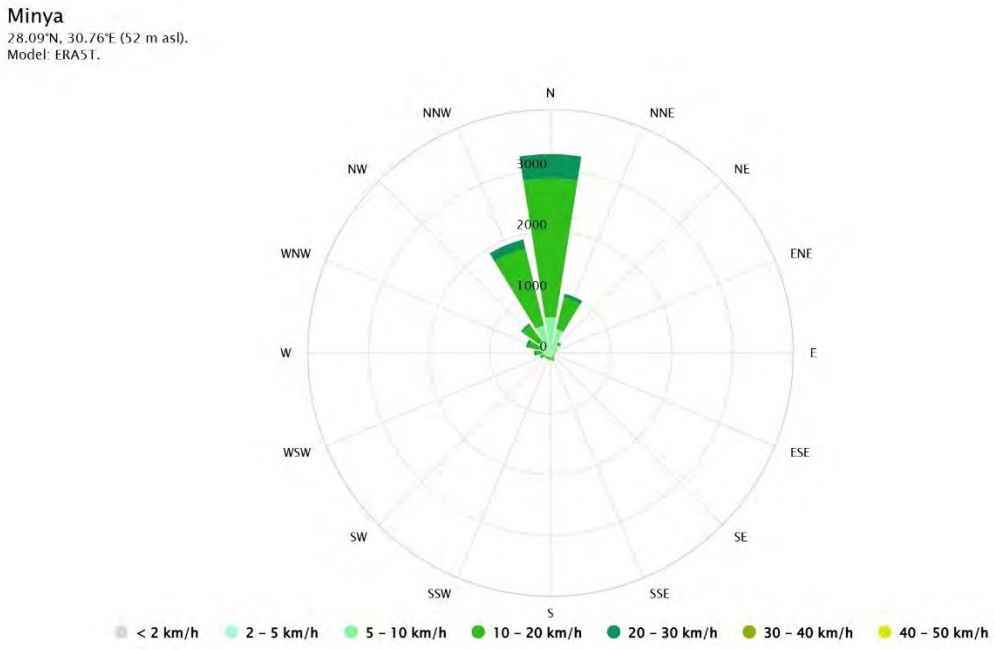


Figure 3–1: Wind direction in Minya Governorate
Source: Meteorological website – Weatherbase

f) Sandstorms

A Sandstorm Frequency and Wind Regime Assessment was conducted by Environics (2023), in order to identify the sandstorm frequency at the East Minya Region. The assessment was based on a data extracted from Assiut weather monitoring station located at about 90 km south of the Project Site (the nearest station providing sandstorms data) for Dust/Sand events frequency were used since El Minya station does not provide long term records for sandstorms. Storm data of 11 years (2012 to 2022) indicate that the maximum number of events of sandstorms (SA), dust storms (DU) or strong sandstorms (SS) during the 11 years occurred in March for 39 days and 227 hours, while the minimum occurring events were recorded in August for 1 day and 1 hour.

Overall, the total number of sandstorms (SA), dust storms (DU) or strong sandstorms (SS) are 741 hours in 155 days during 11 years, as shown in Table 3–2 and Table 3–3.

Table 3–2: Assiut monthly SA/DU/SS hour's events during 2012-2022

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%Ratio
Hours	47	87	227	139	80	17	16	1	38	9	16	64	741	0.77%

Source: Assiut meteorological station

Table 3–3: Assiut monthly SA/DU/SS day's events during 2012-2022

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%Ratio
Days	13	20	39	28	18	6	2	1	4	6	6	12	155	3.86%

Source: Assiut meteorological station

g) Air Quality

The Project Site, covering 41 km², is located in the East Nile NREA concession within the desert hinterland of Minya Governorate. It lies 4.4 km east of the Cairo – Aswan Eastern Desert Road and 1.4 km east of the Cairo – Assiut Road. The area is remote, with no industrial or stationary emission sources nearby. The closest human activity includes cultivation of reclaimed lands. Minor emissions may arise from occasional vehicle use on unpaved access roads. Overall, ambient air quality is expected to be good with respect to anthropogenic pollutants. However, the desert setting leads to naturally high levels of windblown dust. Particulate matter (PM_{10}, $PM_{2.5}$) may peak during storm events.

3.1.2 Topography

Generally, the elevations in the East Minya Region increase towards the east and decrease to the west towards the Nile River. The elevations of the Project Site range from 90 - 170 m (above main sea level) in its northernmost part to 170-265 for the rest of the site (Figure 3–2).

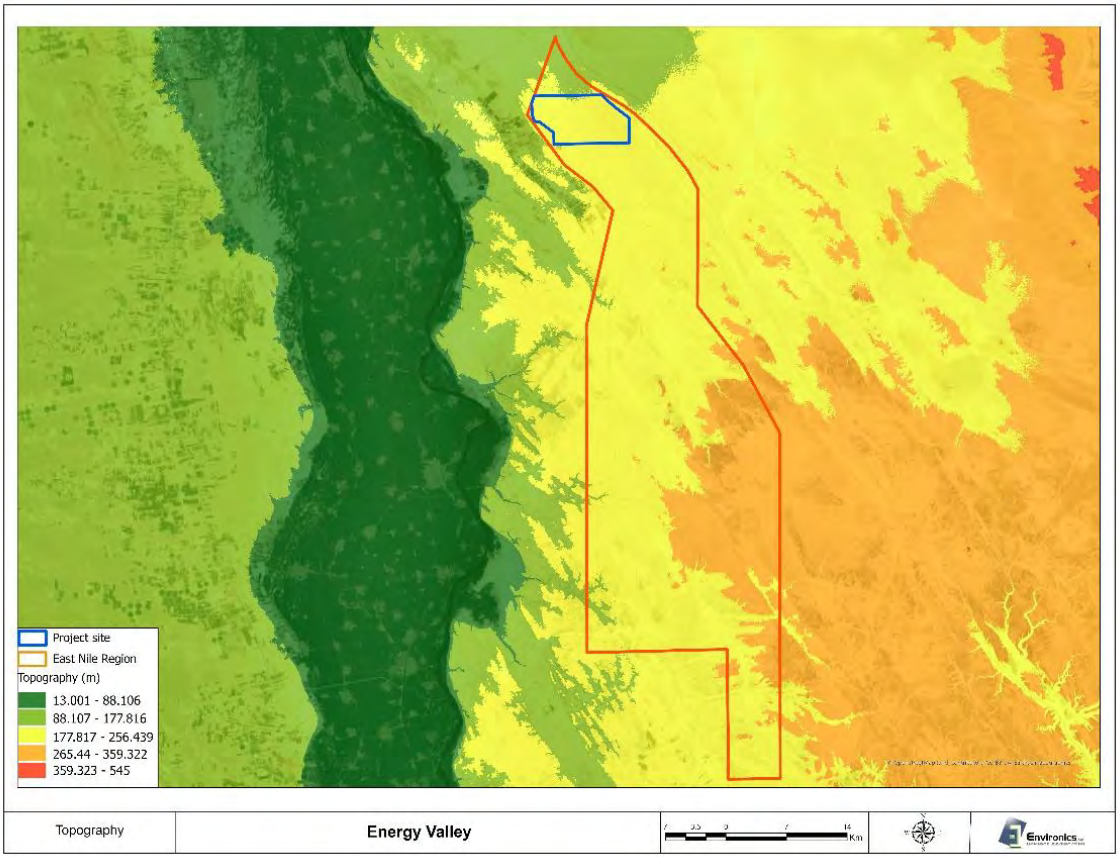


Figure 3–2: Topography of the East Minya Region

3.1.3 Geomorphology and Soils

The geomorphology of the East Minya Region is characterized by a dissected limestone plateau, which is composed primarily of limestone rock shaped by the erosional forces of water and wind over time. Soil within the East Minya Region primarily consists of lithosols. Lithosols are a specific type of soil characterized by their shallowness, stoniness, and relative infertility (Hammad, 1975).

No sand dune fields are located in the East Minya Region. The nearest sand dune field is located at about 35 km northwest of the Project Site across the Nile River (Bubenzer *et al.*, 2020).

3.1.4 Hydrology

a) Groundwater

As mentioned above, the main aquifer underlying El Minya Governorate is the Quaternary aquifer, which comprises two hydrological units (Geotechnical Encyclopedia, 2003; Moneim *et al.*, 2016) as follows:

- The Pleistocene sub-aquifer, covering the Nile valley and desert fringes, with high groundwater productivity, and
- The Eocene sub-aquifer, underlining the eastern and western sides (desert hinterland) of the Governorate. This sub-aquifer has low groundwater productivity.

The main source of groundwater in the East Minya Region originates from the Basement Complex Eocene sub-aquifer (Figure 3–3).

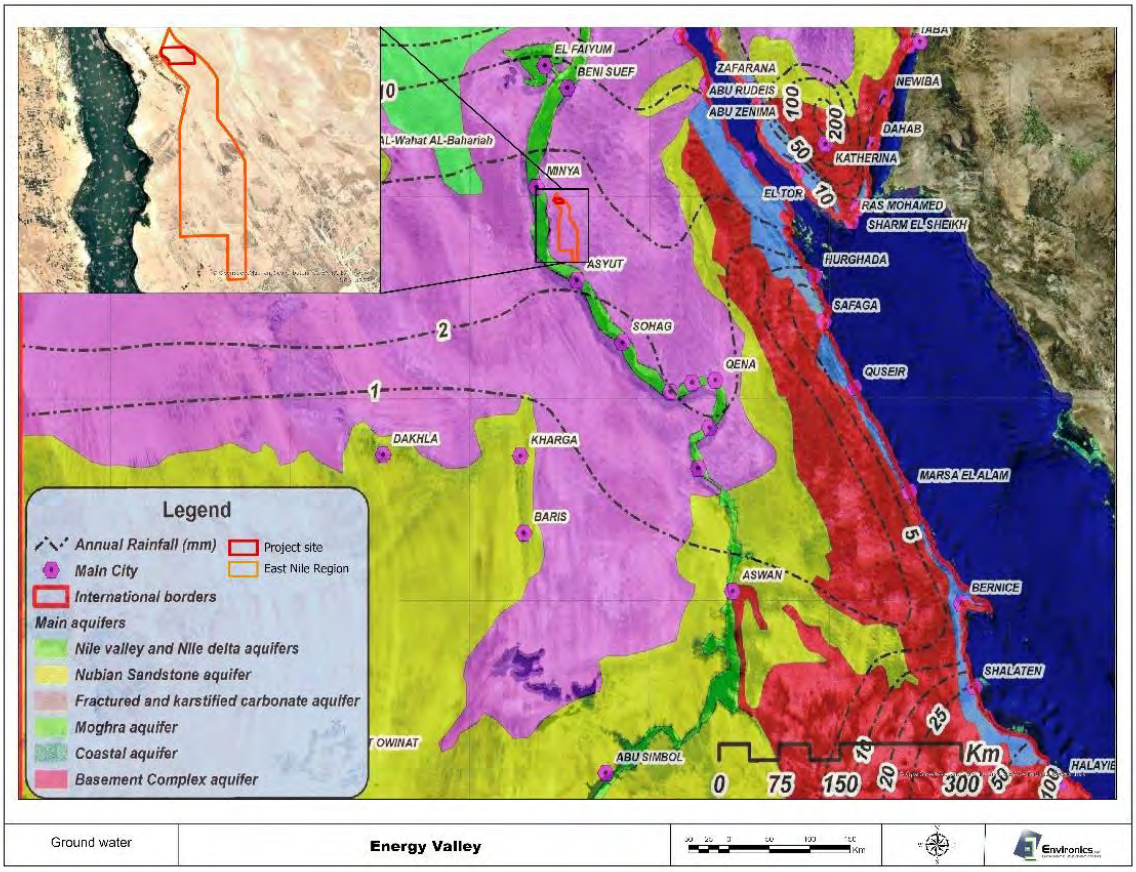


Figure 3–3: Groundwater system in East Minya Region

A levels range from 21.59 meters to 30.08 meters (Habibah *et al*., 2022). Information obtained during the site visit from agriculture land operators indicated that the depth of groundwater in the area ranges between 120m up to about 180m below ground.

Salinity levels vary across the different locations within the area covered by the study, spanning from 349.7 mg/L to 2043.9 mg/L, resulting in a range from fresh-to-brackish water types. Notably, the average salinity in the area is around 1000 ppm, making the groundwater suitable for drinking and irrigation purposes (Habibah *et al*., 2022). This level of salinity complies with the acceptable limits set by the World Health Organization (WHO) guidelines for drinking water quality (WHO, 2003) and is also consistent with Health Ministry Decree No. 458 of 2007 (FAO, 2007).

b) Surface Waters

- **Rivers, canals and drains**

  There are no surface water bodies in the East MinyaMinya Region. The nearest major source of surface water is the Nile River located about 13 km west of Project Site.

- **Flash Floods**

  The East Minya Region is characterized by the presence of wadis due to the geomorphological nature of the area characterized by plain land, elevated areas and small hills. Wadis, as drainage courses, are distinguished by intermittence of water. Wadis are generally dry year-around, except after a rain.

Based on Ecoda (2018), the West Minya Region falls in the path of two wadis (Wadi Ibadah and Wadi Al Birshawi) which makes it potentially vulnerable to flashfloods (Figure **3–4**). However, these wadis do not intersect the Project Site.

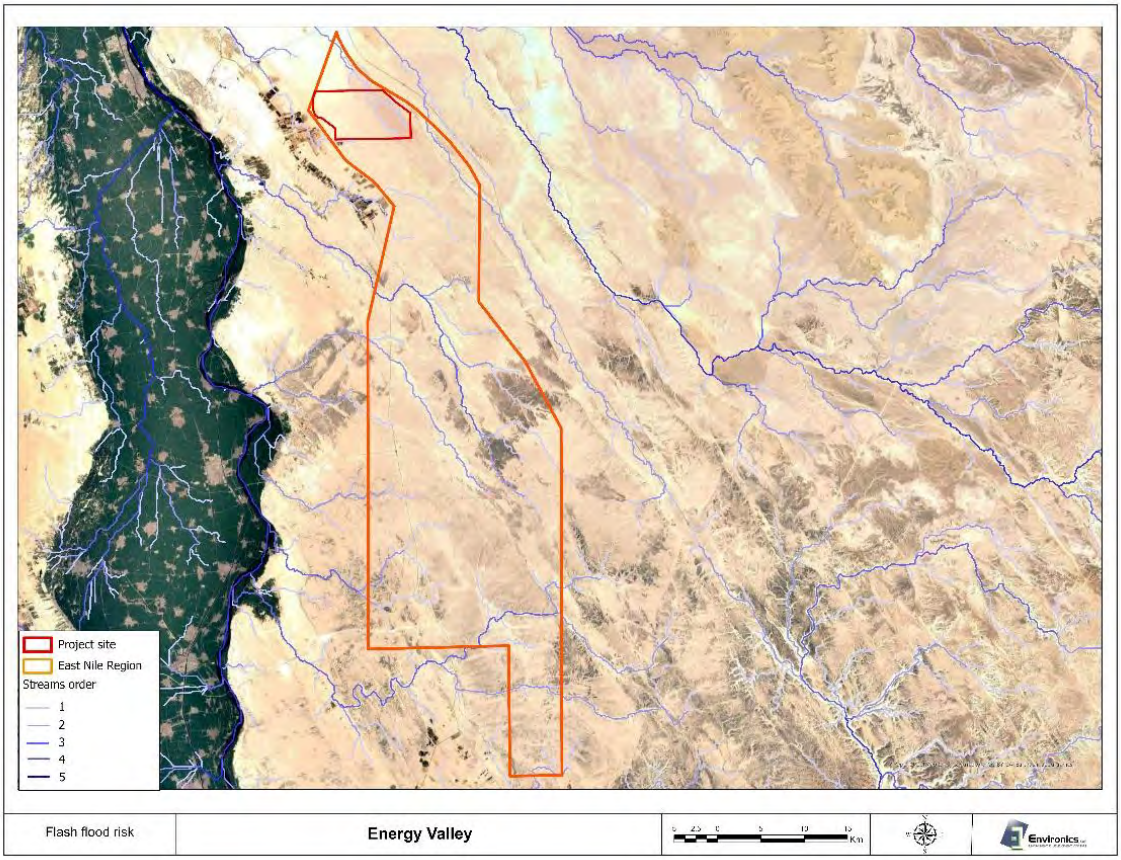


Figure 3–4: Flash Flood Risk at the East Minya Region

3.2 Biological Environment

Information and data on the species/features of the wider area[1] 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.

Accordingly, data and information on biodiversity of the Project Site and surroundings were mainly obtained through:

- Published material and previous reports, analysis of satellite images and recent studies performed by Environics and other entities;
- A field survey performed by Ecoda (2018), targeting the entire East Minya Region;
- References with maps showing empirical records and projected species' range, such as Baha El Din (2006) for herpetofauna, BirdLife International (2025) for avifauna and

[1] 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.

Basuony *et al*. (2010) and Hoath (2009) for mammals;
- BirdLife International database;
- The IUCN Red List of Threatened Species;
- Integrated Biodiversity Assessment Tool (IBAT)[2];
- Migratory Soaring Birds Tool (MSBT);
- Avian Sensitivity Tool for Energy Planning (AVISTEP)[3]; and
- Professional judgment based on analysis of information obtained from literature on the wider area.

The data and information gathered were confirmed and/or refined through two field visits of the Project Site and surroundings carried out by Environics' team on the 15th of February 2026.

Given the extent of the project area, 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 entire study area and provided an initial identification of the area features and landmarks. Accordingly, a number of locations were preliminarily selected for field investigations, representing the different habitat types of the area.

The visit was not limited to the Project Site, but included other habitat types within the wider area, in order to document the ecological difference and variation between other habitat types (particularly the nearby reclaimed agricultural lands) versus the arid desert habitat characterizing the Project Site.

Moreover, as Scatec's field visit preceded Environics' survey, Scatec's field visit results were used to plan Environics' field survey, which focused on confirming Scatec's findings, as well as the main areas of interest not covered by the Scatec's visit.

Accordingly, the entire project site, its Area of Influence (AoI), and an Ecologically Appropriate Area of Analysis (EAAA; see Section 3.2.6), were covered by the two complementary surveys. Environics' survey included – survey points.

Figure 3–5 shows Environics field visit route and visited locations (survey points).

[2] IBAT is a web-based map and reporting tool developed as partnership among BirdLife International, Conservation International, IUCN, and UN Environment World Conservation Monitoring Centre. The tool provides a metric of "biodiversity significance", namely, Rarity-weighted species richness. It is visualized through a map that shows the relative importance of each ~10km (30 arc-seconds) grid cell in terms of its aggregate contribution to the global distribution of species of mammals, birds, amphibians, crabs, crayfishes and shrimps.

[3] BirdLife International has developed AVISTEP to identify where renewable energy could impact birds and should therefore be avoided.

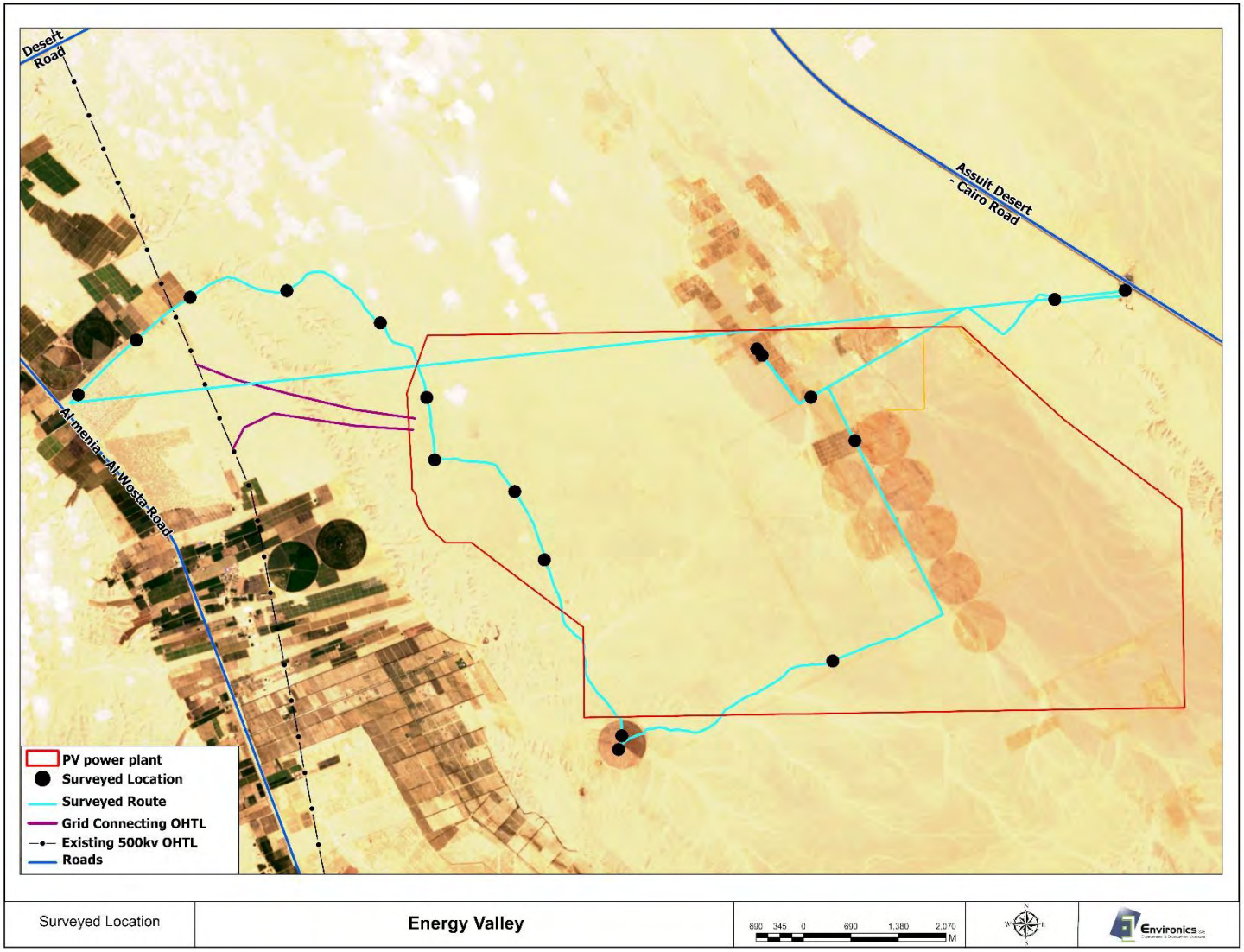


Figure 3–5: Field visit route and survey points

The location of each visited place was recorded using a GPS. At each point, a quick assessment methodology, covering a radius of approximately 500 meters around each point, was used to assess the main ecological features of the site. Moreover, the route connecting the different points was also visually inspected from the car to identify potential variations or other points of interest. 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.

Based on the collected information, valuable habitats, sensitive areas as well as species of concern have been highlighted, to include threatened and/or protected species as well as species of ecological and/or economic importance. The Red List issued by the International Union for the Conservation of Nature (IUCN) is used to determine the international status of species. The national status, whenever available, has been obtained from local literature on the Egyptian biodiversity. As many of these references are not very recent and require updates, the local status obtained from literature has been sometimes modified to reflect the actual status of animals, based on professional judgment. Moreover, if status differs from one source to another, the more stringent classification is applied. The status of species is determined following the IUCN Red List categories[4].

3.2.1 Project wider area

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

a) Nile Valley Farmlands

The Nile Valley farmlands, located approximately 12 km west of the Project Site, are intensively cultivated and anthropogenically altered habitats (Figure 6). Despite being highly modified, these areas support a diverse assemblage of weedy vegetation, naturalized exotic species, and foreign-origin crops. Vegetation along canal and drain banks contributes to habitat heterogeneity, which in turn supports a wide range of fauna. The Nile Valley is almost connected to the Project Site through a corridor of reclaimed agricultural lands.

[4] EX: Extinct; EW: Extinct in the Wild; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated; NA: Not Applicable

Figure 3–6: View of the Nile and Nile Valley farmlands at Minya

Amphibians typical of the Nile Valley include the African Common Toad (*Sclerophrys regularis*), Nile Ridged Frog (*Ptychadena nilotica*), and Bedriaga's Frog (*Pelophylax bedriagae*), which thrive in irrigated fields and water bodies. Reptiles found in the area include geckos such as the Turkish Gecko (*Hemidactylus turcicus*) and White Spotted Gecko (*Tarentola annularis*), skinks, and snakes such as the Egyptian Cobra (*Naja haje*), Diced Snake (*Natrix tessellata*), and Striped Sand Snake (*Psammophis sibilans*) (IUCN, 2025; Baha El Din, 2006).

The farmlands host numerous resident breeding birds, including Cattle Egret (*Bubulcus ibis*), Common Kestrel (*Falco tinnunculus*), Spur-winged Lapwing (*Vanellus spinosus*), Palm Dove (*Spilopelia senegalensis*), and Graceful Warbler (*Prinia gracilis*), among others. The Nile Valley is also a critical migratory corridor, part of the Palearctic-African flyway, used extensively during spring and autumn migrations. It also functions as a wintering ground for numerous migratory species (EEAA, 1993).

Mammals commonly observed in the Nile Valley include small and medium-sized generalist species such as the Long-eared Hedgehog (*Hemiechinus auritus*), African Grass Rat (*Arvicanthis niloticus*), Red Fox (*Vulpes vulpes*), Egyptian Mongoose (*Herpestes ichneumon*), and Afro-Asiatic Wildcat (*Felis lybica*).

Due to agricultural expansion and habitat connectivity, several of these species—particularly adaptable generalists—are likely to colonize nearby reclaimed agricultural lands within the broader project area. This includes species such as Cattle Egret, Black Rat (*Rattus rattus*), and Red Fox, which are already observed in similar landscapes (EEAA, 1993; IUCN, 2025).

b) Urban and Rural Habitats

There are urban and man-made habitats scattered throughout the Nile Valley farmlands and reclaimed agricultural lands, such as towns and villages, banks of canals and drains, roadsides, railways and wastelands. These habitats are mainly home to exotic plants and trees introduced

for ornamental purposes or as windbreakers, as well as opportunistic fauna associated with human activities such as feral dogs and cats, rats, mice, and several species of birds.

c) Reclaimed Agricultural Lands

Several reclaimed agricultural areas exist near and within the Project Site (the latter have been dismantled). These irrigated and vegetated lands serve as ecological attractors, drawing species from the nearby Nile Valley that would not typically inhabit the arid desert environment. The expansion of agriculture has thus created a vegetated corridor extending from the Nile Valley into the desert, enhancing local biodiversity in proximity to the project site.

Wildlife from the Nile Valley is expected to gradually disperse into these newly formed agrarian habitats. Pioneer species are typically birds and large mammals with high dispersal capacity. Common avian colonizers include the Palm Dove (*Spilopelia senegalensis*), Cattle Egret (*Bubulcus ibis*), House Sparrow (*Passer domesticus*), and Hooded Crow (*Corvus cornix*). Among mammals, the Red Fox (*Vulpes vulpes*) and African Wolf (*Canis lupaster*) are expected to have already established themselves in nearby reclamation zones.

The ongoing transformation of desert lands into agricultural use facilitates the spread of Nile Valley mesic species into formerly arid ecosystems. This includes commensal and invasive species that can outcompete and displace native desert fauna. For instance, the Red Fox has been documented replacing the native Rüppell's Sand Fox (*Vulpes rueppellii*) in various reclamation zones such as the New Valley, Fayum Depression, and Bahariya Oases. Similarly, species like the House Mouse (*Mus musculus*) and Cairo Spiny Mouse (*Acomys cahirinus*) have been observed displacing indigenous desert rodents, even in remote areas like the Acacia groves of the Western Desert.

In addition, these irrigated lands may offer suitable stopover habitats for migratory birds due to the availability of food, water, and shelter.

d) Middle Section of the Inland Eastern Desert (Beni Sueif – Qena Desert)

The inland part of the Eastern Desert comprises the area between the Red Sea coastal mountains in the east and the Nile Valley in the West, covering a total area of about 223,000 km^2. The inland desert can be sub-divided from north to south into five sections as follows:

- Cairo – Suez Desert;
- Northern Limestone Plateau;
- Middle Section (Beni Sueif – Qena Desert), where the East Minya Region site is located;
- Idfu – Kom Ombo Section; and
- Southern Nubian Section.

The middle section of this desert extends approximately between Wadi Tarfa in the north, and the valley occupied the main channel of Wadi Qena with its north-south direction (different from other wadis that run east to west). Wadi Qena separates the Eocene limestone formations to its west and the sandstone basement formations to the east (EEAA/UNEP, 1993).

This section is located in the extreme arid part of Egypt and is practically rainless. Perennial plant growth is confined to run-off collecting wadis. The type of vegetation relates to the catchment area of the site and differences are noted between the plant growth in the main channel of a wadi and that of the tributary branches and finer runnels.

The area between latitude 27°30' and 25°30' N (Assiut – Qena Desert) represents the transition between the predominantly limestone country and the southern non-calcareous country (separated by Wadi Qena). Several wadis dissect the limestone plateau but do not reach the Red Sea coastal mountains.

3.2.2 The Project Site

The Project Site lies within a hyper-arid desert landscape that differs markedly from surrounding ecological regions, such as the Nile Valley farmlands and reclaimed agricultural corridors. These contrasting habitat types highlight the need for site-specific ecological investigation, particularly because most prior biodiversity surveys in the region have focused on areas of known or expected ecological richness, often overlooking the harsh, arid desert ecosystems.

To address this gap and ensure that the ESIA baseline reflects true on-ground conditions, the environmental team conducted a targeted in situ biodiversity field survey. This was designed to validate or correct regional biodiversity assumptions derived from literature and secondary sources.

Before field deployment, a detailed analysis of recent satellite imagery was undertaken to assess habitat structure and homogeneity across the project footprint. The analysis confirmed that the site almost consists of a single, uniform, arid desert habitat, lacking distinct natural ecological micro-zones.

To support accurate spatial referencing of the Project Site, the coordinate system used is Africa_Lambert_Conformal_Conic, as presented below.

Table 3–4: Coordinates of the Project Site (Africa_Lambert_Conformal_Conic)

Point	Easting (Longitude)	Northing (Latitude)
1	632032.4921602416	3035807.5252274573
2	624695.9596219833	3035706.2761660814
3	624414.0993877718	3034922.366002381
4	624483.9767640651	3033605.109857768
5	624537.3388341365	3033527.9947473705
6	624689.2237992727	3033096.5491323173
7	624938.7207172832	3032878.0961324275
8	625291.5657612912	3032878.325832367
9	626828.8022436886	3031715.6398382485
10	626834.7831908315	3030485.2029592395
11	635075.9186972552	3030596.964916587
12	635039.9421693081	3033316.4403622746

To ensure robust ecological coverage, field surveys were conducted across the Project Site and its AoI, were surveyed (Figure 3–7). Each point has been surveyed within a radius of approximately 500 meters, and additional transect-based observations have been made along the route connecting the survey points. This spatial strategy ensured complete coverage of the site and provided a comprehensive ecological characterization of its ecological and geomorphological attributes.

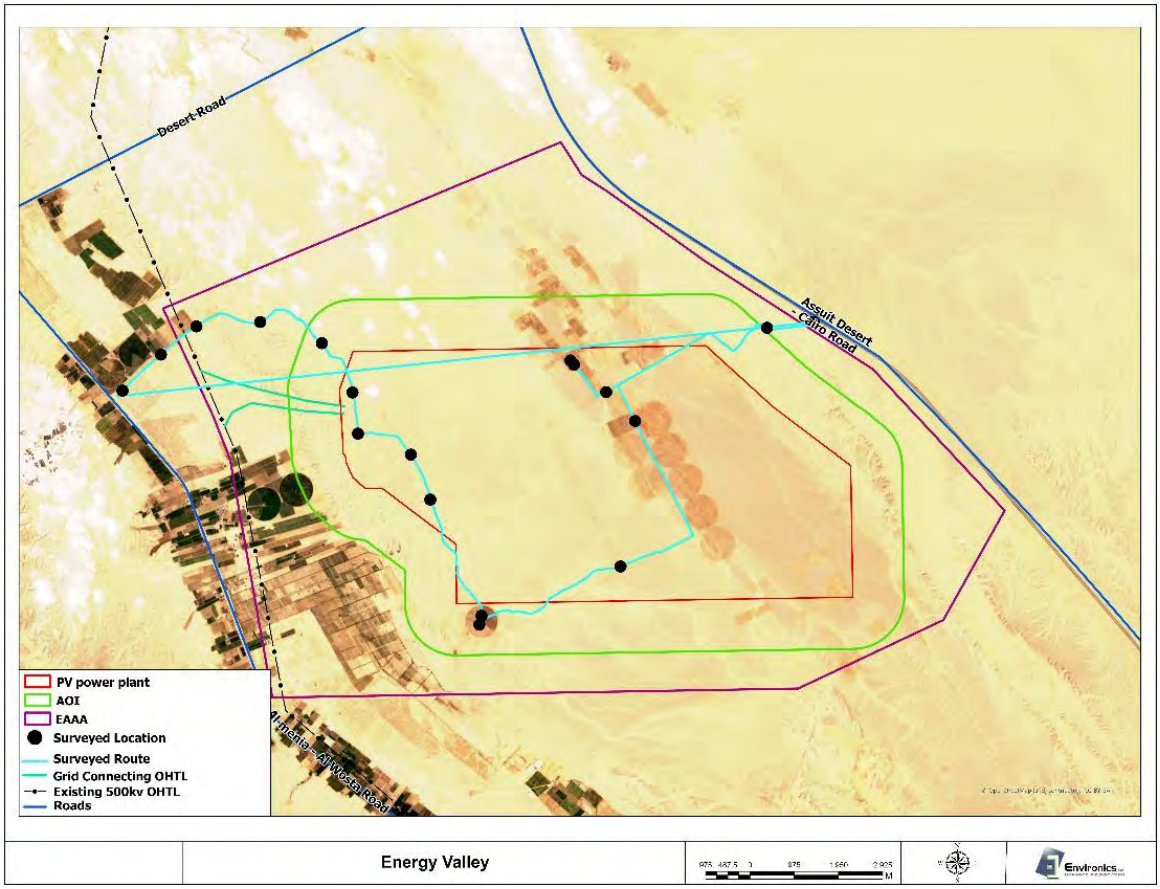


Figure 3–7: Surveyed locations within the Project Site and its AOI

3.2.3 Ecology and Biodiversity

Desktop information on biodiversity specific to the project area is mainly based on the field surveys performed by Ecoda (2018), which covered the entire East Minya Region, as well as other sources. Desktop information was complemented by the results of the field survey carried out by Environics team.

a) Habitats

The East Minya Region is situated in the middle inland section of the Eastern Desert, which stretches from the Nile Valley to the Red Sea mountains. Numerous canyon-like depressions (wadis) extending to the Red Sea eastwards, or the Nile Valley westwards, cut across the Eastern Desert.

Wadis are typically the main place where plants and animals can be found. After rain, water pours into the wadi systems from the eastern mountains. Floods are less common in lower reaches of wadis because they are less steep and spread out, which allows any remaining

water to soak into the ground and support vegetation in the main wadi streams. Therefore, the value of wadis as a habitat for both plants and animals might vary. Two main wadis cut across East Minya Region, namely, Wadi Ibadah and Wadi al-Birshawi (Ecoda, 2018). However, these wadis do not cross the Project Site. The natural habitats of the Project Site are composed of bare soils with sparse vegetation.

Figure 3–8 shows the main habitat types in the East Minya Region and the Project Site.

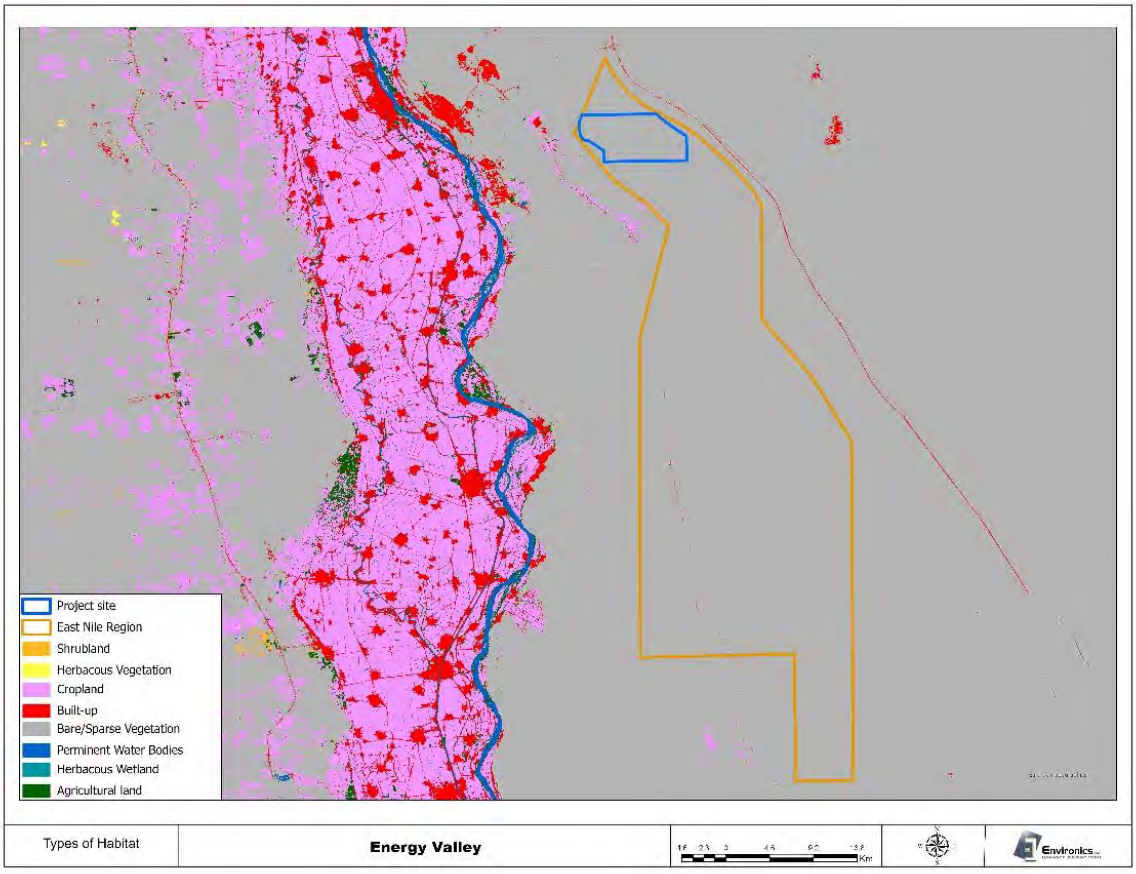


Figure 3–8: Main habitat types in the East Minya Region

The field visit confirmed that the Project Site is part of the desert area described in Section 3.2.1 - d) Middle Section of the Inland Eastern Desert (Beni Sueif – Qena Desert). Its natural habitats mostly consist of a flat, rather homogeneous, arid desert habitat entirely composed of bare sandy soil, with some more elevated parts forming small plateaus.

Figure 3–9: View of the natural desert habitat of the Project Site at different locations showing its uniformity

At the macro level, the landscape and the natural habitats of the Project Site and surrounding desert are overall similar and repetitive, with no significant variation in landscape features at the micro level. The landscape is generally flat with few altitudinal variabilities, providing easy access to the site.

A relevant feature noticed during the field visit was represented by the presence of a ground fracture leading to an underground cave (Figure 3–10). This fracture is located in the southwestern part of the Project Site. Two Rock Doves were hidden in this crack, which fled when the team approached.

Figure 3–10: Ground fracture leading to an underground cave. The round hole in the bottom left photo is the entrance to the cave

On the other hand, large parts of the site had been modified by anthropogenic activities and included previous reclaimed agricultural lands and associated utilities (groundwater wells, accommodation buildings and electricity lines). The land located in the western southmost part of the Project Site was cultivated with alfalfa and wheat, while vineyards were the main plantations in the eastern part of the site. All the plantations and associated utilities have been dismantled by the Minya Governorate (Figure 3–11 to Figure 3–13).

Figure 3–11: Dry reclaimed agricultural land previously cultivated with alfalfa

Figure 3–12: Demolished accommodation building

Figure 3–13: Dismantled vineyards and demolished buildings located in the eastern part of the Project Site

Natural and modified habitats

In accordance with EBRD ESR6 (EBRD, 2024) and IFC PS6 (IFC, 2012), habitat types are categorized into natural and modified habitats. Most of the Project Site is categorized as "natural habitat". However, the site visit indicated that some parts of the sites were cultivated by local investors, but have been dismantled (Figure 3–14), while parts located to the north of the site are currently being used for quarrying activities (Figure 3–15). Accordingly, modified habitats also occur within the Project Site.

Figure 3–14: Dismantled vineyard plantation located in the eastern part of the Project Site

Figure 3–15: Area located to the north of the Project Site used for quarrying activities

b) Flora

The Eastern Desert flora is neither rich in species, nor dense in populations. Based on the latitudinal variation and floristic composition, the Eastern Desert is divided into two phytogeographic sub-territories: Northern Galala Desert and Southern Arabian Desert. Northern Galala Desert, where the East Minya Region is located, extends from the northern limits at 30°N latitude southward to Minya-Assiut desert at 27°N latitude. This sub-territory is relatively rich in plant species and the occurrence of numerous plant families (15 families) (Ecoda, 2018; Abd El-Ghani *et al.*, 2017). According to IUCN (2023), more than 98 plant species are likely to be found in the Galala sub-territory, none of which is threatened.

The wadis tend to support most vegetation due to generally higher soil moisture levels mainly after heavy rainfall. On local basis, during previous field surveys in the East Minya Region, 19 plant species belonging to 12 families were recorded (Ecoda, 2018). None of the recorded species is endemic or threatened.

Table 3–5 shows the list of plant species recorded in the survey performed by Ecoda (2018) targeting the entire East Minya Region.

Table 3–5: List of plant species previously recorded in the East Minya Region

Species	Family	IUCN status
Acacia tortilis ssp. raddiana	Acacieae	LC
Anastatica hierochuntica	Brassicaceae	NE
Diplotaxis acris		NE
Farsetia aegyptia		NE
Zilla spinosa		NE
Trigonella stellata	Fabaceae	NE
Fagonia arabica	Zygophyllaceae	NE
Zygophyllum coccineum		NE
Trichodesma africanum	Boraginaceae	NE
Echinops spinose	Asteraceae	NE

Species	Family	IUCN status
Launaea nudicaulis		NE
Pulicaria incisa		NE
Senecio glaucus		NE
Salsola aegyptiaca	Amaranthaceae	NE
Panicum turgidum	Poaceae	NE
Ochradenus baccatus	Resedaceae	LC
Neurada procumbens	Neuradaceae	NE
Erodium sp.	Geraniaceae	NE
Astragalus caprinus	Leguminosae	NE

Source: Ecoda (2018)

During the February 2026 site visit, few desert native plant species were recorded. In non-reclaimed areas, vegetation was extremely dry (Figure 3–16), while it was green and lush in or near areas previously reclaimed for agriculture (Figure 3–17). This is probably due to the recent presence of irrigation water. Reclaimed areas also included the invasive reed *Phragmites australis*. Recorded native species included *Zilla spinosa* (Figure 3–18) and *Zygophyllum* spp. (Figure 3–19).

Figure 3–16: Dry desert vegetation in a non-reclaimed area

Figure 3–17: Green and lush vegetation near areas previously reclaimed for agriculture

Figure 3–18: A flowery bush of *Zilla spinosa* near a previously reclaimed agricultural land

Figure 3–19: Green and lush bush of *Zygophyllum album* near a previously reclaimed agricultural land

c) Fauna

A number of species might be possibly encountered based on the intersection of the East Minya Region with their distribution range. Among the different categories of fauna species that might be encountered in the Northern Eastern Desert, only three bird species are EN according to the IUCN (2023).

In the East Minya Region, Wadi Ibadah and Wadi Al Birshawi, are the main habitats to be likely considered as suitable habitats for animal species from different groups, including invertebrates such insects and spiders, reptiles, birds and mammals (Ecoda, 2018). However, these wadis do not intersect the Project Site.

Moreover, the results of a previous fauna survey of the East Minya Region clearly show that the local fauna is poor in species diversity. The recorded species are quite widespread and can be found in several desert habitats in Egypt. Except for some migratory birds, none of the recorded species is known to be threatened. The different faunal groups recorded during the previous survey carried out by Ecoda (2018) are herein provided.

- **Invertebrates**

  During previous surveys, seven swarming and migrating insects were recorded in the area encompassing the East Minya Region, with obvious migration of two species of butterflies (Ecoda, 2018).

- **Herpetofauna**

  At least 10 species of reptiles were recorded in the East Minya Region. Table **3–6** shows the list of reptiles recorded by Ecoda (2018).

Table 3–6: List of reptiles recorded in a previous survey

Species		IUCN status
English name	Scientific name	
Horned Viper	*Cerastes cerastes*	LC
Sahara Sand Snake	*Psammophis aegyptius*	LC
Saharan Fan-toed Gecko	*Ptyodactylus siphonorhina*	LC
Species not determined	*Tarentola* sp.	--
Species not determined	*Trapelus* sp.	--
Sinai Agama	*Pseudotrapelus sinaitus*	LC
Bosc's fringe-toed Lizard	*Acanthodactylus boskianus*	LC
Nidua fringe-fingered Lizard	*Acanthodactylus scutellatus*	LC
Red-spotted Lizard	*Mesalina rubropunctata*	LC

Source: Ecoda (2018)

On the other hand, no reptiles were recorded by Environics within the Project Site during the February 2026 survey.

- **Avifauna**

  A total of 45 species has been recorded during previous bird surveys carried out in 2016 and 2017 (Ecoda, 2018) targeting the entire East Minya Region.

Resident birds

Resident birds were represented by 14 species. Table **3–7** show the list of local birds recorded during the previous bird survey.

Table 3–7: List of local birds recorded in the previous survey (2016-2017)

Species		IUCN status
English name	Scientific name	
Barbary Falcon	*Falco pelegrinoides*	LC
Brown-necked Raven	*Corvus ruficollis*	
Desert Lark	*Ammomanes deserti*	
African Desert Warbler	*Sylvia deserti*	
Desert Wheatear	*Oenanthe deserti*	
Greater hoopoe Lark	*Alaemon alaudipes*	
Hooded Wheatear	*Oenanthe monacha*	
Isabelline Wheatear	*Oenanthe isabellina*	
Mourning Wheatear	*Oenanthe lugens*	
Northern Wheatear	*Oenanthe oenanthe*	
Rock Dove	*Columba livia*	
Rock Pipit	*Anthus petrosus*	
Spotted Sandgrouse	*Pterocles senegallus*	

Source: Ecoda (2018)

In addition, two individuals of Rock Dove (*Columba livia*) have been recorded in a ground fracture located in the southwestern part of the site (see Section 3.2.3 – a) Habitats).

Migratory birds

A previous migratory bird survey for the East Minya Region recorded 15 large soaring bird species during spring migration (2016 and 2017) and 21 large soaring bird species during spring migration for the same two years (Ecoda, 2018). Among the recorded migratory species, two species are globally EN (IUCN, 2023), namely the Steppe Eagle (*Aquila nipalensis* and Egyptian Vulture (*Neophron percnopterus*), while the Sooty Falcon (*Falco concolor*) is categorized as VU at the global level. According to a report on risk assessment to migratory soaring birds from proposed MV OHTL in the Gulf of Suez area (Environics, 2024), flight altitude was categorized into two relevant categories: one below 120 m above ground level, and one above 120 m. The < 120 m altitude was considered as a high-risk band for collision with electrical transmission infrastructure in the Gulf of Suez region. Although this altitude is somewhat higher than most power transmission lines, the cut off takes a precautionary approach accounting for the limits in visual estimates in flight altitude of birds, particularly at a distance, and also takes into account the fact that birds change their altitude as they fly through.

Although the Gulf of Suez area is a much more important area for bird migration compared to the current project location, data from this report are herein used to provide an indicative percentage of PBF birds (see Section 3.2.6) Potentially flying below 120 m.

Accordingly, the following Table provides the percentage of PBF bird species observed above and below 120 m above ground based on monitoring activities at five wind farms in the Gulf of Suez area between 2019 and 2023 (representing results from 20 seasonal studies from both spring and autumn). Note that bird numbers in the two altitudinal categories might not

always add up to the total birds observed, as some birds observed at one altitude are often subsequentially observed at a different, higher or lower, altitude. This is also reflected in the percentage reported in the table

The following table shows the numbers of birds recorded during standardized observations in Autumn 2016 (Ecoda, 2018).

Table 3–8: Number and percentage of PBF birds observed above and below 120 m above ground in the Gulf of Suez area

Bird species		Total number of birds	Birds < 120 m		Birds > 120 m	
English name	Scientific name		#	%	#	%
Steppe Eagle	*Aquila nipalensis*	588	49	8.3	541	92
Montagu's Harrier	*Circus pygargus*	282	219	77.6	105	37
Egyptian Vulture	*Neophron percnopterus*	1178	187	15.8	1095	93
Sooty Falcon	*Falco concolor*	90	77	85.5	32	35.5

The following table shows the numbers of birds recorded during standardized observations in Autumn 2016 (Ecoda, 2018).

Table 3–9: Numbers of birds recorded in autumn 2016

English name	Scientific name	IUCN Status	Recorded number	Estimated global population	% of global population
Short-toed Snake Eagle	*Circaetus gallicus*	LC	381	290000 - 430000	0.1314
Marsh Harrier	*Circus aeruginosus*	LC	90	4000000 - 5700000	0.0023
European Honey Buzzard	*Pernis apivorus*	LC	76	50000 - 99999	0.1520
Steppe Buzzard	*Buteo buteo*	LC	76	2000000-3500000	0.0038
Black Kite	*Milvus migrans*	LC	73	4000000 - 5700000	0.0018
Steppe Eagle	*Aquila nipalensis*	EN	42	50000-75000	0.0840
Pallid Harrier	*Circus macrourus*	NT	15	18000-30000	0.0833
Montagu's Harrier	*Circus pygargus*	LC (glob.) VU (Med.)	14	300000-550000	0.0047
Booted Eagle	*Hieraaetus pennatus*	LC	14	150000-195000	0.0093
Common Kestrel	*Falco tinnunculus*	LC	12	4300000-6700000	0.0003
Sooty Falcon	*Falco concolor*	VU (glob.) CR (Med.)	11	2800-4000	0.3929
Egyptian Vulture	*Neophron percnopterus*	EN	7	12400-36000	0.0565

Other birds of species deemed of minor relevance recorded by chance in spring 2016 are shown in the following table.

Table 3–10: Random records of birds from species of minor relevance in spring 2016

English name	Scientific name	IUCN Status	Recorded number	Estimated global population	% of global population
European Bee-eater	*Merops apiaster*	LC	1,279	14000000 - 25999999	0.0091
House Sparrow	*Passer domesticus*	LC	180	896000000-1310000000	0.0000
Barn Swallow	*Hirundo rustica*	LC	133	290000000-487000000	0.0000
Common swift	*Apus apus*	LC	91	95000000-164999999	0.0001
Pallid Swift	*Apus pallidus*	LC	37	800000-1499999	0.0046
Northern House Martin	*Delichon urbicum*	LC	29	10000000-500000000	0.0003

Area assessment using Migratory Soaring Birds Tool

Based on the Migratory Soaring Birds Sensitivity Tool (MSBT), the sensitivity of the project site, including a 2-km buffer area, was assessed as very low for soaring migratory birds (potential score: 0.000). Moreover, no soaring migratory bird tracks were recorded within the assessed project area (Figure 3–20). However, 13 migratory bird species were detected within the project site area, as presented in Table 3–11.

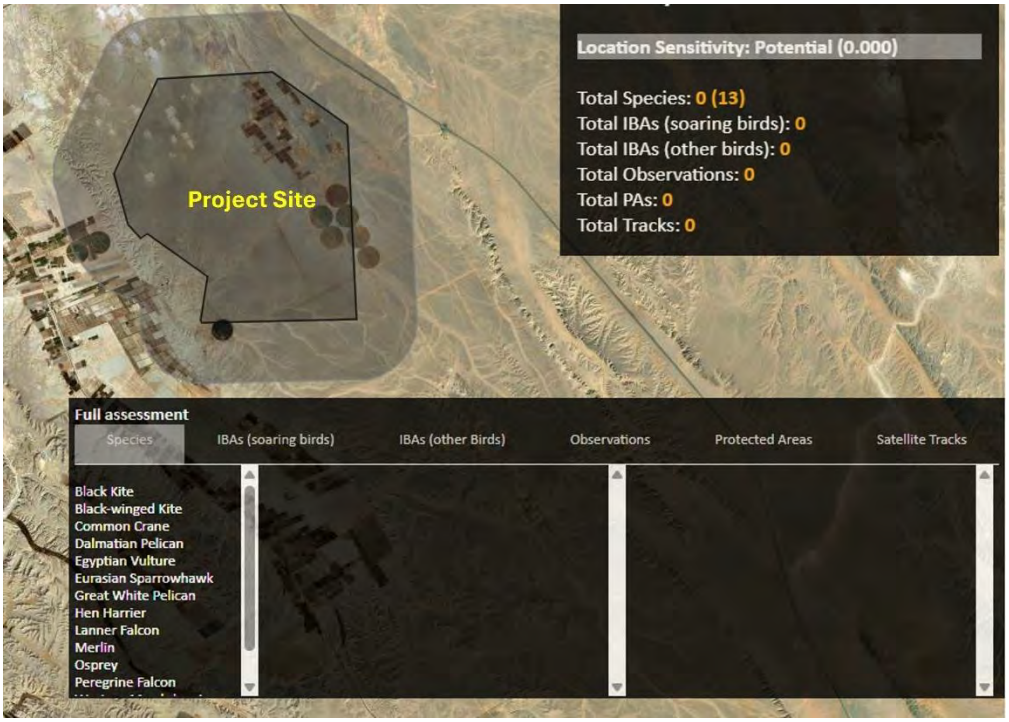


Figure 3–20: Sensitivity of the East Minya Region to migratory soaring birds
Source: Migratory Soaring Birds Tool

Table 3–11: Migratory birds potentially occurring in and around the Project Site using MSBT

Species		IUCN status
English name	Scientific name	
Black Kite	*Milvus migrans*	LC
Black-winged Kite	*Elanus caeruleus*	LC
Common Crane	*Grus grus*	LC
Dalmatian Pelican	*Pelecanus crispus*	NT
Egyptian Vulture	*Neophron percnopterus*	EN
Eurasian Sparrowhawk	*Accipiter nisus*	LC
Great White Pelican	*Pelecanus onocrotalus*	LC
Hen Harrier	*Circus cyaneus*	LC
Lanner Falcon	*Falco biarmicus*	LC
Merlin	*Falco columbarius*	LC
Osprey	*Pandion haliaetus*	LC
Peregrine Falcon	*Falco peregrinus*	LC
Western Marsh-harrier	*Circus aeruginosus*	LC

Assessment of avian sensitivity in relation to PV development using AVISTEP

BirdLife International has developed AVISTEP – the Avian Sensitivity Tool for Energy Planning to identify where renewable energy could impact birds and should therefore be avoided. AVISTEP provides users with spatial heat maps depicting potential avian sensitivity in relation to the several types of energy infrastructure including Solar Photovoltaic. Each 5km x 5km cell within the heatmaps has a sensitivity score. These scores have been grouped into four categories of sensitivity, namely: Low, Moderate, High and Very High.

Based on AVISTEP, most of the Project Site falls within an orange zone of high risk to bird populations (Figure 3–22). However, results of the MBST assessment, complemented by the Ecoda seasonal surveys (Ecoda, 2018) and Environics' site visit contradict this level of risk.

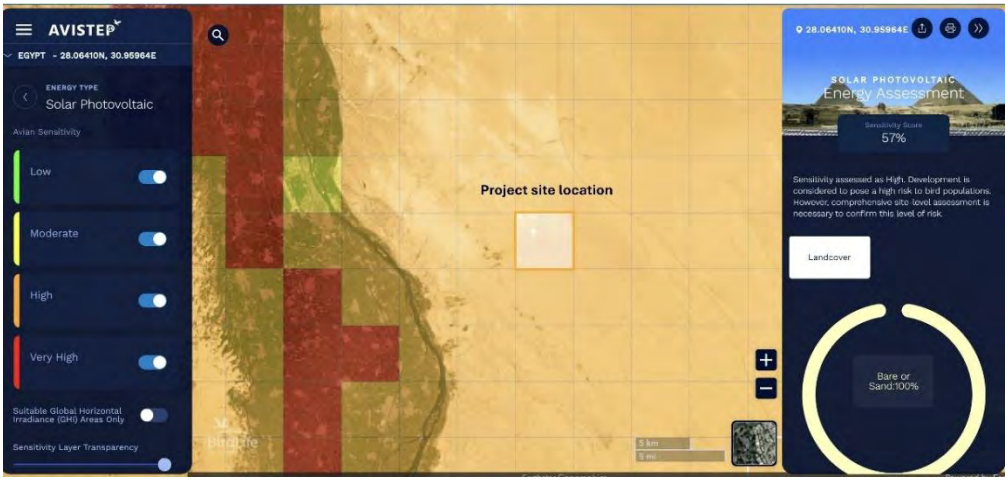


Figure 3–21: Area sensitivity to bird populations based on AVISTEP

Given the arid nature of the desert environment, with limited vegetation, food and shelter, and due to the proximity of the Nile Valley and close vicinity of reclaimed agricultural lands, it is highly unlikely that most of the species listed earlier would intentionally land in this location. In fact, the environment of the project area is likely to be a "bird barrier" or a

"migration bottleneck," where birds would actively avoid flying over or landing in the area due to its harsh conditions.

However, it is possible that some bird species might still be seen in the wider desert area (and possibly at the project site), albeit rarely, and usually under specific circumstances, as follows:

- Accidental landings: Birds migrating or traveling through the area might be forced to make an emergency landing due to exhaustion, bad weather, or injury.
- Stopovers during migration: Some bird species, especially raptors and waders, might use this area as a brief stopover during their migration, even if it is not an ideal habitat.
- Birds blown off course: Strong winds or sandstorms could blow birds off their intended course, leading them to land in this area unintentionally.

In normal conditions, given the limitedness or even absence of attractive features for birds, such as food sources, water, shelter or perching and roosting sites, it is reasonable to predict that bird presence in this area will be extremely low. References supporting this prediction include:

- A study on bird migration patterns in the Sahara Desert found that "*birds tend to fly around or over the desert rather than crossing it directly due to the harsh environmental conditions*" (Biebach, 1990);
- A study on the ecology of desert birds found that "*bird density and diversity are typically low in desert environments due to the limited availability of resources*" (MacLean, 2004);
- "Birds and Climate Change" by the IUCN states that "*birds tend to avoid areas with extreme temperatures, lack of water, and poor habitat quality*" (IUCN, 2010); and
- "BirdLife International" website states that "*deserts are generally avoided by birds due to the lack of food, water, and shelter*".

These references support the idea that birds tend to avoid areas with harsh environmental conditions, such as the harsh sandy desert environment of the Project Site and its AoI.

- **Mammals**

  Few mammals have been documented in the East Minya Region during the survey carried out by Ecoda (2018) indicating that mammal diversity and density is very low due to the harsh living conditions in the desert (Table 3–12). Wadis mainly serve as a habitat for mammal species (mostly night active rodents). However, the number of recorded mammal species is low and the number of individuals per species is very low. Hence, the East Minya Region is not deemed to constitute an important habitat for mammals. Moreover, no signs indicating the presence of mammals were recorded during the February 2026 survey.

  According to Hoath (2009), the occurrence of most bat species in Egypt is restricted to vegetated areas, namely the Nile Valley. Activity of bats within the East Minya Region was found to be very low during previously conducted bat monitoring survey. The East Minya Region was reported as insignificant habitat for bats (Ecoda, 2018).

Table 3–12: List of mammals recorded previously in the East Minya Region

Species		IUCN status
English name	Scientific name	
Rüppell's Sand Fox	*Vulpes rueppellii*	LC
Red Fox	*Vulpes vulpes*	LC
Wildcat	*Felis silvestris*	LC
Lesser Egyptian Jerboa	*Jaculus jaculus*	LC
Lesser Egyptian Gerbil	*Gerbillus gerbillus*	LC
Sundevall's jird	*Meriones crassus*	LC

3.2.4 Ecological Sensitivities

a) Species of Concern

The following sections identify and describe species of conservation concern (i.e., threatened, endemic, highly sensitive, keystone species) from the above-mentioned species that could potentially inhabit or visit the Project Site or localities in close proximity to it.

Moreover, it should be taken into consideration that the size of the Project Site is negligible when compared to the vast geographical size of the Eastern Desert, in addition to the fact that the species mentioned above are listed based on their habitat preferences and species distribution maps, and none have been formally recorded from within the Project Site or from areas in close proximity to it. Thus, the probability of their actual occurrence within the Project Site is considerably low and, even if one or more of these species were present onsite, alternative habitats would be readily available, and their avoidance of the Project Site is not likely to cause any significant effect on their population levels.

On the other hand, according to the previous surveys carried out by Ecoda (2018) targeting the entire West Minya Region, complemented by the February 2026 site visit, no threatened plants, herpetofauna or mammals have been recorded. The only threatened species of the area are represented by five migratory birds potentially passing over the Project Site, based on the Ecoda survey and results of the MSBT assessment, as shown in Table 3–13.

Table 3–13: Threatened migratory species potentially passing over the Project Site

English name	Scientific name	IUCN Status
Steppe Eagle	*Aquila nipalensis*	EN
Pallid Harrier	*Circus macrourus*	NT
Montagu's Harrier	*Circus pygargus*	LC (glob.) VU (Med.)
Sooty Falcon	*Falco concolor*	VU (glob.) CR (Med.)
Egyptian Vulture	*Neophron percnopterus*	EN

In terms of the Project Site's value to migratory avifauna, 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 terrestrial habitat and

not “on its own” (IFC, 2023). In the present case, the Project Site does not provide any resources to avifauna “on its own”. Moreover, potentially “attractive” areas to migratory birds, such as reclaimed agricultural lands, have been dismantled. As such, the Project Site and the surrounding desert environment are of no ecological use to migrating avifauna. On the other hand, avifauna might utilize the reclaimed agricultural lands located outside the West Minya Region as fueling and resting stations.

b) Key Biodiversity Areas

The East Minya Region is not located within or near any nationally and/or internationally recognized Protected Area or Key Biodiversity Area. The closest ecologically sensitive area is Wadi El Assiuty Protected Area, located approximately 103 km southeast of the Project Site.

3.2.5 Ecosystem Services

Paragraph 2 of IFC Performance Standard 6 (PS6) defines ecosystem services as the benefits that people, including businesses, derive from ecosystems (IFC, 2012; 2019). Ecosystem services are organized into four types:

(i) Provisioning services, which are the products people obtain from ecosystems such as food, freshwater, timber, fibers and medicinal plants;
(ii) Regulating services, which are the benefits people obtain from the regulation of ecosystem processes such as surface water purification, carbon storage and sequestration, climate regulation and protection from natural hazards;
(iii) Cultural services, which are the nonmaterial benefits people obtain from ecosystems and may include natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment; and
(iv) Supporting services, which are the natural processes that maintain the other services.

a) Provisioning services

Reclaimed agriculture lands were present within the Project Site but have been dismantled. Other reclaimed agricultural areas are located outside the East Minya NREA concession (See **Error! Reference source not found.** in Section 3.3.5).

b) Regulating services

The site’s contribution to ecosystem processes (such as pollination, seed dispersion, etc.) is insignificant, again, due to its barren, species poor nature, particularly in terms of its lack of vegetation cover.

c) Cultural services

The Project Site does not entail any elements that would allow for recreational use, aesthetic enjoyment, and there are no indications of its current or historical use by humans for spiritual or other cultural purposes. This has been confirmed by interviewees during the site visit.

d) Supporting services

The Project Site’s contribution to nutrient cycling processes and primary production are insignificant, given its lack of vegetation cover. Moreover, its contribution is further

limited by the sites hyper-aridity and the Project Site's geographical size compared to vastity of the Eastern Desert.

3.2.6 Critical Habitats

Critical habitat (CH) refers to the most sensitive biodiversity features in a defined area, regardless of whether these habitats are natural or modified. Both EBRD ER6, IFC PS6 and AfDB OS6 have similar criteria for defining critical habitat.

In this respect, a CH is an area with high biodiversity value, which meets at least one of the following criteria (EBRD, 2019):

(i) Highly threatened or unique ecosystems;
(ii) Habitats of significant importance to endangered or critically endangered species;
(iii) Habitats of significant importance to endemic or geographically restricted species;
(iv) Habitats supporting globally significant migratory or congregatory species; or
(v) Areas associated with key evolutionary processes.

The occurrence of the above features does not automatically qualify a habitat as critical, and this is dependent on the proportion of such a CH-triggering species/feature being present in a project area. Numerical thresholds are applied to the first four critical habitat criteria to determine whether any of the species/features are likely to qualify habitats as critical, while there are no numerical thresholds for Criterion V. In this respect, the best available scientific information and expert opinion should be used to guide decision-making with respect to the relative "criticality" of a habitat in these cases.

EBRD ESR6 also considers Priority Biodiversity Features (PBF), which are features that are considered particularly irreplaceable or vulnerable, but at a lower priority level than critical habitats. On the other hand, PBFs are not considered in IFC PS6[5]. PBF includes:

(i) Threatened habitats;
(ii) Vulnerable species;
(iii) Significant biodiversity features identified by a broad set of stakeholders or governments; and
(iv) Ecological structure and functions needed to maintain the viability of priority biodiversity features.

As for CH, PBF criteria III and IV have no predetermined conditions. For these criteria, the assessment must rely on expert judgement.

a) Ecologically Appropriate Area of Analysis

The scale at which a CH determination takes places depends on underlying ecological processes for the habitat in question and is not limited to the Project Site boundaries or its Area of Influence (AoI).

EBRD Guidance Note (EBRD, 2023) mentions that the study area may need to be expanded to fully encompass the Ecologically Appropriate Area of Analysis (EAAA) for features that

[5] Other items and requirements included in both EBRD ESR6 and IFC PS6, including Biodiversity Conservation, Protected Areas, Invasive Alien Species, Sustainable Management of Living Natural Resources and Supply Chains, are highly similar.

require additional focused study. In most cases, that will mean the landscape-level distribution of the feature requiring study, again considering the ecological patterns, processes and functions that are necessary to maintain it. The EAAA should consider the distribution and connectivity of such features in the landscape and the ecological processes that support them.

In addition, Paragraph 59 of IFC Guidance Note (IFC, 2019) states *"the project should identify an ecologically appropriate area of analysis to determine the presence of critical habitat for each species with regular occurrence in the project's area of influence, or ecosystem, covered by Criteria 1-4. The client should define the boundaries of this area taking into account the distribution of species or ecosystems (within and sometimes extending beyond the project's area of influence) and the ecological patterns, processes, features, and functions that are necessary for maintaining them"*.

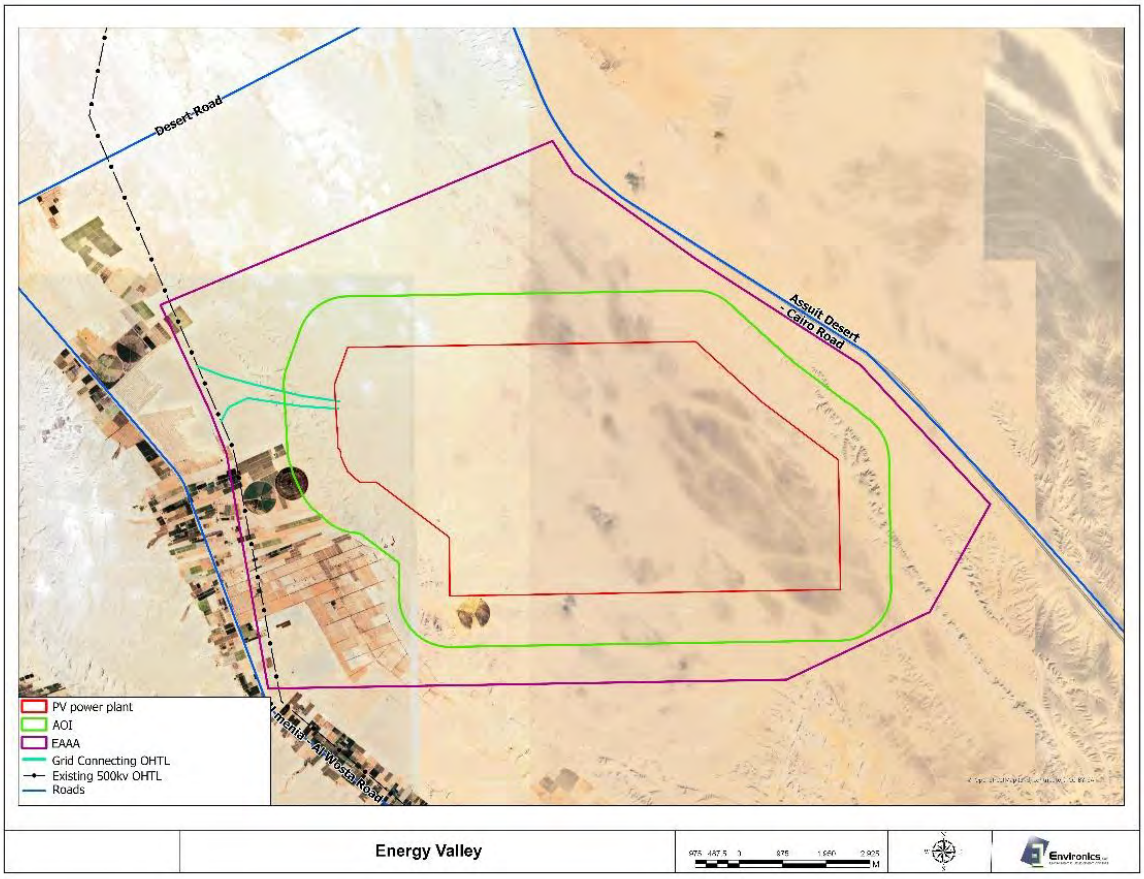


Figure 3–22: EAAA of the East Minya PV

b) Results of the Screening Exercise

Potential PBF- and CH-triggering species/features have been screened against the PBF/CH criteria and thresholds.

- **Identification of potential Priority Biodiversity Features**

  The species/features of the EAAA do not meet any of the PBF criteria except for Criterion ii (VU species). The thresholds for this criterion are as follows:

- EAAA supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species;
- EAAA supports VU species; and
- EAAA for regularly occurring nationally or regionally listed EN or CR species

The thresholds for this criterion also consider CR and EN species, although the criterion mentions VU species only. These thresholds are less stringent than those applied to qualify an area as CH. In this respect, in addition to VU species, CR and EN species have also been screened against the PBF thresholds for Criterion ii.

Accordingly, the following threatened species (VU, EN and CR) have been identified as PBFs:
- Steppe Eagle (*Aquila nipalensis*), EN (globally);
- Montagu's Harrier (*Circus pygargus*); VU (Mediterranean);
- Sooty Falcon (*Falco concolor*), VU (globally) CR (Mediterranean); and
- Egyptian Vulture (*Neophron percnopterus*); EN (globally).

All identified PBFs are migratory birds that could occur under specific circumstances. In this respect, although the EAAA cannot be considered to "support" these species, there is a possibility of their occurrence in the area and are herein considered PBFs using a precautionary approach.

- **Identification of potential CH triggering species and/or features**

Based on their compliance with the definition of each criterion, potential CH triggering species and/or features present or potentially present within the project wider area have been identified, as follows:

Criterion 1: Highly Threatened and/or Unique Ecosystems

The area ecosystems do not meet the definition of Highly Threatened and/or Unique Ecosystems stated in IFC GN6 (IFC, 2019).

Criterion 2: Critically Endangered and/or Endangered Species

CR species
- Sooty Falcon (*Falco concolor*), CR at the Mediterranean level.

EN species
- Egyptian Vulture (*Neophron percnopterus*), EN at the global level; and
- Steppe Eagle (*Aquila nipalensis*), EN at the global level.

Criterion 3: Endemic and/or Restricted-range Species

None present.

Criterion 4: Migratory and/or Congregatory Species

During a previous bird survey, migratory birds have been recorded flying over the project area and surroundings (see Table 3–9 and Table 3–10).

Criterion 5: Key Evolutionary Processes

None of the features mentioned in IFC GN6 (IFC, 2019) apply to the area and, therefore, the area is not deemed of particular importance for key evolutionary processes.

The species/features of the EAAA meet the CH criteria for Criteria 2 and 4. Therefore, the identified potential CH triggering species have been screened against the thresholds for CH Criteria 2 and 4.

Thresholds for Criterion 2:

(a) EAAA supports ≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species;
(b) EAAA supports globally significant population of VU species necessary to prevent a change of IUCN Red List status to EN or CR, and satisfies threshold (a); and
(c) EAAA for important concentrations of a nationally or regionally listed EN or CR species.

Thresholds for Criterion 4:

(a) EAAA sustains, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population at any point of the species' lifecycle; and
(b) EAAA predictably supports ≥10 percent of global population during periods of environmental stress.

Results of the CH screening exercise indicate that none of thresholds of CH criteria apply to the biodiversity and/or features of the project area and surroundings. The EAAA neither supports globally important concentrations of these species nor nationally/regionally important concentrations qualifying the area to meet the thresholds for Critical Habitat. Therefore, the project area and surroundings do not qualify as critical habitat.

Results of the CH screening process are presented in Table 3–14.

Table 3–14: Screening of CH triggering species and features potentially present within the East Minya Region

Species/Features	Rationale	Qualifies the area as CH (Yes/No)
CRITERION 1 – HIGHLY THREATENED OR UNIQUE ECOSYSTEMS		
None present	The habitats within the project's EAAA are found in the Western Desert across a large expanse of Egypt and beyond within the Saharan desert eco-region.	No
CRITERION 2 – CRITICALLY ENDANGERED AND ENDANGERED SPECIES		
Egyptian Vulture (*Neophron percnopterus*) - IUCN global status: EN	A very preliminary estimate of the global population size is 18,000-57,000 individuals, roughly equivalent to 12,000-38,000 mature individuals, although further validation of this estimate is needed. Global population estimates for the species are crude, but 3,000-4,700 pairs are estimated in Europe (equating to 6,000-9,400 mature individuals), forming 25-49% of the total species' population, and perhaps 1,000-2,000 pairs in Africa (BirdLife International, 2019). The species has been recorded in the project area by Ecoda (2018), but only seven individuals were recorded in autumn 2016. Therefore, the presence of small numbers as passage migrants does not qualify the animal to meet the thresholds for Critical Habitat.	No
Steppe Eagle (*Aquila nipalensis*) - IUCN global status: EN	According to BirdLife international (2021), combined totals from across the whole range estimate the number of pairs at 31,372 (26,014-36,731), which equates to 62,744 (52,028-73,462) mature individuals or 94,116 (78,042-110,193) individuals (I. Karyakin in litt. 2015). The global population is hence below 37,000 pairs (Karyakin et al. 2016). Regular wintering or passage populations in Egypt are concentrated along the Gulf of Suez migration corridor. Tharwat (1997) indicates the species as "common passer and rare winter visitor" and occurring in the Eastern Desert and Sinai. Ecoda (2018) recorded 42 individuals in the area in autumn 2016. However, the recorded number does not qualify the bird to meet the thresholds for Critical Habitat.	No
Sooty Falcon (*Falco concolor*) - IUCN Mediterranean Status: CR	The global population is estimated at 2,800-4,000 mature individuals. Ecoda (2018) recorded 11 individuals passing over the area in autumn 2016. Therefore, this number does not qualify the animal to meet the thresholds for Critical Habitat.	No
CRITERION 3 – ENDEMIC/RESTRICTED RANGE SPECIES		
None present	No endemic or restricted range species are known to occur within the project's EAAA.	No
CRITERION 4 – MIGRATORY/CONGREGATORY SPECIES		
Migratory birds	A number of migratory birds flying over the area have been recorded. On the other hand, the numbers recorded by Ecoda (2018) indicate that none of the migratory birds occur in such numbers and/or concentrations able to qualify the EAAA as CH Moreover, the West Nile Region sensitivity is classified as "potential, score: 0.000", indicating that the region has a very low sensitivity to soaring migratory birds.	No
CRITERION 5 – KEY EVOLUTIONARY PROCESSES		
None present	This part of the Western Desert does not support features and has no structural attributes deemed of particular importance for key evolutionary processes.	No

3.3 Socio-economic Baseline

This section describes the socio-economic baseline and demographic characteristics of the Project Site's wider area, focusing, as possible, on the closest and most accessible areas to the Project Site. In this respect, the socio-economic baseline information is mainly provided at the governorate level, unless otherwise indicated.

This baseline information includes general information on the labor force, population, transportation and health infrastructure, sewage disposal and treatment facility availability, and potable water supply sources in the Project Site's wider area. The cultural heritage of the wider area is also briefly summarized. Furthermore, land use types within the Project Site and its immediate vicinity are also described.

The majority of the information described below is derived from secondary sources including the Center for Documentation of Cultural and Natural Heritage (CULTNAT), the Central Agency for Public Mobilization and Statistics (CAPMAS), the official media and public relations apparatus of the Egyptian state and the official Minya Governorate website. However, two primary sources of data were also used to compile information on the nearest inhabited areas to the Project Site; the first being data acquired during consultation meetings with the project's stakeholders, and the second being data obtained during site visits.

Additional contextual information was derived from primary sources, including a site visit and stakeholder consultations conducted during the period 15-16 February 2026.

3.3.1 Governorate Background and Administrative Divisions

The proposed project is located in the Eastern Desert of Minya Governorate, about 50 km from Minya city. The total area of Minya Governorate covers 32,279 km2, representing about 3.22% of Egypt. The populated area is around 5,293.88 km2, representing 16.4% of the total governorate area. The governorate is divided administratively and encompasses nine administrative centers (Markaz, plural Marakez), nine cities, 61 rural local units, 360 villages and 1,715 hamlets (Kafr) and settlements (Nagaa). The nine Marakez of Minya Governorate are: Al Adwah, Maghagha, Bani Mazar, Matay, Samalut, El-Minya, Abu Qurqas, Mallawi and Deir Mawas.

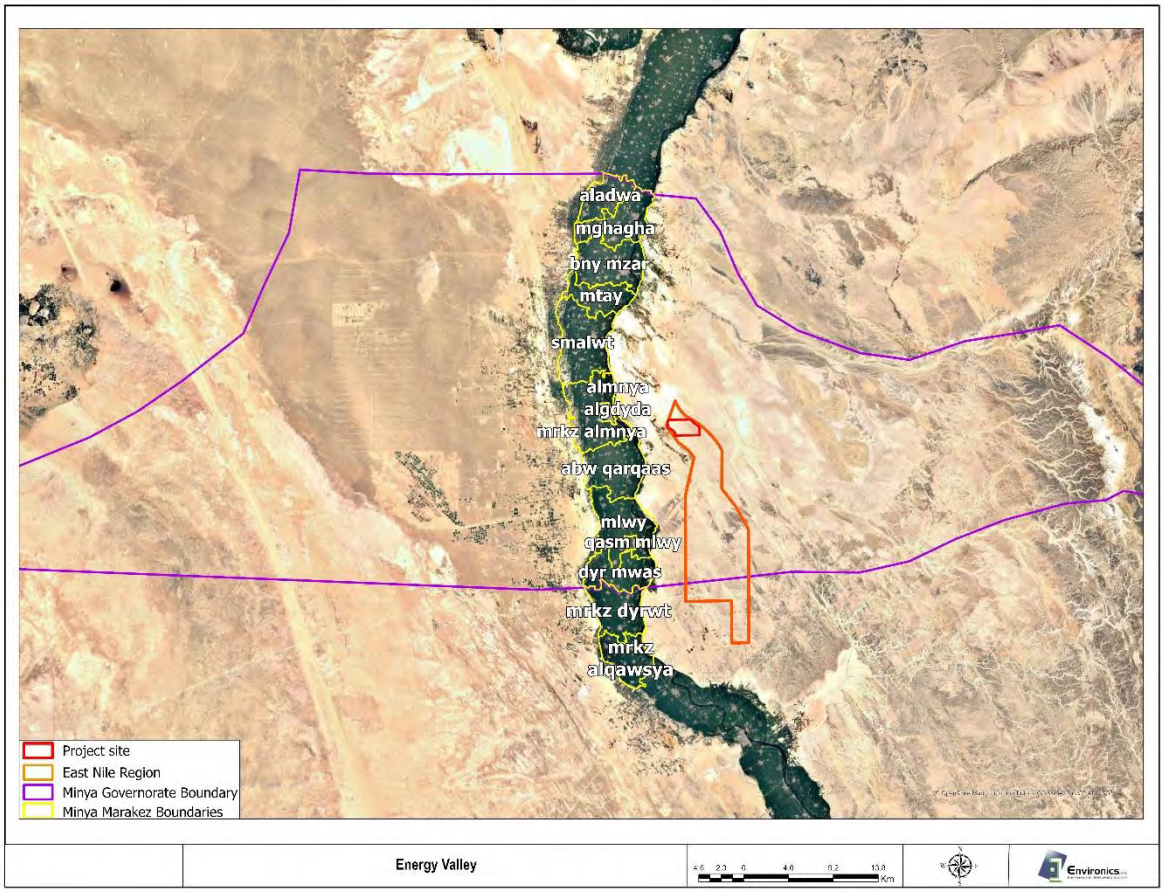


Figure 3–23: Minya Governorate borders and administrative centers in relation to the East Minya Region and the Project Site

The site is affiliated to Markaz El Minya. New Minya City is the closest settlement to the project, located at a distance of about 11.5 km.

3.3.2 Population

The population of Minya Governorate has grown significantly since the 2017 census. As of 2025[6], the governorate boasted an estimated 6,511,377 inhabitants, up from 5,497,095 in 2017[7]—a rise of approximately 18.5% over six years. The governorate covers approximately 32,279 km², yielding an average density of 202 people per km² FOR 2025. Rural residency continues to dominate: an estimated 81% of Minya's population lives in rural areas, compared to Egypt's national average of 57%.

The East Minya Region lacks any existing settlements, with human habitation predominantly clustered around the Nile Valley and its surrounding areas. The nearest residential settlement is New Minya City situated at distance of approximately 11.5 km west of the Project Site.

[6] Central Agency for Public Mobilization and Statistics (CAPMAS). Annual Statistical Yearbook of the Arab Republic of Egypt, 2025.

[7] Central Agency for Public Mobilization and Statistics (CAPMAS). *Population Census of the Arab Republic of Egypt, 2017.*

a) Urban/Rural Distribution

Table 3–15 provides an estimate of the urban/rural distribution in Minya Governorate. Urban/rural percentages are based on CAPMAS estimates for Minya Governorate as of 2023.

Table 3–15: Estimated urban/rural distribution

Area Type	Approximate %	Estimated Population
Urban	19%	1,226,239
Rural	81%	5,227,653

Source: CAPMAS (2023a)

b) Population by Gender

The gender ratio is approximately 103.6 males per 100 females. The population distribution by gender and residence is shown in Table 3–16.

Table 3–16: Population distribution by gender and residence in Minya Governorate

Residence	Male	Female	Total
Rural	2,625,418	2,458,160	5,083,578
Urban	608,031	587,426	1,195,457
Governorate Total	3,233,449	3,045,586	6,279,035

Source: CAPMAS (2023a)

c) Age Structure

Table 3–17 shows the age structure in Minya Governorate. Percentages are based on national totals; actual Minya distribution is assumed as proportional.

Table 3–17: Age structure in Minya Governorate

Age Group	Male	Female	Total	% of Total
0–4	417,107	392,404	809,511	14.7%
5-14	639,729	294,258	1,233,987	22.4%
15-44	1,299,503	1,228,344	2,527,847	46.0%
45-59	355,502	280,434	582,160	10.6%
+60	176,883	166,707	343,590	6.3%
TOTAL	**2,888,724**	**2,362,147**	**5,497,095**	**100%**

Source: CAPMAS (2024). Population Age Census 2017

d) Households

There are no settlements within the West Minya Region, with human habitations predominantly clustered around the Nile Valley and its surrounding areas. The estimated households present in urban and rural areas are shown in Table 3–18.

Table 3–18: Estimated households in Minya Governorate

Residence	Population	Estimated Households	% of Total Households
Rural	5,083,578	1,058,544	80%
Urban	1,195,457	253,508	20%
Total	6,279,035	1,312,052	100%

Source: CAPMAS (2023a)

3.3.3 Education

Minya Governorate mirrors national educational patterns in Egypt, with high enrolment at the primary level but a notable drop at secondary and tertiary stages. As of the 2022–2023 academic year, approximately 28 million students were enrolled in pre-university education across Egypt (CAPMAS, 2023b). While governorate-specific breakdowns are limited, Minya's rural majority – over 80% of its population – suggests its education profile reflects the challenges of rural access and infrastructure (CAPMAS, 2017).

Illiteracy rate among those over 10 years reached 37% in Minya in 2017, which is higher than the national average of 25%. Illiteracy rate among females is (45%) higher than males (29%) in the governorate (CAPMAS, 2017).

Some children drop out of school as sometimes low-income families encourage their children to work for extra income. Table 3–19 shows the number and percentage of the labor force in Minya Governorate.

Table 3–19: Number and percentage of the labor force (10 years & above) by education status and gender in Minya Governorate, 2016

Gender	Illiterate	Read & write	Below intermediate	Intermediate	Above intermediate	University degree	Above university degree	Total
Males	2938	1458	1534	141	4398	468	1343	12218
Females	1576	333	412	45	1321	86	715	4489
total	4554	1792	1947	186	5718	553	6958	16707
Total (%)	27.3	10.7	11.6	1.1	34.2	3.3	11.7	

Source: CAPMAS (2016b)

Table 3–20 below shows the number of different secondary education schools.

Table 3–20: Secondary education types across the governorate by number and sex of students for 2015/2016

#		General secondary education	Industrial secondary education	Business Secondary education	Hotel secondary education	Agricultural secondary education
Number of schools		105	45	16	2	90
Number of Students	Males	29235	39441	9173	401	2612
	Females	22662	27159	27890	128	0

Source: CAPMAS (2018)

Minya Governorate includes primary, preparatory, and secondary education schools. The number of schools in the governorate reached 3,005 in 2016/2017, totaling up to 28,250 classes. Despite this growth, Minya's Gross Enrolment Ratio (GER) for general secondary education was historically low at 13%, far below the national average of 36% and Cairo's 43.7% (World Bank, 2011).

The low GER is closely tied to poverty and gender disparities. In Upper Egypt, poverty rates exceed 54% (UNDP, 2011). This has direct implications on retention, especially for girls in rural households, who often leave school due to financial constraints and sociocultural pressures (Save the Children, 2020). Overcrowded classrooms, underpaid teachers, and infrastructure gaps further strain education quality (Ministry of Education, 2022).

Efforts to bridge the gap include initiatives like the USAID-supported Technology for Improved Learning Outcomes (TILO) program, which introduced digital learning tools in 44 schools across Minya's Beni Mazar and Matay districts (USAID, 2022).

There is also one public and two private universities in Minya.

Minya University (Public Unversity) remains the governorate's central higher education institution, enrolling approximately 57,930 students in 2019 (Minya University, 2019). The recent Lotus University, inaugurated in 2019, has introduced additional faculties to increase access to higher education, alongside the establishment of Deraya University, which has further diversified academic offerings in the governorate.

The 2023–2024 Citizen Investment Plan earmarked EGP 362 million (8% of the total) to pre-university education and EGP 736 million (16%) to higher education infrastructure (Ministry of Planning and Economic Development, 2023a).

3.3.4 Economy and Employment

Minya's employment landscape is shaped by structural constraints typical of Upper Egypt. According to the latest available statistics, Egypt's national unemployment rate reached 7.1% in 2023 (CAPMAS, 2023c), with higher rates among women and youth. Regional data suggests Minya's rate may exceed 10%, particularly for young graduates and female job seekers (World Bank, 2022a).

Employment in Minya remains predominantly informal and agricultural. Nationally, 25% of Egypt's workforce is engaged in agriculture; this figure is likely higher in Minya due to its rural dominance (CAPMAS, 2022). Female labor force participation remains low (≈15% nationally), and lower still in conservative, rural regions like Minya (UN Women, 2021).

The informal economy is driven by agriculture, construction, retail, and family-owned trades. Public sector jobs continue to dominate formal employment, particularly in education and healthcare. To address underemployment and skills gaps, programs like the World Bank's Upper Egypt Local Development Program (UELDP) support entrepreneurship and vocational training (World Bank, 2022b).

In the 2023–2024 Investment Plan, EGP 445 million was allocated for industrial and employment infrastructure, with a focus on youth and women (Ministry of Planning and Economic Development, 2023b).

On the other hand, although Minya is mainly an agriculture-oriented governorate, various industrial activities have been established, particularly in food processing, spinning and textile, and chemical industries.

a) Key Economic Sectors

- **Agriculture**

  Agriculture is considered the main economic activity in the governorate of Minya. It is known for cultivating cotton, onions, wheat, maize, clover and sugar cane. Clover and wheat are the most important crops, representing 80% of the total winter crops.

Maize is the main summer crop, representing 67% of the summer crops' cultivations (Information & Decision Support Center, 2014). Moreover, Minya represents one of the top four major producers of sugar cane (El-Sharif et al., 2009). In 2016, the agriculture sector employed about 32% of the labor force in the governorate (CAPMAS, 2016b). Large parts of desert land around the Project Site have been reclaimed for agriculture, relying on groundwater resources for irrigation.

- **Mining and Mineral Industries**
  - Calcium Carbonate: The region is the heart of Egypt's calcium carbonate production, offering some of the purest limestone worldwide, used in plastics, rubber, paper, and paints.
  - Other Minerals: The governorate also mines and processes talc powder, dolomite, silica sand, and kaolin.

- **Manufacturing and Industrial Zones**
  - Textiles and Garments: Minya is becoming a major center for spinning, weaving, and ready-made clothing. A new dedicated textile city is under development in Minya as part of a $3 billion investment project to establish integrated textile hubs in Upper Egypt**.**
  - Food and Beverage: A significant portion of light manufacturing consists of food processing.
  - Manufacturing Facilities: The Industrial Zones in Minya (like Matahra) focus on manufacturing industries, including chemicals, pharmaceuticals, marble, and building materials**.**

- **Transportation:**
  Due to its central location, Minya serves as a logistics hub with road connections to both the Mediterranean and Red Sea ports.

- **Renewable Energy**
  The East Minya Region has been entirely allocated by NREA for solar and wind farm development projects. The present PV project is included within the NREA concession. Another large NREA concession (the West Minya Region) is located west of the Nile, in the Western Desert. Given the large extension of these concessions, renewable energy projects are expected to strongly contribute to the economic development of the governorate in the near future.

b) Main Occupations

The total labor force was 1,670,700 in 2016; those employed were 1,475,800 while 194,900 were unemployed. This unemployment rate of 11.6% is relatively lower than the national rate of 12.5% according to CAPMAS. The rate of unemployed males in Minya Governorate is 44.54% of the total unemployed persons (CAPMAS, 2017; 2016b). Table 3–21 shows the age structure of the unemployed people in Minya.

Table 3–21: Age structure of the unemployed persons (10 years & above) in Minya Governorate (hundreds) in 2016

Gender	Up to -15	-20-24	-25-29	-30-34	-40-44	-50-54	60-64	Total
Males	154	509	98	65	28	12	2	868
Females	215	371	212	242	33	6	0	1081
Total	369	881	310	308	61	18	2	1949
Total (%)	18.9	45.2	15.9	15.8	3.1	0.9	0.1	100

Source: CAPMAS (2017)

Table 3–22 presents the education level of unemployed people across the governorate. It shows that more than half of the unemployed people are of intermediate technical education and 20% are university graduates, implying a negative relationship between the level of education and employment. This might be related to the fact that the governorate is mostly rural and relies on agricultural activities, which may not be providing opportunities to people with other types of higher education.

Table 3–22: Education level of unemployed persons (10 years & above) in Minya Governorate (hundreds) in 2016

Gender	Illiterate	Read & write	Below intermediate	Intermediate	Intermediate technical	Above intermediate (technical but precollege)	University degree & above	Total
Males	66	20	88	40	441	21	194	868
Males (%)	3.386352	1.0261673	4.515136	2.0523345	22.626988	1.0774756	9.9538225	
Females	182	37	25	4	595	22	215	1081
Females (%)	9.3381221	1.8984094	1.2827091	0.2052335	30.528476	1.128784	11.031298	
Total	247	57	114	44	1036	43	409	1949
Total (%)	12.7	2.9	5.8	2.3	53.2	2.2	21	100

Source: CAPMAS (2016b)

Table 3–23 presents the main characteristics of Minya Governorate's labor market.

Table 3–23: Main characteristics of the labor market in Minya Governorate in 2016

Item	Value
Total labor force (thousand persons)	16707
Number of employed persons (thousand persons)	14759
Number of unemployed persons (thousand persons)	1949
Labor force (% of population)	30
Rate of unemployment (%)	11.6
Females (% of work force)	29
Unemployment rate of higher education graduates (%)	21
Unemployment rate of intermediate and above intermediate education graduates (%)	57.7

Source: CAPMAS (2016b)

c) Labor force engagement in economic activities and women participation in the workforce

As previously mentioned, agriculture is the main economic activity and employs a considerable portion of the labor force (about 44%). Agriculture also represents the highest portion of female employment. Table 3–24 presents the distribution of employment in Minya in different economic activities.

Table 3–24: Distribution of labor force in economic activities by sex (hundreds) in Minya in 2016

Labor force	Agriculture & Fishing	Mining & Quarrying	Manufacturing	Electricity	Water services
Male	4749	89	587	48	146
Female	1864	0	87	3	5
Total	6613	89	674	51	151
Labor force	**Construction & Building**	**Trade, retail, wholesale & repair**	**Transportation & Storage**	**Hotel & restaurants**	**Communication**
Male	1500	1035	729	262	27
Female	20	327	0	17	4
Total	1520	1362	729	279	31
Labor force	**Finance & insurance**	**Real estate**	**Scientific & technical specialties**	**Administrative**	**Social services**
Male	50	13	72	43	771
Female	4	0	18	2	211
Total	54	13	90	45	982
Labor force	**Education**	**Health**	**Arts & Culture**	**Other services**	**Domestic for other families**
Male	747	165	25	228	64
Female	506	128	8	24	181
Total	1253	293	33	252	245

Source: CAPMAS (2016b)

Minya has a low female participation rate in the governorate's labor market of 29%. Moreover, they are underpaid where the Gender Pay Gap (GPG) is equal to 44.5% in favor of males which is considered the highest across Egypt (IARIW & CAPMAS, 2015).

d) Child labor

Poor families tend to have their children work to gain extra income. Exact figures are not available as surveys are not conducted in that matter, which will still be deceiving due to its illegal nature. Although there are many laws that regulate child labor under certain conditions, specifying ages and standards, agricultural children's workers are not addressed within the national labor laws (Sekeeker, 2008).

3.3.5 Land Uses

A number of private reclaimed agricultural areas are located less than 1 km to the west of Project Site, outside the NREA East Minya concession. No interaction or overlap will take place between these activities and the project. Moreover, a number of former agricultural activities were within parts of the proposed Project Site. At the time of the site visit, these activities were in the process of being dismantled following land clearance actions undertaken by the Governorate.

During the site visit, a number of agricultural farms operators met while dismantling their infrastructure to evacuate their lands. Discussions indicated that since January 2025, the governorate has been notifying and warning farmers to evacuate the lands, while some farmers claimed that no warnings took place by the governorate before undertaking the evacuation campaigns. As indicated by the interviewed farmers, the majority of them came from other governorates, such as Gharbeya and Beheira governorates.

The farmers advised that they had submitted applications to the governorate regarding acquiring the lands area for agricultural activities, however, they received no feedback on their applications, thus they assumed that the applications were accepted and moved forward with their projects. They have also applied to the Egyptian Electricity Transmission company and got connected to the electricity grid and they pay monthly electricity bills. This provided support to their assumption.

Farm operators also mentioned that the governorate did not hold any meetings with them to discuss compensation or land replacement options.
Further clarification regarding the land status and the applicability of involuntary resettlement requirements is provided in Annex 1 and summarized below;

I. Applicability of IFC PS5, EBRD ESR5, and AfDB OS5

The Project site is identified to be part of a government-designated renewable energy development area prior to the reported agricultural use, and the available evidence indicates that agricultural activities commenced after the applicable cut-off date for that purpose.

Based on the findings of the land status review, the Project Site was unoccupied at the applicable cut-off date. Therefore, no persons with recognizable rights or claims to the land were present at the time the area was legally designated for renewable energy development. Consequently, IFC PS5, EBRD ESR5, and AfDB OS5 is not considered applicable.

II. The Cut-off Date

1. The project site is part of the East Nile concession allocated to NREA via a presidential Decree (116 for 2016) on 23 March 2016 amended by the presidential Decree (126 for 2022).
2. Presidential Decrees are published in the official Journal (the Egyptian Gazette)
3. Moreover, a quick media review reveals that the Presidential Decrees and the allocation of land for renewable energy development were widely disseminated through multiple channels, including:
    a. Elmasdar on 27 March 2016 قرار جمهوري بتخصيص أراضي لإقامة مشروعات توليد الكهرباء من الرياح
    b. El Watan on 22 October 2017 قرار جمهوري بتخصيص بعض أراضي الدولة لإنتاج الطاقة المتجددة - الوطن
    c. Ministry of Electricity and Renewable Energy on 9 January 2020 الأخبار - هيئة الطاقة الجديدة والمتجددة
    d. Albawabh news on 14 April 2022 https://www.albawabhnews.com/4561160
    e. Shorouk news on 14 April 2022 https://www.shorouknews.com/news/view.aspx?cdate=14042022&id=eb92c6b2-cb5b-4c8c-a776-c694a40f4232
    f. Egyptian Laws on 14 April 2022 https://egyptianlaws.com/?p=159496
    g. Instagram on14 April 2022 https://www.instagram.com/p/CcU3P7No9aw/
    h. Among many other publications

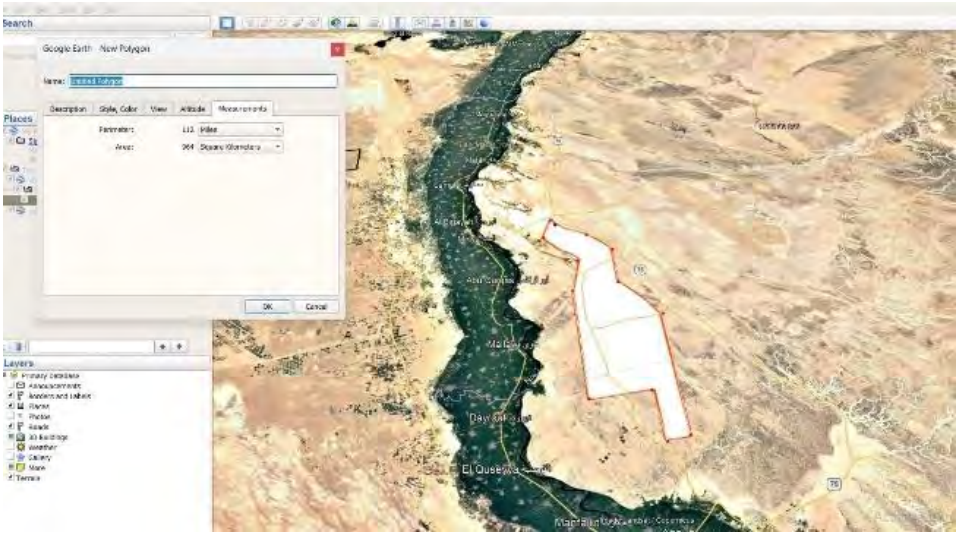
4. In addition, the East Nile concession was subject to a Strategic Environmental and Social Assessment (SESA) in 2018 supported by EBRD, which:
    a. Identified the area as a designated renewable energy development zone for NREA.
    b. Included stakeholder consultations in Minya Governorate.
    c. Publicly disclosed the intended land use for renewable energy projects.

    This demonstrates that the allocation and intended use of the land were widely communicated and known to relevant stakeholders well before any recent informal occupation.

    EBRD website: Egypt: Strategic Environmental and Social Assessment of Renewable Energy Projects in the East Nile Area | We invest in changing lives

As per the Environmental and Social Requirement 5: Land acquisition, restrictions on land use and involuntary resettlement EBRD Guidance Note of December 2025, "the cut-off date as defined by ESR 5, paragraphs 28-29, is usually established by a legal act taken by the government, such as a declaration of public interest (or in some jurisdictions by a specific decree or order taken in application of the declaration of public interest).

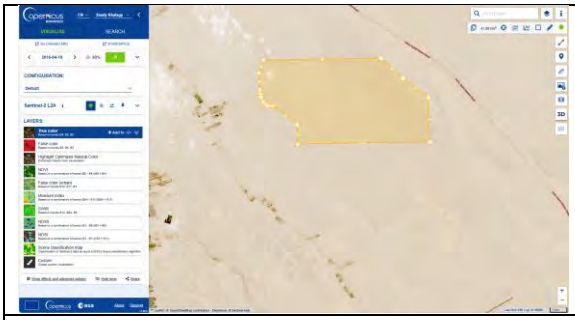
Based on the Presidential Decree No. 116 of 2016 allocating the area for renewable energy development, March 2016 is considered the applicable cut-off date for the purpose of assessing the eligibility of land users under IFC PS5 and EBRD PR5.



III. **Land Occupancy at the Cut-off Date** The project site is part of the broader East Nile renewable energy concession, as defined in the Presidential Decree, representing approximately 4% of the overall designated area.

A. The proposed project location within the NREA East Minya concession was completely empty back in 2016. Available satellite imagery indicates that agricultural activities within the Project footprint first became visible during 2023–2024 as shown below.
B. In 2022, Presidential Decree 126 for 2022 was issued. Decree 126 slightly modified the east Minya concession area. The modified area still includes the proposed

project location and avoids small locations that were utilized by farmers in the western part of the old concession.



April 2016

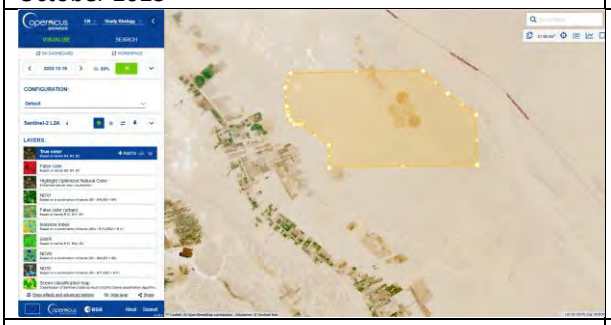
April 2018

April 2020

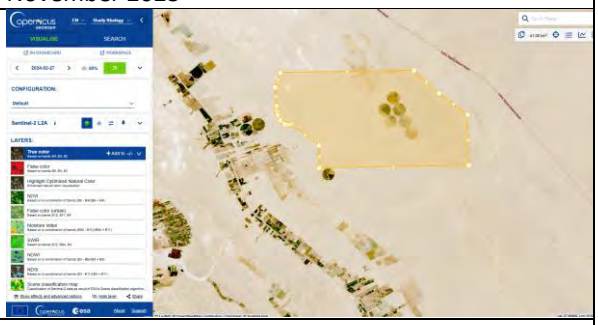
April 2022

October 2023

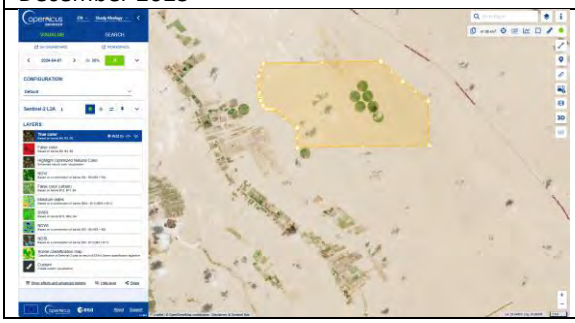
November 2023

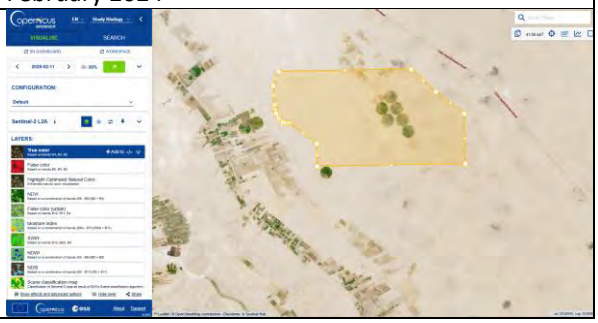


December 2023



February 2024





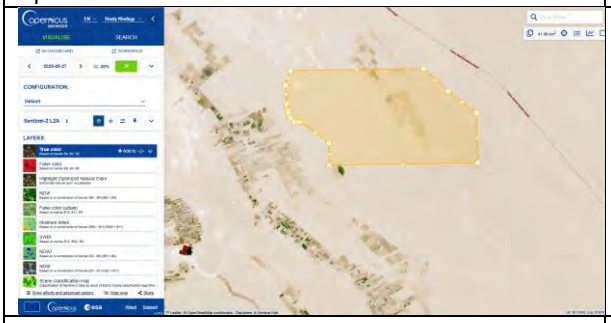
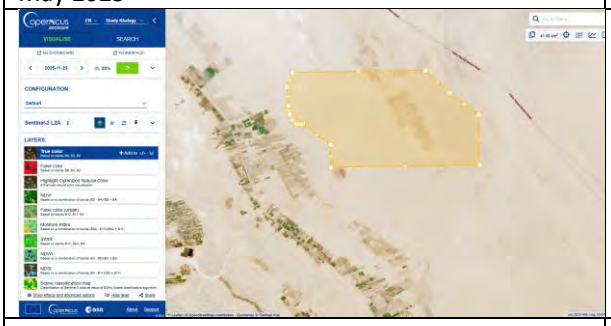
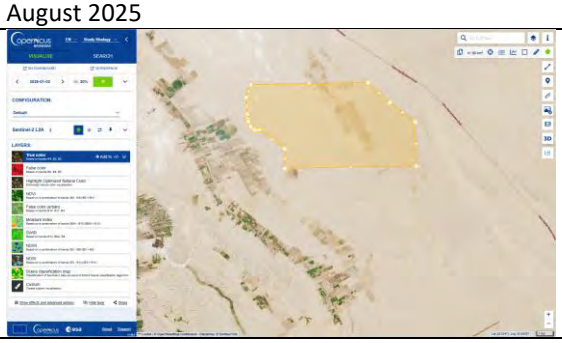
April 2024	February 2025
	
May 2025	**August 2025**
	
November 2025	**Jan 2026**

Figure demonstrating the modification of the NREA concession area from Decree 116/2016 (to the left) and Decree 126/2022 (to the right), both including the proposed project location

Second: Reasons related to the expropriation process

1. The land clearance process took place before handing the location to Scatec
2. This was part of a wider Governorate programme, which was clearly announced and covered on the Minya Governorate official site (Portal News - main page), as well as Facebook posts (محافظة المنيا - محافظ المنيا يعلن انطلاق اليوم السبت... | Facebook). The programme covered the NREA concession and several other locations in Minya Governorate.
3. The land was formally handed over to Scatec as vacant land.
4. The Project recognizes that the government-led clearance process was not implemented as a PS5/PR5/OS5-compliant resettlement process. However, current evidence indicates that the agricultural users entered the land after the 2016 legal designation of the area for renewable energy development and therefore are not expected to be eligible for compensation under IFC PS5/EBRD ESR5/AfDB SO5 on the basis that all users

Consequently, no physical or economic displacement of persons with recognizable land rights or claims has been identified, and the requirements related to involuntary resettlement are therefore not considered applicable to the Project.

3.3.6 Infrastructure, Utilities and Services

The Project Site currently lacks direct access roads but is easily accessible given the relatively flat nature of the ground, the absence of soft sands and the presence of some tracks. The nearest roads are the Cairo – Aswan Eastern Desert Road and the Cairo – Assiut Road. Both roads are wide and in good condition.

The Cairo-Assiut Road is located approximately 1.4 km east of the Project Site, while the Cairo – Aswan Eastern Desert Road, it is located about 4.4 km to the west of the Project Site. This road intersects several crossroads, including the Abu Qurqas Desert Road, Mallawi Eastern Desert Road, and El Sheikh Fadl-Ras Ghareb Road.

In terms of essential services, the Project Site does not have access to communication, natural gas, water network, or a sewerage network. These services are available in the nearby residential areas. Furthermore, a transmission line runs approximately 2 km west of the Project Site.

a) Energy Supply

Concerning power supply, the nearest power substation is New Al-Minya substation located in New Al-Minya City, situated approximately 9.7 km from the Project Site.

b) Potable Water Supply

Table 3–25 shows the production and consumption rates of potable water across the governorate as well as the number of water stations.

Table 3–25: Total potable water stations, sources, production and consumption in Minya (1000 m^3/day) in 2015/2016

Number of stations		Total quantity of water produced (million m^3)		Total water produced	Total water consumed
Surface water	Groundwater	Surface water	Groundwater		
80	119	228.5	59.2	287.7	186.7

Source: CAPMAS (2016c)

c) Sewage Disposal and Wastewater Treatment

About 25% of the population living in Minya has access to sewage systems, while 13% have no access to any kind of sanitation. The rest of the governorate mainly depends on open-bottom tanks or septic tanks to dispose of sanitary waste (General Authority for Urban Planning, 2017).

d) Solid Waste

Minya Governorate is implementing several municipal waste management projects. Three sanitary landfills are currently under construction in the districts of Tuna El-Gabal and Al-Adwa (Egyptian Cabinet Presidency website, 2025). In addition, discussions with the New Menia Urban Authority indicated that there exist two waste dumpsites for solid and construction wastes within New Menia area.

Moreover, a contract has been recently signed with a private sector company for the management and operation of a municipal waste recycling plant in the Al-Adwa district, with a minimum processing capacity of 150 tons per day (Egyptian Cabinet Presidency website, 2025).

e) Health Infrastructure

There are five governmental hospitals and six private hospitals in Markaz El Minya (Minya Governorate Information Center, 2025).

Table 3–26: Types of hospitals in Markaz El Minya

Hospital name	Type	Address	Number of beds	Specialization
Minya General Hospital	Governmental	Ibn Khassib Street, Minya	0	External clinics only
Misr El Horra Hospital	Governmental	Misr – Aswan Agricultural Road, in front of the Old Mansoura Bridge	67	General
Minya Chest Hospital	Governmental	Misr – Aswan Agricultural Road, Western District, Minya	82	Chest
Minya Ophthalmology Hospital	Governmental	Saad Zaghloul Street, Minya	25	Ophthalmology
Minya Fever Hospital	Governmental	Hommeyat Square, Minya	87	Infectious diseases
Sharia Society Hospital	Private	Abu Hilal, Minya	41	All specializations
Omar Ibn El Khattab Hospital	Private	Abu Hilal, Minya	40	All specializations
Horus Hospital	Private	Wabour El Nour Street, Minya	15	Ophthalmology
Abu El Seoud Hospital	Private	Al Shorafaa Village, Minya	54	All specializations
Minya National Hospital	Private	Saad Zaghloul Street, Minya	42	All specializations
Dar Al Hilal Hospital	Private	Tahnasha Village, Minya	42	All specializations

Source: Minya Governorate Information Center (2025)

f) Transportation Infrastructure

The transportation network available within Minya Governorate includes 1,828 km of main paved roads and 565 km of unpaved ones. The project is located about 109 km northeast of Assiut International Airport.

A number of roads run close to the East Minya Region and the Project Site. The nearest road to the Project Site is Cairo-Assiut Road, located approximately 1.4 km east of the Project Site.

Figure 3–24: Road network of the Project Area

3.3.7 Archeology and Cultural Heritage

Minya Governorate is rich in historical heritage, with 39 recorded archaeological sites. According to the Archaeological Atlas issued by the Geographical Information Center of the Supreme Council of Antiquities, there are neither known nor indications of the potential presence archaeological sites within the East Minya Region. The nearest archaeological sites are Beni Hassan Rock-Cut Tombs and Tal El Amarna site located respectively at 14 and 41.5 km southwest of the Energy Valley PV project, along the River Nile's eastern bank (Kwok and Peters, 2020). Moreover, the 2018 SESA for the NREA East Minya concession did not identify any known archaeological, historical or cultural heritage sites within the concession area or within a surrounding buffer of more than 5 km from its boundaries.

- **Beni Hassan: Historical Rock-Cut Tombs**
  It is situated south of El Minya and features a cluster of significant rock-cut tombs from Dynasties XI and XII. These tombs are intricately carved into the elevated limestone cliffs on the river's eastern side. Access requires ascending a steep flight of stone steps, offering panoramic views of the river valley.

- **Tal El Amarna: Ancient Capital**
  It holds the remnants of a city established in the 14th century BC by King Akhenaten. This historical city once spanned 15 square kilometers and housed numerous temples, palaces, and fortified walls. Today, only a few structures and artifacts remain, with two sets of cliff tombs found at its northern and southern entrances.

4. Policy, Legal, and Administrative Framework

This section summarizes the environmental and social legislation and regulations of relevance to the project. They were identified according to the type of the proposed activity (described in detail in chapter 2), its geographic location, and the expected risks and impacts. Consideration is first given to the national legislation pertaining to the execution of the ESIA, followed by a review of guidelines of international financing institutions for environmental requirements relevant to the project, as well as the Company's sustainability, environmental, health, and safety framework requirements.

4.1 National Legislation Pertaining to EIA

In accordance with Article 29 of the 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 EIA for new projects and expansions or modifications within 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 an EIA study to the Competent Administrative Authority (CAA) or the licensing authority prior to the commencement of the project. The CAA or the licensing authority is responsible for verifying all required data, before forwarding the study to EEAA for review.

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

EEAA may request the proponent to provide additional data, or clarifications, only once, and if the required data isn't provided within 15 working days, EEAA will return the study to the CAA for completion and resubmission.

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

The CAA shall notify the project proponent of the results of the EEAA assessment.

The project proponent has the right to appeal in writing the result of the assessment within 30 days from the date of his notification following which non-response constitutes implicit approval.

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 project categorization lists issued by EEAA in June 2023, the Valley Solar Power Plant (1,950 MWp) and BESS have been classified as a Category Scope B project. Consequently, a public stakeholder consultation meeting is not required for these projects.

However, according to the EBRD's categorization, the project is a Category A (High E&S risks) project, requiring a full-scale ESIA report including public disclosure and stakeholder engagement.
Furthermore, 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).

4.2 Applicable Egyptian and International 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 below.

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 (µg/m^3)	Urban Areas	300	-	125	50
EU[8]		*350*	-	*125*	*20*
WHO		-	-	*125*	-
Carbon Monoxide (mg/m^3)	Urban Areas	30	10	-	-
EU		-	*10*	-	-
WHO		-	-	*7*	-
Nitrogen Dioxide (µg/m^3)	Urban Areas	300	-	150	60
EU		*200*	-	-	*40*
WHO		-		*120*	*40*

[8] https://www.europarl.europa.eu/factsheets/en/section/193/environment-policy

Pollutant	Area	Maximum Allowable limits			
		1 hr	8 hrs	24 hrs	1 year
Total Suspended Particles (µg/m^3)	Urban Areas	-	-	230	125
EU		-	-	-	-
WHO		-	-	-	-
PM_{10} (µg/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.*

4.2.2 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.*

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, in conjunction with Articles 50 to 54 of ERs No. 722/2022, delineates the protocols for the hazardous waste management process, including comprehensive record-keeping and disposal methodologies.

Hazardous material management applies throughout the construction and operation phases of the proposed project.

Hazardous waste management requirements apply throughout the lifecycle of the proposed project. Yet, larger quantities of hazardous waste are expected to be generated during the construction phase compared to the operation phase.

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, establishments that generate hazardous waste must maintain a register of such materials and waste, including details on its disposal and the entities contracted for any waste management operations.

In addition, in accordance Appendix (3) of the ERs of Law No. 4/1994, and Article 50 and Appendix (7) of the ER of Law No. 202/2020 on waste management and its ERs (654/2021), establishments generating hazardous waste shall maintain a register of this type of waste that explains the method of disposal and the companies responsible for waste management.

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4.2.6 Biodiversity Protection

Article 28 of the Environmental Law No. 4 of 1994 is a crucial provision for wildlife protection. It explicitly prohibits the hunting, killing, or capturing of specific wild animals and plants, particularly those that are endangered or essential for maintaining the natural ecological balance.

This article aims to safeguard biodiversity by preventing the depletion of species at risk of extinction or those playing a critical role in their ecosystems.
The protection measures extend to habitats and ecosystems, ensuring the preservation of both flora and fauna that contribute to environmental stability. Additionally, this article

empowers authorities to enforce these prohibitions and take necessary actions to protect wildlife from illegal activities.

Furthermore, Annex 4, as amended by ERs 1095 of 2011 of the Environmental Law No. 4 of 1994, lists the specific species of wild animals and plants protected under the law. These species are prohibited from being hunted, killed, or captured due to their ecological importance and the need for their conservation.

- **First:**
  Wild birds, animals, and other terrestrial or aquatic creatures, or any parts or derivatives thereof, are prohibited from being hunted, killed, traded, bred, possessed, transported, exported, or imported, whether alive or dead prohibition specifically includes:
  - All wild birds, except those that are permitted under clause (1) of article 28 to be hunted in accordance with their designated seasons and within the allowed quantities.
  - The Prohibited Animal Species (Mammals) under clause (1) of Article 28
  - The Prohibited Animal Species (Amphibians and Reptiles) under clause (1) of Article 28:

Additionally, it is prohibited to kill or capture wild birds, animals, and aquatic creatures in areas where such actions would result in the destruction or alteration of their natural habitats. This includes areas of significant importance for resident and migratory wild birds, such as wetlands, natural lakes, the Nile River system, migration routes, and movement corridors of resident birds. The prohibition also applies to areas designated under the Ramsar Convention, to which the Arab Republic of Egypt is a party, as well as currently declared nature reserves and those that may be declared in the future by a decision from the Prime Minister under Law No. 102 of 1983.

- **Second:** Flora is forbidden to be collected, imported, exported, cultivated, or commercialized. This includes wild plant species related to trade, specifically those listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to which the Arab Republic of Egypt is a party, according to Article 28.

- **Third:** Endangered Animal or Plant Species or Those Cultivated Outside Their Natural Habitats Without a License:

According to Article 28 of the law, it is prohibited to cultivate or breed endangered animal or plant species, or those that are grown or raised outside their natural habitats, without obtaining a license from the Environmental Affairs Agency. This provision ensures that such activities are regulated to prevent potential harm to the species and their ecosystems.

Furthermore, in accordance with Article 3 of Law 102 of 1983 Concerning Natural Protected Areas, it is strictly prohibited to undertake any activities, actions, practices, or experiments in the zones surrounding a protected area. These zones are designated by a decision from the competent minister, following a proposal from the Environmental Affairs Agency at the Council of Ministers. Such activities are only permissible if a permit has been granted by the relevant administrative authority, particularly if they have the potential to impact the

environment of the protected area or its natural features.

In addition, Law 53 of 1966 (the Law of Agriculture) is also concerned with biodiversity. Article 117 prohibits the hunting of birds and other wild animals useful to agriculture. It also bans the trading, killing, and destruction of their nests. Minister of Agriculture Decree 28 of 1967 (amended by Decree 1227 of 1988) specifies the species of birds and other wild animals under protection covered by Article 117 of Law 53/1966.

These requirements apply to the proposed project, although, as described in Chapter 4, the project area is characterized by low ecological sensitivity 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. Moreover, there are no registered archeological sites within or in close proximity to the proposed project location. However, chance finds plan would be developed for the construction activities.

4.2.8 Work Environment

A. Workplace emissions

The new Egyptian Labor Law 14/2025 [9], alongside Minister of Manpower and Immigration's Decisions 134/2003 and 211/2003, establish comprehensive guidelines in Egypt for occupational safety, health, and a secure work environment.

[9] 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.

The Ministerial Decree 134/2003 requires that facilities hiring more than 50 employees establish an occupational health and safety department to be responsible for the workplace and employees' safety and provide the necessary equipment for measuring and monitoring pollution in the 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.

B. Workplace Noise

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

C. Occupational health and safety

Based on the Ministerial Decree 134/2003, facilities with more than 50 workers should establish an occupational health and safety structure/department, which is responsible for health and safety issues and will undertake all related responsibilities, and should undertake daily inspections to detect hazards and risks.

D. 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 in sections one to four. The occupational health and safety requirements are addressed in Book Four of the Labour Law.

E. Noise in the workplace

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).

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.

F. 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

G. Child labour

According to Articles 62, 63, 64, and 65 of the Labor 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.

H. 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, and 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:

- 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.
- Employer Quotas: Employers with 20 or more employees must hire at least 5% of their workforce from people with disabilities.
- 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.

I. 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 the provision of equal rights to this group. It includes their rights to have life insurance, social insurance, freedom in choices, and chances of work opportunities that do not surpass their physical disability limit.

J. 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.

K. Protection from Harassment

Article 254 of Labour Law 14/2025 stipulates that those 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.

L. Grievance

Article 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.

M. Community Investment:

According to the Egyptian Investment Law 72/2017, towards achieving the goals of 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 the PV and BESS projects to Egypt's National NCCS 2050 includes:
  - 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 Minya 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 $GgCO_2$-eq under a business-as-usual (BAU) scenario to 0,89 $GgCO_2$-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

Egypt has been among the first countries to take an active interest in conserving biodiversity and preserving natural resources and heritage. In 1936, Egypt became a participant in the "Convention Relative to the Preservation of Fauna and Flora in their Natural State", London 1933. This was later followed by signing and ratifying conventions and agreements pertaining to the various aspects of biodiversity conservation. Those potentially relevant to the site include:

4.4.1 Biodiversity

- **Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), 1995**
  The convention emphasizes the importance of migratory birds on the global biological diversity and that they highly depend on wetlands. Parties of this convention are expected to minimize disturbances as much as possible that can negatively impact migratory water birds when planning and constructing. Egypt ratified the convention on the 1st of January 1999.

- **United Nations Convention on Biological Diversity (UNCBD), Rio de Janeiro, 1992**
  It recognizes the importance of biological diversity in offering ecosystem services such as recreational, ecological, economic, and educational services, etc., and its importance in maintaining life. The convention emphasizes that countries and States are responsible for preserving their biological diversity and that specific human activities negatively affect their presence. Parties are expected to sustainably manage the surroundings of protected areas. Egypt signed this convention on the 9th of June 1992, ratified it on the 2nd of June 1994, and it entered into force on the 31st of August 1994.

- **Convention on the Conservation of Migratory Species of Wild Animals (CMS), Bonn Convention. 1979**
  Globally conserve aquatic, terrestrial, and avian migratory animals and it recognize their crucial role in the stability of the ecosystem. It also recognizes that all boundaries where the species occur or pass through need to be managed. Egypt ratified it on the 2nd of November 1982, and it entered into force on the 11th of January 1983.

- **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973**
  It is an international agreement between states that aims to ensure that international species trade does not affect their survival. It recognizes the importance of international cooperation in controlling animal trade to avoid over-exploitation. It was put in effect on 1 July 1975. Egypt ratified the convention on 4 January 1978 and was put into force on 4 April 1978.

- **African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968**
  The convention recognizes the economic, social, cultural, and environmental importance of natural resources, including renewable and non-renewable resources, as well as the soil, water, flora, and fauna. It aims to promote and enhance environmental protection, to encourage sustainable use of natural resources, and to synchronize policies in the different fields. It requires all parties to adopt measures to reach these aims. It requires all parties to implement preventive measures to avoid land degradation and soil deterioration. It also requires parties to sustainably manage their water resources and to prevent pollution and excessive abstraction of the water. In addition, it requires that parties maintain and enhance genetic diversity and floral cover. Egypt signed this convention on the 15th of September 1968, ratified it on the 12th of April 1972, and it entered into force on the 12th of May 1972.

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 does 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., an 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 UNFCC 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 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 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.

The sections below provide a summary of the International E&S Requirements.

4.5.1 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.

No reesettlement is involved the land acquisition requirements are not relevant. Based on the current project status, the Project site forms part of the East Nile renewable energy concession allocated to the New and Renewable Energy Authority (NREA) under Presidential Decree No. 116/2016, as amended by Presidential Decree No. 126/2022. The designation of the area for renewable energy development was publicly disclosed through official governmental decrees, media publications, and the Strategic Environmental and Social Assessment (SESA) conducted for the East Nile area in 2018.

As described in section 6 and annex 1 The legal designation of the land in March 2016 constitutes the applicable cut-off date for eligibility related to land use and occupancy claims. Available evidence, including satellite imagery and land status records, indicates that the proposed Project location was vacant and unoccupied at the cut-off date, and that informal agricultural activities only commenced in 2023/2024, i.e., several years after the official allocation and public disclosure of the concession area for renewable energy purposes. Therefore, these users are considered post cut-off date occupants and are not expected to qualify for compensation or livelihood restoration under the principles of OS5/PR5.

Furthermore, the land clearance process was undertaken by the relevant governmental authorities prior to handover of the site to the Project developer as vacant land. While the Project acknowledges that the broader government-led clearance activities were not implemented as a formal OS5/PR5-compliant resettlement process, current evidence confirms that no physical displacement, economic displacement, or legally recognizable land acquisition attributable to the Project has occurred within the proposed Project footprint.

Accordingly, 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 construction of most project components as they are located within a natural desert environment.

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 construction and operation phases of the project.

A gap analysis between the applicable African Development Bank (AfDB) Operational Safeguards (OSs) under the Integrated Safeguards System (ISS, 2023) and the relevant Egyptian environmental and social regulatory framework is presented in Annex (2).

4.5.2 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 monitoring[10]. 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

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

The requirement applies to the potential emissions and wastes (solid and liquid) from different sources during the construction and operation phases and their potential impacts.

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 is a PV Power Plant (500 MW, AC) and BESS and is located at a distance of about 2.8 km from the nearest community and about 1.2 Km from the Giza - Luxor Road. North of the proposed project site.

Therefore, the likelihood of the surrounding community and nearby road users being affected by construction activities is considered minimal and localized. Additionally, the potential impacts on the community during the operational phase are expected to be insignificant. However, the current ESIA study will address these potential impacts.

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.

[10] 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

ESR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
This performance requirements addresses how projects[11] can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources.
As a significant part of the ESIA, the biological baseline in the project area is to be described. Preliminary information about the proposed project area indicates the absence of significant ecological diversity. Yet, the ESIA will describe the different habitats and biodiversity surrounding the area and investigate the potential project impact on them, where/if 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 the area.

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.

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.
ESR-10 is applicable to the Project.

4.5.3 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.

[11] 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

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 current one.

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.
This standard is relevant to the current one.

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 potential emissions and wastes (solid and liquid) from different sources during the construction and operation phases and their potential impacts.

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.

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.

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 objectives are: To address inequalities and facilitate equitable access to mitigation and benefits. Requiring promoters to adopt a gender-responsive approach to identifying, managing, and monitoring impacts. For Indigenous Peoples: Ensuring respect for their rights, identity, culture, and livelihoods. In required cases (e.g., impacts on customary lands or cultural resources), promoters must obtain Free, Prior, and Informed Consent (FPIC).

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

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, and 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 is relevant to the current one

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

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 and 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.

4.5.4 IFC E&S Performance Standards

PS1: Social and Environmental Assessment and Management System

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 current ESIA report is prepared satisfying PS 1.

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: Pollution Prevention and Abatement

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 PS applies to the potential generation of wastewater from different sources of this project and their potential impacts.

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 PS applies to the proposed project, as the substation component is located outside the industrial area. Chapter 6 of this study discusses the mitigation measures needed for the biodiversity environment concerning the proposed project.

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.

This PS does not apply to the proposed project as there are no recorded archaeological sites within the Project site.

4.5.5 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.

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 and regulations as well as international standards.

5.1 No Project Alternative

The 'no project' alternative means that the 1,950 MW PV(DC) plant project will not be developed. If the "no-project" alternative is selected, the project area would remain unchanged, retaining its current characteristics or allocated for another renewable energy project.

However, the benefits of the project would also not be realized. The project aims to meet part of the continuously increasing energy requirements in Egypt. Additionally, it contributes to sustainable development and reduces GHG emissions, particularly CO_2, which would have been generated if the same amount of energy were produced from fossil fuel-fired power plants. It also aids in conserving resources such as oil and gas reserves.
In regions with high solar power potential, like Upper Egypt, utilizing solar energy is one of the best alternatives to satisfy Egypt's growing energy demand.
The project is expected to generate local employment and procurement opportunities during the construction and operation phases and commit to other social responsibilities.

Therefore, the "no project" alternative is not considered a suitable alternative for this project.

5.2 Alternative Site Location

The proposed project is located in East Minya, in the vacant desert land, covering approximately 41 Km^2. The site has been allocated by the Egyptian government, through the New and Renewable Energy Authority (NREA), for the project and does not conflict with other land uses.

Therefore, the alternative site location option is not considered, and the selected site is suitable for establishing the project.

5.3 Alternative PV Types

Types of PV module can be classified by the following 3 types:

- Mono and Poly Crystalline
- Silicon Thin-Film
- Compound Thin-Film

General classification of the types of PV modules is shown in Figure 5–1. Materials marked with red dotted lines mean that these are new emerging technologies modules that are under research and development.

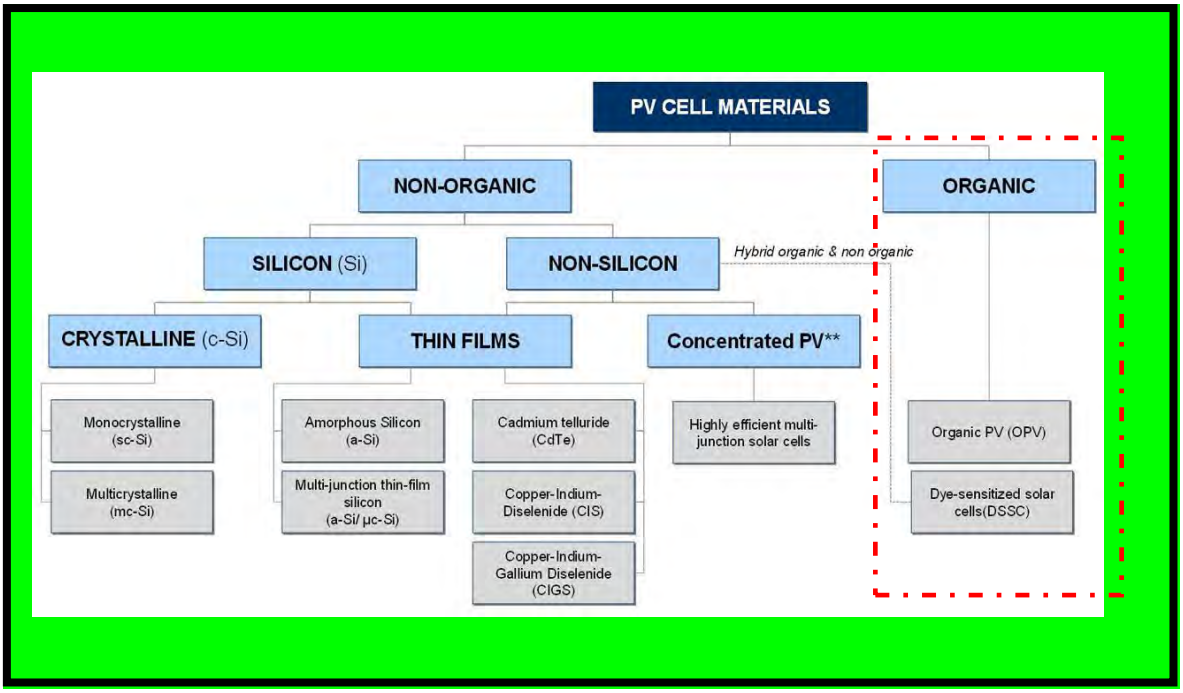

Figure 5–1: Types of PV modules[12]

Upon comparison of the three types of PV modules in terms of: cost; efficiency; temperature characteristics; lifetime; environmental consideration; and effect of shade, Mono Crystalline bifacial type is selected for the proposed project.

Table 5–1 below shows the comparison between various PV panel options.

Table 5–1: Evaluation Result for each PV Module[13]

PV Module	Silicon crystallized		Silicon Thin film		Compound thin film	
	Mono Crystalline	Poly Crystalline	Amorphous Silicon	MLTF	Cd-Te	CIS
Cost	High	Low	Middle	Low	Low	Low
Efficiency	Excellent	High	Low	Middle	Middle	Middle
Temperature Characteristic	Middle	Middle	Excellent	Excellent	Good	Good
Life time	Good	Good	Middle	Good	Good	Good
Environmental consideration	does not include HS	does not HS	does not include HS	does not include HS	Includes HS Cd	Can include a small amount of Cd
Land/per MW	4-5 acres (16187 – 20234 m^2/MW)		7.5-9 acres (30351 - 36421 m^2/MW)			

*HS: Hazardous Substances

[12] Source: http://sovoxglobal.com/cell_classification.html

[13] Developed based on: http://www.sunsinesolution.com/faq.aspx, http://www.slideshare.net/gouravkumar220/solar-panel-technology-ppt. - http://www.geni.org/globalenergy/research/review-and-comparison-of-solar-technologies/Review-and-Comparison-of-Different-Solar-Technologies.pdt.

5.4 Alternative Tracking Systems

PV power systems are also classified according to their configurations: (a) Fixed PV systems, normally oriented to the south at northern latitudes and vice versa at southern latitudes; (b) PV tracking systems, which follow the sun's path in the sky (Figure 5–2).

Sun tracking systems are more efficient than fixed-tilt systems as they can capture a higher amount of incident solar irradiance, thereby increasing the annual electrical output. However, they require a larger area compared to fixed systems and consume a fraction of the generated electric power to track the sun. PV trackers can be further classified based on the number of their axes: single-axis tracking systems and double-axis tracking systems.

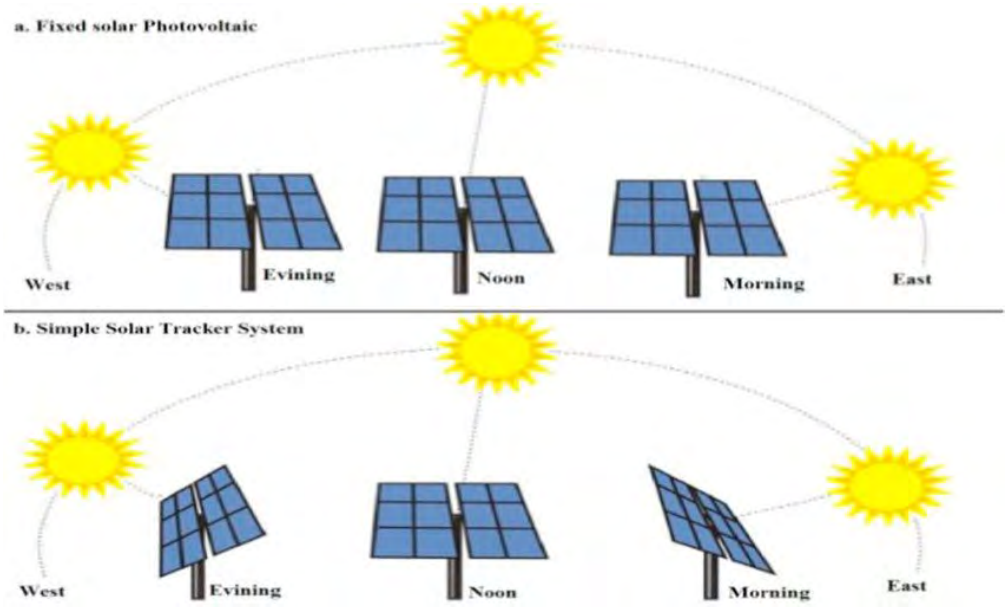

Figure 5–2: Fixed-angle solar panel (a) and solar panels with a tracking system (b)
Source: Nadia et al., (2018) [14]

Compared to a fixed mount, a single-axis tracker increases annual output by approximately 15% to 25%[15] as shown in Figure 5–3.

[14] Nadia, A. R., Isa, N. A. M., & Desa, M. K. M. (2018). Advances in solar photovoltaic tracking systems: A review. Renewable and sustainable energy reviews, 82, 2548-2569.

[15] Design of a Solar Tracker System for PV Power Plants, Tudorache. T, Kreindler, L. Acta Polytechnica Hungarica, Vol. 7, No. 1, 2010

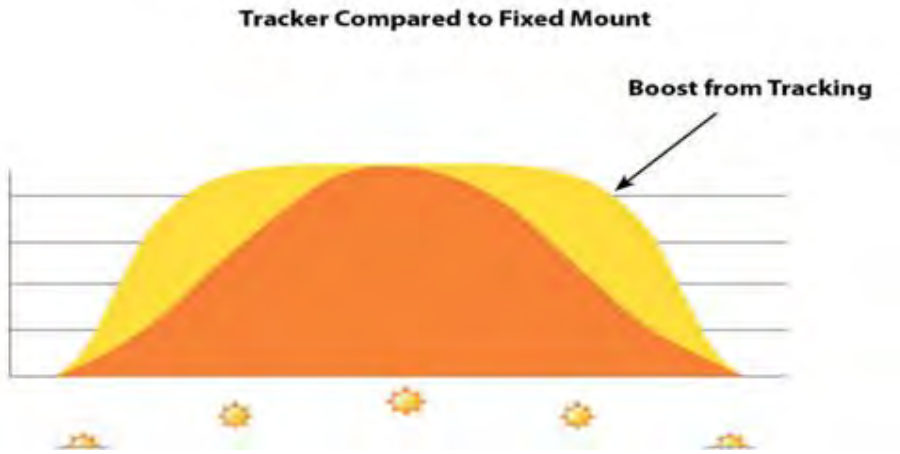

Figure 5–3: Daily power production, fixed tilt versus tracking
Source: First Solar

In addition, dual-axis solar trackers are equipped with two axes of movement to have a wider range than their single-axis counterpart. They are more efficient and provide significantly more energy throughout the day. On the other hand, they become more expensive and need more frequent maintenance because of the added axis of movement. For one-axis trackers, only one motor is required, whereas for two-axis trackers, two motors are needed.

Based on the above, the single-axis solar tracking system has been selected for the project.

5.5 Alternative Module Cleaning

At present, there are multiple cleaning options available to clean PV modules.

(1) Manual Cleaning involves mostly manual labor, using brushes or cloths to clean small-scale PV modules, such as those on residential or commercial systems.

(2) Semi-Automated Cleaning uses both automation and manual effort. It includes:
- Robotic Cleaning Systems: Robots clean PV modules but need to be manually moved between rows.
- Vehicle-Driven Cleaning Systems: A cleaning mechanism, typically a brush, is attached to a vehicle and driven along rows, with an operator controlling pressure to prevent damage to panels. These systems require a larger land area for vehicle maneuvering. Non-Automated Cleaning and Semi-Automated Cleaning are shown in Figure 5–4.

(3) Fully Automated Cleaning uses Automatic Robotic Cleaning Systems (ARCS) to efficiently clean PV modules with minimal human intervention. Robots are permanently installed on each row and move along panel edges, cleaning both directions. They dock at stations located at the ends or within rows and move between arrays using bridges. ARCS can operate day or night, preferably at sunset for better moisture-based cleaning, and can be controlled remotely.

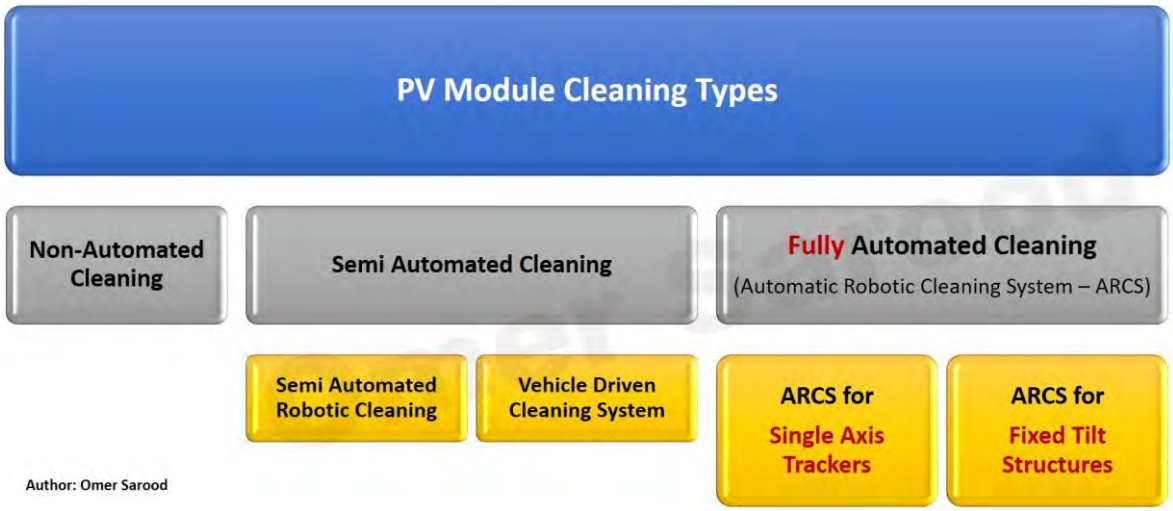

Figure 5–4: PV Modules cleaning options

Methods have been investigated for module cleaning, namely:

- Dry cleaning: Wiping modules with dry cloths.
- Wet cleaning: Wiping modules with wet cloth.
- Washing: Washing with high pressure water.

Wet vs Dry Cleaning

Wet Cleaning involves water and relevant chemicals in removing sediments from the solar panel and is more feasible for regions that have abundant water reserves and experience heavy rainfalls. However, based on the PI PV-Institute Berlin AG, solar panel cleaning for large power plants involving water is rarely considered to be an optimal solution.

Dry Cleaning is a solution that does not involve water. Various reports and studies completed recently in desert-like environments recommend Dry Cleaning as the best cleaning option for such arid climatic zones. Table 30 below shows a brief comparison between the different cleaning techniques.

The selected option for PV Module Cleaning is the automatic robotic dry-cleaning Systems.

Table 5–2: Evaluation of the ways of module cleaning

Items	Wipe with a dry cloth	Wipe with a wet cloth	Washing	Robotic Cleaning
Tools and resources	Rotating brush/cloth carried by tractor; fuel	Rotating brush/cloth carried by tractor; water; fuel	Water truck; water; fuel	Cleaning machine, power
Number of workers	2 workers, one for each tractor per shift; two shifts per day (Fully manual cleaning would require 15 to 30 workers per shift, working in two shifts per day for similar cleaning)		1 x Driver also functioning as Team Supervisor and first Water Operator 1 x second Water Operator 2 x Washer 2 x Squeegee Dryer 2 x Cloth Dryer	Each cleaning robot can clean up to 6,000 m² with one battery load; depending on the design of the plant/length of table rows, min. 70 robots need to be deployed for daily cleaning; 2 workers per shift are required for moving robots
Water volume	None	approx. 0.4 – 0.6 liter per module; in total 85 – 126 m³ per cleaning cycle	approx. 0.75 – 1.0 liter per module	None
Working effort	Easy	Easy	Easy	Easy
Damage on glass surface	Scratch by dust on the surface might cause glass scratching	Stuck dust on the glass might remain and cannot be removed	No damage to the glass	No damage to the glass
Waste	Waste clothes	Waste clothes, wastewater for washing clothes	Potential wastewater generation	No wastewater
Conclusion	Does not need any water, but longer maintenance time, possible damage to the surface, and produces significant waste quantities.	Does not need much water, but longer maintenance time; dust might be stuck hard on the panels.	High resource consumption and potential generation of wastewater	Continuous cleaning is required to avoid a significant accumulation of soil stuck hard on panels

5.6 BESS Alternatives

- *Lithium Solid State Containerized Batteries*
  A Solid-State Battery consists of multiple battery cells assembled to form modules. Each cell contains a positive electrode, a negative electrode, and an electrolyte, which is mostly solid but can contain a small amount of liquid/polymer. The solid-state batteries that are being considered are Lithium-ion systems, as shown in Figure 5–5 below.

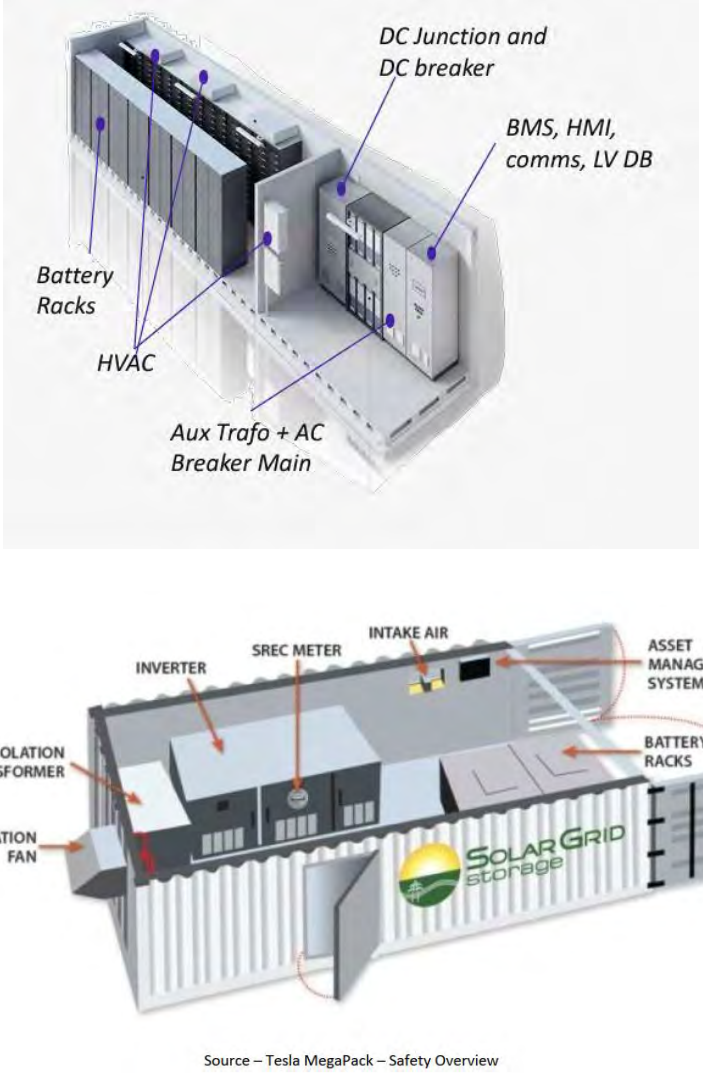

Figure 5–5: BESS systems

The possibility of thermal runaway potentially resulting from improper operation, such as increased battery temperature, overcharging, or discharging. Li-Ion battery technologies have different chemistries, among the most promising ones are: lithium-ion titanate (LTO), lithium iron phosphate (LiFePO4), and lithium nickel manganese cobalt (NMC).

Lithium Iron Phosphate Batteries: This type has the safest chemistry among Li-ion technologies and has a relatively cheap cost. It also has high power density and can deliver all

power under a 100% of depth of discharge (DoD). In contrast, this type of battery presents low energy density, which ends up limiting its area of application.

Lithium Nickel Manganese Cobalt Batteries (NMC): They represent the most common type used in grid-scale power systems. These batteries present balanced characteristics in terms of power, energy, life cycles, and costs.

Lithium-Ion Titanate Batteries (LTO): They have large life cycles, which can reach up to 20.000 cycles. They also have high power densities, and compared to previous Li-Ion batteries, they have the fastest charging process. However, it has a much lower energy density and higher costs.

- *Vanadium redox flow battery installations (VRFB)*
  Redox Flow Batteries, typically Vanadium chemistry based (VRFB), are energy storage systems supplied either as containerized units or as a fixed installation. Redox flow batteries can be installed in containers where the individual quantities of electrolyte involved would be smaller but still significant. Because this technology has a low energy density, requiring a larger area for the electrolyte tanks, it has not been selected for this project.

  The key disadvantage is the possibility of spills of corrosive electrolytes.

- *Molten Metal Battery Energy Storage Systems*
  Molten Metal batteries, typically the AMBRI Technology, are energy storage systems supplied as containerized units. The liquid metal battery is comprised of a liquid calcium alloy anode, a molten salt electrolyte, and a cathode comprised of solid particles of antimony.

  The key disadvantage is that they have to be heated to the melt temperature of the metals used to keep them constantly hot. This results in constant consumption of energy even when not being used to provide power.

- *Sodium-ion (Na-ion) batteries*
  In this type of battery, the positive electrode is usually made of molten Sulphur (S) and the negative of molten sodium (Na). These electrodes are separated by a solid ceramic, called sodium beta alumina, which also serves as the electrolyte. The chemical reactions occur at high temperatures, between about 300 ^{0}C and 400 ^{0}C, in order to keep the electrodes in a molten state, which implies a heating system for the battery.

  Based on the above, the project will use lithium nickel manganese cobalt oxide (NMC) or lithium iron phosphate (LFP) for its cathodes.

5.7 Water Sources Alternative

Water supply is required during construction activities and during operation activities, for sanitary purposes. The water supply may be trucked from the nearest water treatment plant or from the connection to the nearest distribution network to the project.
The daily consumption is expected to be 173 m^3/day during peak construction. The O&M consumption on site is expected to be limited to 75-100 m^3/month, as the method used for regular cleaning of PV modules will be dry cleaning. Drinking water for workers will be bottled water and will be provided separately.

The potential options would include:

5.7.1 Groundwater abstraction

Groundwater in the project area occurs at depths exceeding 120 m below ground level (bgl). Regionally, the main aquifer within the West Nile area extends between approximately 120 and 140 m in depth, while groundwater levels have been recorded at depths ranging from 45 to 74 m bgl, depending on the specific location. The Quaternary aquifer in this region is characterized by relatively high salinity levels, ranging from 2,500 to 3,500 ppm (NaCl-type water) (Al Amar, 2012), which would necessitate pre-treatment prior to use for construction or operational purposes.

Groundwater abstraction and utilization would require obtaining the necessary permits from the Ministry of Water Resources and Irrigation, in addition to conducting an aquifer assessment and modelling studies. Furthermore, well development requirements, potential well clogging, and the management and disposal of pre-treatment liquid waste streams (e.g., brine and backwash from demineralization systems) represent key technical and environmental constraints.

In this respect, groundwater abstraction is not considered a preferred water supply option for the Project.

5.7.2 Water trucking

The required water for the construction and domestic activities would be trucked and stored in on-site tanks. The water will be trucked to the site when needed during operation. O&M consumption is expected to be 75-100 m^3/month, with dry cleaning used for PV modules.

This option is a preferred option for water supply.

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

6.1 Methodology

An environmental and social impact assessment was carried out to identify and assess potential risks and impacts of the project on the environment as well as risks/impacts of the environment on the project.

The assessment was carried out in five main steps, as follows:

1. Delineation of the Area of Influence.
2. Identification and classification of risks and impacts into irrelevant (scoped out), positive and negative.
3. Assessment of negative risks and impacts in terms of their significance based on the magnitude of the aspect and the sensitivity/vulnerability/value of the affected receptor .
4. Identifying and proposing suitable mitigation measures following the mitigation hierarchy.
5. Determination of residual risks and impacts after mitigation.

The main cumulative impacts have also been assessed using the same methodology applied for evaluating potential negative impacts, incorporating contributions from other existing and foreseeable projects within the Area of Influence

6.1.1 Delineation of the Area of Influence (AoI)

AoI may be defined as “such an area where significant risks and impacts caused by the project performance are evident on the physical, biotic, social, and socioeconomic components of the environment. The expression of these risks and impacts must be objective and, to the extent possible, quantifiable, provided this is feasible, in line with the available methodologies”.

The AoI during the construction phase extends to encompass transportation routes, nearby urban centers, and worker accommodation areas.

During the operation phase, the AoI is defined based on the location of potential receptors and the nature of project impacts, particularly visual and glare-related effects. This includes areas within the potential line-of-sight of the PV panels, such as nearby roads, surrounding open areas, and the closest residential receptors, typically extending up to approximately 1.5 km from the project boundary for visual and glare assessments.

6.1.2 Identification and Classification of Project Aspects and Associated Impacts

Project aspects are elements of project activities, products or services that interact — or may interact — with the environment or with social receptors. Impacts are the resulting changes to environmental or social conditions. The identification process maps the causal chain: Project Activity → Aspect (cause/source) → Pathway → Receptor → Impact (effect/change to baseline).

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 "scoped out risks and impacts". Those that were considered relevant were "scoped-in risks and impacts."

Scoped in risks and 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

6.1.3 Assessment of Negative Risks and Impacts

All scoped in negative risks and 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 was based on field data, available literature, and concerns and feedback raised during stakeholder consultations. These inputs were systematically reviewed, validated, and addressed by the environmental consulting team, ensuring that all comments were adequately considered, integrated, and reflected in the assessment outcomes.

The significance of each potential negative risk and impact is determined before and after implementing the design integrated measures and/or applying mitigation, management and monitoring practices (i.e. residual risks/impacts).

SIGNIFICANCE Assessment Procedure

Risk and Impact assessment is the assignment of **SIGNIFICANCE** to each risk/impact. The **SIGNIFICANCE** of potential negative impacts is assessed, considering the **MAGNITUDE** of an **ASPECT** in combination with the sensitivity of the **RECEPTOR** exposed to this aspect through a defined **PATH.**

The overall **SIGNIFICANCE** of the risk/impact considers the magnitude of an aspect in combination with the importance of the receptor or resource (according to its sensitivity or vulnerability or value), in the absence of quantified standards.

A more detailed explanation of the adopted methodology is provided hereafter.

Characterisation of Aspect Magnitude The magnitude of an aspect is determined according to the following criteria:

- The temporal scale or duration of the aspect;
- The spatial scale or geographic extent of the aspect; and
- The intensity scale of the aspect.

1. *The **temporal scale*** (duration) defines the aspect at various time scales, as an indication of the overall duration of the aspect.

Category	Description
Short term	Less than 5 years. Aspects will be of short duration
Medium term	Between 5 and 20 years
Long term	Between 20 and 40 years (a generation) and from a human perspective essentially permanent
Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there

2. The ***spatial scale*** (geographic extent) defines the physical extent of the aspect.

Category	Description
Localized	At localized scale and a few hundred meters in extent
Study area	The project area and its immediate surroundings within the defined AoI.
District	District level (e.g. Markaz or equivalent)
Regional	Provincial level (e.g. Governorate or equivalent)
National	Country wide – Egypt
Global	Global scale

3. The ***intensity scale*** is used in order to scientifically evaluate the size of an aspect would be on a particular affected system or a particular affected party. It is a methodology that attempts to remove, as much as possible, value judgments from the assessment, although it mainly relies on the professional judgment of the specialist.

Category	Description
Very severe	Usually an irreversible change to the affected system(s) or receptors that cannot be mitigated. For example, the change to topography resulting from a quarry. However, professional judgment is also required in order to categorize an impact as "very severe".
Severe	Impacts that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these. For example, the clearing of vegetation which is fairly common elsewhere, could be rehabilitated.
Moderate	Impacts that could be mitigated. For example, constructing a narrow road through vegetation with a low conservation value.
Slight	Mitigation is either integrated in the project design or is very easy, cheap, less time consuming or not necessary. For example, the temporary change in the water table of an irrigation canal, which is adapted to fluctuating water levels.
No effect	The system(s) or party(ies) is not negatively affected by the proposed development. For example, construction activities will have no effect on the overall geological context of the area.

In addition, other parameters that might be considered to assess the intensity of an aspect include its frequency, duration (i.e. the period of time during which the aspect persists)[16], probability of occurrence and the degree of certainty or confidence with which the intensity of an aspect has been predicted[17]. Accordingly, assessing the intensity of an aspect is still subjective and is influenced by the expert's experience, estimation and professional orientation.

[16] The duration meant here differs from the temporal scale. For example, an oil spill is a long term impact as it can happen throughout the project lifetime but it usually has a short duration when it occurs.

[17] The degree of certainty can be categorized into definite, probable, possible and unsure. To define a specific impact as definite, substantial supportive data are usually required.

The MAGNITUDE scale is an attempt to evaluate the importance of a particular risk or impact taking into account the temporal, spatial and intensity scales.
Temporal scale + spatial scale + intensity scale = Magnitude of aspect:

- Large
- Medium
- Small
- Negligible

Assigning numerical values can assist in assessing the MAGNITUDE of an impact; however, this type of assessment is not always realistic and is only taken as a guide to assist professional judgment.

For some aspects, especially noise, air and water pollution, the intensity can be assessed directly against numerical criteria and standards[18]. If exceeding, further mitigation must be incorporated by the Project to reduce the magnitude of the aspect (and, accordingly the significance of its impact).

For other aspects, nominal levels of magnitude (small, medium, large) may be adopted based on widely recognized factors such as: the nature of a change; its duration and reversibility, size or intensity and, for unplanned events, likelihood of occurrence.

Some activities will result in changes to the environment that may be immeasurable or undetectable or within the range of normal natural variation. Such changes will be assessed as having a negligible magnitude and will not lead to significant impacts.

A) Assessment of Receptor / Resource Importance

Significance is evaluated through considering the magnitude of an aspect in combination with the sensitivity / vulnerability / value (collectively called "importance") of the receptor or resource that is affected.

Receptor (or resource) sensitivity is the degree to which a particular receptor is more or less susceptible to a given aspect.

Receptor (or resource) vulnerability (or conversely, resilience) describes the ability of the receptor to withstand adverse impacts. It takes into consideration not only activity-impact-receptor pathways, but also environmental characteristics of the receptor that might make it more or less resilient to change. As such, a receptor can be considered as existing within a spectrum of "vulnerable" to "resilient", with the former more likely to experience significant impacts as a result of a given change.

Receptor (or resource) value takes into consideration its quality and its importance as represented, for example, by its conservation status, its cultural importance and/or its economic value.

[18] Environmental measurements are usually not available since it is assumed that the project has not started yet; however, these can be sometimes available from previous similar projects, from utilities and machinery technical specifications, from simulation activities (such as mathematical modeling), if the project is an extension of an existing project, or if, for any reason, the project has already started and measurements can be carried out.

Impact SIGNIFICANCE SCALE

The following table assesses the significance of a potential impact by combining the stressor's magnitude with the sensitivity/vulnerability/value of the receptor or resource that is affected.

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

Impacts/effects of more than minor significance may warrant re-examination to see if an impact magnitude can be reduced r. Different mitigation options may be examined and the reasons for selecting one and rejecting others explained. Some impacts/effects that cannot be adequately mitigated may need to be addressed through the consideration of offsets[19] or compensations. A cautious judgment is undertaken before assessing the significance of an impact as "Extreme", which should comply with the definition provided in the table below. Otherwise, the impact is categorized as "Major".

Adoption of mitigation measures usually decrease the magnitude of the aspect or the exposure of the receptor rather than the inherent sensitivity and/or vulnerability and/or value of the resource and/or receptor.

Impact significance definitions

Significance	Definition
Extreme	**Highly significant**. Impacts with an "**Extreme**" significance are known to permanently disrupt the function and value of the resource/receptor, and have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are very difficult or impossible to mitigate and might require the implementation of offset and/or compensation measures, contributing to national and/or regional-level conservation goals rather than solely site-level impact mitigation.
Major	**Significant**. Impacts with a "**Major**" significance are likely to disrupt the function and value of the resource/receptor and may have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
Moderate	**Significant**. Impacts with a "**Moderate**" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of the resource or receptor, although the overall function and value of the resource or receptor is not disrupted. These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.

[19] Offsets are a set of actions with on-the-ground "*measurable conservation outcomes*" that can balance significant residual environmental and/or social losses caused by the project *only after appropriate avoidance, minimization and restoration measures have been applied*, with equivalent or higher environmental and/or social gains in terms of characteristics and size of expected gains. The decision to undertake an environmental and/or social offset therefore would never be a substitute for the implementation of good management practices that prevent significant impacts.

Significance	Definition
Minor	**Detectable but not significant**. Impacts with a "**Minor**" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause hardship, degradation, or impair the function and value of the resource or receptor. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
Insignificant	**Not Significant**. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

6.1.4 Mitigation Measures

The mitigation of impacts should follow 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 both types of mitigation measures, the residual impacts, which are those potentially, remaining after implementing the mitigation measures, will be minimal and acceptable.

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

6.1.5 Residual Impacts

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

6.1.6 Cumulative Impacts

The present ESIA assesses the cumulative impacts in Section 6.6. The methodology used to assess cumulative impacts is the same as that used to assess negative impacts.

6.2 Scoped Out Impacts

The potential impacts of the project are identified based on the analysis of the impacts of the surrounding environment and social aspects.
Examination of the environmental setting of the area and the operational processes has shown that the impact on the following resources/receptors is irrelevant:

Impacts on "surface water quality" and "aquatic life."
As the location of the project is located in a desert region with no water bodies or surface canals within its boundaries, and the nearest water body, the River Nile, is approximately 11 km west of the project area, there are no surface water sources in the vicinity of the project.

Therefore, impacts on surface water can be scoped out.

Impact on groundwater
Based on the nature of the project, there will not be any interaction with the groundwater in the area.

Moreover, the groundwater depths reach about 120–150 m below ground level at the proposed project site.

Restrictions on Land Use and Involuntary Resettlement
As described in the Project Baseline Chapter, the Project is located entirely within the East Minya concession area allocated to the New and Renewable Energy Authority (NREA) pursuant to Presidential Decree No. 116/2016 issued on 23 March 2016 and subsequently amended by Presidential Decree No. 126/2022. These decrees were officially published in the Egyptian Official Gazette and publicly disclosed through governmental entities and media outlets, confirming the legal status of the land and its planned use for renewable energy development since 2016, as illustrated in annex 1

In addition, the East Nile concession area was subject to a Strategic Environmental and Social Assessment (SESA) supported by the EBRD in 2018. The SESA identified the area as a designated zone for renewable energy projects under NREA and included stakeholder consultations in Minya Governorate, as well as public disclosure of the intended land use for renewable energy purposes. This confirms that the land allocation and intended development use were publicly known and disclosed to relevant stakeholders prior to the emergence of any subsequent informal land use activities.

In accordance with the European Bank for Reconstruction and Development Environmental and Social Requirement 5 (ESR5), the "cut-off date" is typically established through the formal governmental decision or procedure allocating land for a public purpose or specific development use. Accordingly, March 2016 — the issuance date of Presidential Decree No. 116/2016 — is considered the applicable cut-off date for the Project.

Accordingly, the agricultural activities that later appeared in 2023 within the Project area constitute informal encroachments on state-owned land legally allocated to NREA and were not based on any formally recognized ownership or land-use rights.

Available evidence, including historical satellite imagery and land-use analysis, indicates that the Project site was entirely vacant and free from agricultural activities or occupation at the time of land allocation in 2016, and that informal agricultural activities only commenced during the period 2023–2024, several years after the formal designation and allocation of the area for renewable energy development.

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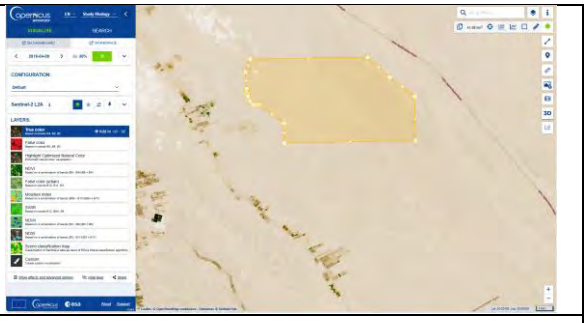
<tr><td> </td><td>  </td></tr>
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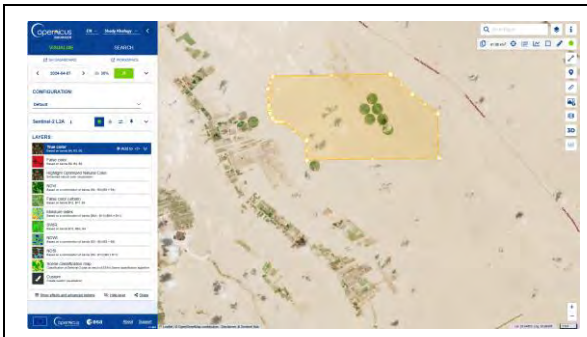

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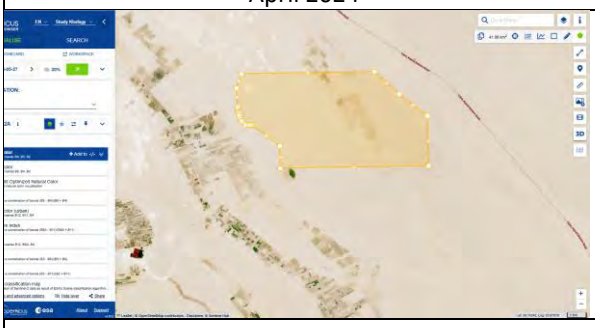

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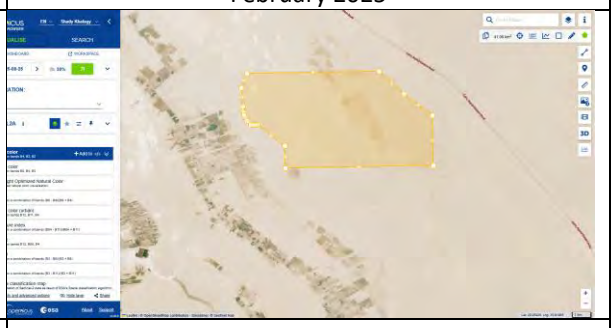
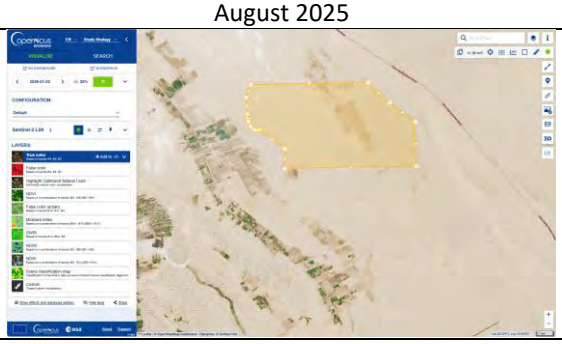


August 2025

November 2025



Jan 2026

Furthermore, official documents and correspondence confirmed that the land clearance process took place prior to handing over the site to the Project developer. The clearance formed part of a wider Governorate-led state land recovery programme publicly announced and disclosed through the official Minya Governorate website and related official social media announcements. The programme covered the NREA concession area as well as several other locations across Minya Governorate.

The available documentation further confirms that:

- The land was formally handed over to the Project developer as vacant land;
- The Project developer did not participate in any land clearance, eviction, removal, or land recovery activities; and
- The government-led clearance process was undertaken independently by the competent authorities prior to Project site allocation.

This indicates that the government-led land clearance process was not implemented as a resettlement process in accordance with IFC PS5 or EBRD ESR5 requirements. However, available evidence demonstrates that the agricultural users entered the land after the legal designation of the area in 2016 for renewable energy development purposes.

In addition, meeting records and technical documentation indicate that the majority of land users were agricultural investors rather than small-scale farmers or subsistence-dependent households, and that they were not members of nearby local communities in Minya Governorate surrounding the Project area.

Based on the requirements of International Finance Corporation Performance Standard 5 (PS5) and European Bank for Reconstruction and Development ESR5, individuals occupying land after the established cut-off date are generally not considered eligible for compensation or resettlement assistance, particularly where the land had already been formally allocated for public interest or development purposes prior to the commencement of informal occupation. In this context, the technical memorandum considers the current agricultural users to be "post cut-off occupants," and therefore, the compensation and resettlement requirements under PS5/ESR5 are not considered applicable

Accordingly, impacts related to land-use restrictions and involuntary resettlement are not considered applicable to the Project and are scoped out from further assessment.

6.3 Positive Impacts

Environmental Impacts

1. The Project is expected to result in a significant positive impact on climate change mitigation through the displacement of fossil fuel-based electricity generation. Based on the projected annual electricity generation and Egypt's grid emission factor, the Project is anticipated to achieve substantial avoided greenhouse gas (GHG) emissions, estimated at approximately 1.22 million tCO_2e per year[20], thereby contributing to a net reduction in emissions over its operational lifetime, as further detailed in Chapter 6.
2. The solar plant will not produce air pollutants like nitrogen oxides, sulfur oxides, and particulate matter during operation, unlike fossil fuel power plants.
3. PV power generation does not require water compared to traditional thermal power plants or Concentrated Solar Power (CSP) plants, helping conserve water resources in this desert area.
4. The inclusion of a BESS allows for better integration of renewable energy into the grid, potentially reducing the need for fossil fuel-based peaking power plants.

Socio-economic Impacts

1. The project is likely to provide around 5000 direct jobs at the PV project during the peak construction phase. The hiring and procurement policies, as well as the use of all local channels, official and societal, for job advertisement, would ensure maximizing the local hires from the surrounding communities and the Minya in general.
   Contractors will be encouraged to maximize the inclusion of workers from local communities, targeting more than the 50% local hiring threshold established by the

[20] The estimated avoided GHG emissions of approximately 1.22 million tCO_2e/year were calculated based on the Project's expected annual electricity generation and the applicable Egyptian grid emission factor. The calculation follows the equation:
Avoided GHG Emissions (tCO_2e/year) = Annual Net Electricity Generation (MWh/year) × Grid Emission Factor (tCO_2e/MWh).

Project.Once operational, it may provide about 30 permanent jobs for maintenance and operation.
2. During the construction phase, the project is expected to Indirectly support more than 500 jobs in the supply chain and related services.
3. Increased economic activity in Minya will likely boost local businesses and services.

The positive impacts of the project during the construction phase are short-term and highly beneficial due to the provision of a large number of direct and indirect job opportunities, thus the significance of the positive impacts is high.

The operation phase during its lifetime will provide a small number of direct and indirect job opportunities; however, this will be for the lifetime of the project. In addition, the project will significantly contribute to meeting the increasing energy demand. The positive impacts are long-term and highly beneficial, and thus their overall positive impact is high.

6.4 Assessment of Potential Negative Impacts and Proposed Mitigation Measures

6.4.1 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.

A. Potential Risks and Impact on the Physical Environment

- ***Potential Risks/Impacts on Air Quality***

Potential sources of air emissions include dust and particulate matter generated by excavation works, soil leveling, internal access road construction, and vehicle movement on unpaved surfaces, as well as emissions from uncovered truckloads transporting construction materials. In addition, exhaust emissions will arise from the operation of construction machinery, transport vehicles, and mobile diesel-powered generators. These emissions are expected to include nitrogen oxides (NOx), sulphur oxides (SO_2), carbon monoxide (CO), hydrocarbons (HC), greenhouse gases (GHGs), and total suspended particulates (TSP).

The aspect of air emissions from construction activities for the project will be localized and the construction phase is expected to last approximately 36 **months**, the activities will be **temporary** , with emission sources distributed across the site . The intensity of emissions is therefore expected to be **moderate**, considering the nature of the activities and the absence of high-intensity emission sources.

In addition, the project is located within an **open desert environment**, characterized by natural ventilation and the absence of physical barriers, which facilitates the dispersion of dust and gaseous emissions. Accordingly, the overall magnitude of this aspect is considered **SMALL**.

Given the separation distance between the project site and sensitive receptors, with the nearest residential area (New Minya City) located approximately 11.5 km west of the Project Site and outside the project Area of Influence (AoI). As a result, the susceptibility of the

surrounding environment to construction-related air emissions is considered **Medium**. Accordingly, the overall significance of the impact on air quality during the construction phase is assessed as **MINOR**.

Mitigation Measures

To address these potential impacts, mitigation measures would be implemented as the project management will ensure that the construction contractors will carry out the necessary measures to minimize impacts and include them in the contractors' agreements.

The following mitigation measures are usually used to minimize the impacts of construction activities on the air quality:

- Implement policies/procedures to reduce idling times for vehicles and machinery.
- Maintaining machinery and vehicles in good working conditions to minimize fugitive emissions and exhaust.
- Ensuring workers are aware of safe driving and maintain good practices in machinery usage.
- Emissions from power generator stacks will comply with Law 4/1994 and its relevant ERs.
- Dust damping where necessary water spraying of exposed soil, unpaved roads, and active construction areas, particularly during dry and windy conditions.
- Limiting vehicle speed within the site to reduce dust generation from traffic movement.
- Scheduling of earthworks during periods of lower wind intensity where feasible.

Residual Impacts

With the implementation of the proposed mitigation measures, the residual impacts of construction activities associated with the proposed project on workplace air quality are expected to be **INSIGNIFICANT**.

- ***Potential Impacts on Ambient Noise***

  The predominant noise generation during construction will result from the operation of heavy equipment, power generators, vehicle movement, and ramming for foundations. These **aspects** resulting from construction activities is expected to be localized within the project boundaries. The construction phase is anticipated to last approximately 36 **months**, representing a short-term duration. Given the temporary nature of the activities and the open, vacant setting of the Western Desert, the intensity of the noise aspect is considered **moderate** due to the use of typical construction machinery and intermittent high-noise activities such as ramming; however, these activities will not occur continuously or simultaneously across the entire site. In addition, the project is located within an open desert environment, with no surrounding structures that could reflect or amplify noise level . Accordingly, the overall magnitude of the impact is assessed as **SMALL**.

Table 6–1 presents typical noise levels, in decibels (dBA), expected at various distances from construction machinery.

Table 6–1: Average Noise Levels from Construction Equipment

Equipment Type	Distance from Noise Source (dBA)		
	10m	50m	100m
Ramming Machines[21]	100	88	80
Bulldozer	74	60	54
Generator	76	62	56
Backhoe	79	65	59

The potential impacts are anticipated to be temporary and largely confined to the on-site working environment. Given the separation distance between the project site and sensitive receptors, the wide undeveloped setting of the Western Desert, and the absence of nearby residential areas within the project Area of Influence (AoI), the susceptibility of the surrounding environment to construction-related noise is considered **low**. Workers are considered to be receptors of **medium sensitivity** due to occupational exposure. Accordingly, the overall significance of the impact on ambient noise during the construction phase is assessed as **MINOR**.

Mitigation Measures

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.

Residual Impacts

With the implementation of the proposed mitigation measures, the residual impacts of construction activities associated with the proposed project on **workplace noise levels** are expected to be **INSIGNIFICANT**.

- ***Potential Impacts on Soil***

Potential sources of impacts on soil during the construction phase include improper management of domestic wastewater and waste, construction waste, as well as accidental spills or leakages of fuels, lubricants, oils, and other chemicals from construction machinery and equipment. These may result in localized soil contamination if not properly managed.

The aspect related to soil disturbance and potential contamination is expected to be **localized**, as all construction activities will be confined within the project site boundaries. Although the construction phase is anticipated to extend over approximately **36 months**, the activities will be **temporary** , limiting the duration of exposure .

The intensity of the soil-related aspect is considered slight, as the handling and storage of potentially contaminating materials (e.g. fuels, oils, and chemicals) will be limited in quantity and controlled, and no large-scale hazardous material handling or high-risk industrial

[21] Noise Reduction System - IQIP

processes will be involved during construction. In addition, potential impacts are expected to occur only in the event of accidental spills, which are typically infrequent and site-specific. Accordingly, the overall magnitude of the impact is considered **SMALL**.

Construction activities are not expected to result in significant soil contamination requiring future decontamination or remediation measures. Given the project's location within the Eastern Desert and the absence of sensitive land uses within the project Area of Influence (AoI), the susceptibility of soil receptor is considered **MODERATE** receptor. Accordingly, the overall significance of the impact on soil during the construction phase is assessed as **MINOR**.

Mitigation Measures

Although the risks of the construction phase on the soil are limited, mitigation measures are recommended to manage the potential impacts.

- Maintain good housekeeping practices to ensure a clean and organized construction site.

Fuel/chemical Spills

- Conduct maintenance of vehicles, trucks, and construction equipment off-site to reduce on-site effluents and spills.
- Collect and dispose of spillages from tank filling or generator operation through licensed/authorized waste contractors.
- Develop and implement a spill management plan.
- Provide secondary containment systems for fuel storage areas, and the bunded areas will be designed with a capacity of at least 110% of the maximum volume of the largest single storage tanks.

Wastewater Management.

- Collect and transport wastewater by authorized contractors to ensure proper disposal and prevent contamination.

Non-Hazardous Solid Waste

- Collect 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.

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 proposed mitigation measures, the residual impacts of construction activities associated with the proposed project on soil are expected to be **INSIGNIFICANT**.

B. Risks and Impact on the Biological Environment

- ***Habitat loss, modification, and fragmentation***

  The Project Site lies within a hyper-arid desert landscape that differs markedly from surrounding ecological regions, such as the Nile Valley farmlands and reclaimed agricultural corridors.

  Construction activities associated with the project, including site preparation, installation of photovoltaic panels, construction of internal access roads, utilities, and fencing, will

result in localized and permanent modification of the existing desert habitat. These activities will alter soil characteristics and surface topography within the project footprint, leading to a conversion of the habitat from natural to modified conditions.

This impact is considered permanent and irreversible, unless the project is decommissioned and the site is restored. The spatial extent of the impact is limited to the project footprint. Given the relatively small footprint of the project when compared to the vast expanse of the Eastern Desert, the intensity of the impact is assessed as **moderate**, and the overall magnitude is considered **MEDIUM**.

The affected habitat is characterized by bare sandy soils with very limited biodiversity and low ecological value. Accordingly, the sensitivity and vulnerability of the receptor are considered low. Based on these factors, the overall significance of the impact prior to mitigation is assessed as **MINOR**.

Mitigation Measures

To address potential impacts on habitats, the project management will ensure that construction contractors implement the following mitigation measures, which shall be incorporated into contractual obligations:

- Limit construction activities strictly to the approved project footprint to avoid unnecessary disturbance of surrounding areas.
- Implement strict housekeeping practices onsite and offsite to prevent degradation of adjacent habitats.
- Avoid disturbance of offsite areas where any vegetation may be present.
- Enforce speed limits for all project-related vehicles to minimize fauna disturbance and collision risks.
- Provide environmental awareness training to workers on the importance of protecting natural habitats and avoiding wildlife disturbance.
- Where feasible, implement wildlife-friendly fencing designed to allow the safe movement of small fauna, including visible fencing and clearance at the lower fence line.

Residual Impacts

Following implementation of the above measures, residual impacts on habitat are expected to remain localized, very limited in extent, and are therefore considered **INSIGNIFICANT**.

- ***Disturbance to wildlife***

  Baseline ecological studies indicate that faunal diversity in the East Minya region is relatively low, with only a limited number of reptiles, mammals, and birds recorded, most of which are common and widely distributed across desert habitats in Egypt. Although a small number of migratory bird species of conservation concern may pass over the broader region, the project site itself does not provide attractive habitat features such as water sources, vegetation cover, or food resources that would encourage birds to land or remain within the site.

  During the construction phase, air emissions, noise and vibrations, light emissions, as well as a relatively large human presence, may affect local wildlife potential Priority

Biodiversity Features (PBFs) at the wider area level, and possibly within the EAAA. These stressors may drive fauna, if available, away from the site, whose area is, however, considered to be very limited. These factors may lead to short-term displacement of fauna from the project site Heavy machinery may also cause localized soil compaction and potential disturbance to burrows, if present. While soil compaction effects may persist beyond the construction phase, the associated ecological impacts on fauna are expected to be temporary, given the limited footprint of disturbance and the availability of suitable surrounding habitats.

These impacts are expected to be short term and confined to **the study area**. The intensity of disturbance to wildlife is assessed as **moderate**, and the overall magnitude is considered **MEDIUM**.

Considering the low ecological sensitivity of the site and the availability of extensive surrounding desert habitats, the overall significance of the impact prior to mitigation is assessed as **MINOR.**

Mitigation Measures

The following measures will be implemented to minimize disturbance to wildlife during construction:

- Develop and implement a solid waste, hazardous waste, and wastewater management plan to prevent attraction of fauna.
- Maintain good housekeeping practices across all construction areas.
- Provide environmental awareness training to workers on minimizing wildlife disturbance.
- Enforce speed limits and prohibit off-track driving by construction vehicles.
- Ensure regular maintenance of construction equipment to minimize noise and vibration emissions.

Residual Impacts

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

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

Improper management of solid waste and wastewater during construction could result in localized accumulation of water and organic material, potentially attracting pests such as insects and rodents, as well as non-native or invasive species, including feral dogs and cats. In arid desert environments, such artificial water or food sources may temporarily attract fauna that would otherwise not utilize the site.

This risk is short term and at a localised level. If this risk is improperly managed, it could be of medium intensity. The magnitude is therefore considered **Small** as it is not continuous nor persistent. Given the long distance form where alien species could come, it has a low probability of occurrence, although it might increase with the advent of land reclamation closer to the project site. Accordingly, this impact is deemed **MINOR**.

Mitigation Measures

To prevent pest attraction and invasive species propagation, the following management measures will be implemented:

- Develop and implement a solid waste, hazardous waste, and wastewater management plan covering collection, storage, transport, and disposal.
- Ensure food storage and eating areas are secured and inaccessible to animals.
- Enforce strict housekeeping practices across all construction and accommodation areas.
- Provide worker awareness training on the environmental risks associated with improper waste and wastewater management.

Residual Impacts

With the full implementation of the proposed mitigation measures, residual impacts related to pest attraction and invasive species propagation are expected to be **INSIGNIFICANT**.

- ***Impacts on Socio-economic Environment***
- ***Water Resources***

During the construction phase, the site is expected to require approximately 150 m^3/day of water to meet the workforce demand. This includes water for both drinking and sanitary purposes, based on an estimated consumption rate of 30 liters/person/day (5 liters for drinking and 25 liters for sanitary use), assuming a peak workforce of approximately 5,000 workers.

Bottled water will be supplied for drinking, while water required for sanitary use will be delivered to the site by licensed water tankers and stored in designated on-site tanks. Water will be sourced from an approved supplier, likely the New Minya water treatment plant. In addition, a limited quantity of water will be required for construction-related activities, including concrete curing and other building purposes.

According to the meeting with the Deputy Head of New Menya Urban Authority it was indicated that the design capacity of Water treatment capacity in new Menya city is about 95,000 m3/day to be operated in two phases of 45,000 and 50,000 m3/day. The current production of the first phase is 36,000m3/day. In this respect, the project's water consumption is minimal compared to the water plant capacity, resulting in limited impact. In addition, the construction activities within the new Menya city are still on going and have not yet reached its maximum capacity. Accordingly, the current excess capacity makes it easy to supply the water needs of the project. Wastewater treatment capacity is also available.

The **aspect related to water consumption** arising from construction activities of the Energy Valley Project will be within the district level. The construction phase is anticipated to last approximately 36 **months**, representing a short-term duration. Given the limited quantities of water required and the temporary nature of the activities, the intensity of this aspect is expected to be slight. Accordingly, the overall magnitude of the aspect is considered **SMALL**.

Given the excess capacity in water treatment plant, the susceptibility of water resource receptors is considered **LOW.** Therefore, the overall significance of the impact on water resources during the construction phase is assessed as **INSIGNIFICANT**.

Mitigation measures:

In order to ensure that the impact remains insignificant, the following measures will be implemented:

- The Contractor will source water only from licensed and approved water supply facilities and transport it to the site using authorized tanker trucks.
- A Water Management Plan will be implemented as part of the Construction Environmental and Social Management Plan (CESMP), including procedures for water supply, storage, monitoring, and reporting, which will be developed by EPC before starting construction activities.
- Water consumption will be regularly monitored and recorded.
- Water-saving practices will be applied during construction activities, including controlled use of water for dust suppression and equipment cleaning
- Storage tanks and distribution lines will be regularly inspected to prevent leakage or water losses.

Residual Impacts

No residual impacts

- ***Worker Influx***

The influx of workers can strain local resources such as water, food, and housing, potentially leading to shortages and increased prices for local communities. Workers' influx may also result in raising apartment rents in the communities closest to the site. This, however, does not apply to larger urban centers at commuting distance, such as New Menya city, especially since the non-local worker influx will not be significant relative to the size of these communities. Discussions with New Menya Urban Authority indicated that large number of the existing buildings are not yet occupied, thus providing sufficient workers accommodation. However, it was recommended to avoid concentrating large number of workers (especially unskilled workers), in one neighbourhood to avoid potential disturbances to the communities and related to community safety, including Gender-Based Violence (GBV) and Sexual Harassment (SH).

Additionally, the presence of a large workforce can increase the generation of waste, including solid waste and sewage, potentially impacting local sanitation and health. However, the risk of disruption to local communities related to speculative job seekers is minimal, as no hiring will be conducted at the project site gate and all recruitment will be managed through formal channels.

The hiring policy entails maximizing utilization of local employment. Contractors will be encouraged to continuously increase the percentage of local hire, while higher qualifications, potentially not available locally, will be sought from outside the surrounding communities.

The EPC Contractors will be required to prepare labour management plans including Code of Conduct to be implemented for the construction phase of the project as well as development of a code of conduct for workers that takes into account the appropriate behaviour of workers at all times including the respect of customs and practices, traditional cultures and social norms of the region. In addition, it will include specific requirements regarding social issues, including violence, exploitation, sexual abuse and harassment.

In this context, the aspect during construction is **MINOR**, short-term. and the overall magnitude of the aspect is assessed as **SMALL**.

Therefore, the overall significance of the impact is assessed as **MINOR**.

Mitigation measures

- Prioritise hiring local workers not only to increase benefits to local communities, but also to reduce the number of incoming workers and minimize social disruption.
- Prohibit "hiring at the door" to control speculative job seekers. Job advertisement and applications receipt will be through the governorate labour office.
- Provide adequate on-site accommodation facilities for workers to prevent overburdening local infrastructure.
- Implement and monitor site-specific waste management procedures for on-site camp, including segregation, safe storage, and proper disposal of waste through licensed contractors.
- Develop Workers' Code of Conduct to ensure respectful behavior toward local communities, compliance with health and safety standards, and prevention of GBV/SH incidents

Residual impacts

By implementing the above mitigation measures, the residual impacts of the construction activities on the social environment will be **INSIGNIFICANT.**

C. Impacts on infrastructure and land use

- ***Impacts on land use***

Large-scale PV facilities can raise concerns about land uptake. Concerning the subject project, it will be located in a desert and unoccupied land, which is allocated by NREA for solar energy power generation. No land ownership claims or other types of land uses exist at the project site.

However, as described in Section 3.3.5, a number of informal agricultural activities had previously taken place within parts of the proposed Project Site. Prior to the handover of the land for project development, these activities had been dismantled.

The environmental aspect related to land use change associated with the project will be localized within the project boundaries. Project activities will be limited to the designated site and will not extend into adjacent areas. Given the designated land use and the absence of competing land uses, the intensity of this aspect is considered **slight**. Accordingly, the overall magnitude of the impact is assessed as **SMALL**.

The project does not involve displacement, loss of access, or restriction of existing land uses. The susceptibility and value of the land resource are therefore considered **LOW**. Consequently, the overall significance of the impact on land use prior to mitigation is assessed as **INSIGNIFICANT**, with no further reduction requiring mitigation.

- ***Traffic***

Trucks of various sizes will be required for the transportation of the project's components, materials, and equipment, distributed throughout its construction period of about 36 months, with varying intensities.

The main road leading to the site, the Ras Gharib–Minya Road, is situated at an approximate distance of 4 km north of the site. This road is a dual-lane paved roadway accommodating different types of transport means.

The **environmental and social aspect related to traffic** arising from construction activities of the Energy Valley Project will be confined to the project access routes. Given the temporary nature of construction traffic and the short-term duration of the construction phase, the intensity of this aspect is considered **moderate**, and the overall magnitude of the aspect is assessed as **MEDIUM**. The susceptibility of receptors, including road users and nearby communities, is considered **MODERATE**, and the overall significance of the impact before mitigation is assessed as **MODERATE**.

Mitigation Measures

Energy Valley PV project shall develop Transportation Management Procedures that apply to the construction, including contractors and subcontractors. The procedure defines the minimum safety requirements for Energy Valley's transportation activities. The requirements are supplementary to national regulatory specifications, and/or insurance requirements. Moreover, the timing of transportation will be coordinated with the traffic department to avoid as many problematic routes/segments and specific times of the day with high traffic volumes.

Residual impacts

With implementation of the traffic policy and management procedures, the residual impacts are expected to be **MINOR**.

D. Occupational health and safety

During the construction phase, workers may be exposed to various occupational hazards, including:

- Accidents involving heavy machinery such as excavators, and pile drivers and physical injuries during the ramming activities.
- Electrocution or electrical fires from improper handling of electrical equipment and installations.
- Exposure to hazardous chemicals such as fuels, solvents, and cleaning agents.
- Injuries from lifting, carrying, or moving heavy materials.
- Fires from flammable materials, electrical faults, or hot work activities.
- Heat exhaustion or heat stroke from working in high temperatures.

The **health and safety aspect** associated with construction activities of the Project will be localized within the project site and is anticipated to occur over the 36 **month construction period**, representing a short-term duration. Given the nature of construction activities (all close to the ground), the intensity of this aspect is considered **moderate**, and the overall magnitude of the aspect is assessed as **MEDIUM**. The susceptibility of receptors (trained construction workers) is

considered **MEDIUM**, and the overall significance of the risk prior to mitigation is assessed as **MODERATE**.

Mitigation Measures

To effectively manage and mitigate OHS risks during the construction phase, EPC Contractors shall develop, implement a Construction Environmental and Social Management Plan (CESMP) prior to the commencement of construction activities. The CESMP shall include a comprehensive Occupational Health and Safety (OHS) Management Plan that applies to all workers, contractors, and subcontractors engaged in the Project .

The OHS Management Plan shall include a detailed OHS Risk Assessment covering all construction activities, clearly defined mitigation and control measures, incident reporting and investigation procedures, and emergency preparedness and response plans addressing medical emergencies, fire incidents, electrical hazards, and extreme weather conditions. As part of the implementation of the OHS Management Plan:

- The excavation sites will be surrounded with warning signs to prohibit access to these places;
- Contractors will ensure that construction workers will be continuously supervised, through the continuous presence of on-site supervisor(s)
- Ensure proper training for operators, regular maintenance of equipment, and implementation of safety protocols.
- Use of personal protective equipment (PPE), proper storage and labelling of chemicals, and training on handling hazardous materials.
- Provide hearing protection, implement noise control measures, and schedule regular breaks for workers.
- Provide training on proper lifting techniques, and the use of mechanical aids, and encourage team lifting for heavy loads.
- Implement fire prevention measures, maintain fire extinguishers on-site, and conduct fire safety training.
- Provide adequate hydration, schedule work during cooler parts of the day, and allow for regular breaks in shaded areas.
- Restrict vehicles speed so that they do not exceed the safety limit inside the site premises (15-20 km/h)
- All equipment will be inspected before the start of the job to ensure the safety of the workers.

Residual risks

With the implementation of the OHS Management Plan and the above mitigation measures, residual impacts on worker health and safety are expected to be **MINOR**.

E. Impact of site security

During the construction phase, the project will require on-site security services to control access and safeguard workers, equipment, and facilities. Security services will be provided by a licensed security company contracted on an annual basis, with trained security guards deployed on rotating shifts within the project premises. If not properly managed, the presence and conduct of security personnel may give rise to potential social impacts.

The **aspects related to site security arrangements** arising from the project will be localized within the project boundaries. The construction phase is anticipated to last approximately 36 **months**, representing a short-term duration. Given the continuous presence of security personnel during construction activities, the intensity of this aspect is considered **moderate** due to the continuous presence of security personnel throughout the construction phase and the potential for interaction with workers. Accordingly, the overall magnitude of the impact prior to mitigation is considered **MEDIUM**.

Given the project's remote desert location and the absence of nearby residential communities, interactions between security personnel and surrounding communities are expected to be limited. Accordingly, the susceptibility of receptors is considered **LOW**. Therefore, the overall significance of the impact associated with site security during the construction phase is assessed as **MINOR**.

Mitigation measures

The security personnel will be adequately trained, have appropriate conduct toward workers and the community, and 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

By implementing the above mitigation measures, the residual impacts will be **INSIGNIFICANT.**

F. Impact on Cultural Heritage

Construction activities associated with the project, including excavation, soil leveling, foundation works, and installation of infrastructure, have the potential to result in accidental discovery of previously unknown or buried archaeological materials. Such impacts, if they occur, would be associated primarily with ground disturbance activities during the construction phase.

Any potential aspects is expected to be localised within the **project footprint**, as all excavation and construction activities will be confined to the project site. The construction phase is temporary (short-term); however, any impact on cultural heritage resources, if encountered, would be permanent and irreversible (long-term in effect).

The **intensity of the aspect is assessed as Moderate**, as the buildings needing excavations for foundation are limited and so is the depth of foundations. Accordingly, the **overall magnitude of the aspect is considered SMALL**. Given the nature of the site, its remote desert location, and the absence of known cultural heritage features[22], the likelihood of encountering cultural heritage resources is **low** Accordingly, the **overall significance of the impact prior to mitigation is assessed as MINOR**.

[22] The nearest archaeological sites are Beni Hassan Rock-Cut Tombs and Tal El Amarna site located respectively at 14 and 41.5 km southwest of the proposed project site

Mitigation Measures

To ensure compliance with national regulations and international lender requirements, the project will implement the following mitigation measures:

- Implement a Chance Find Procedure consistent with national legislation and IFC Performance Standard 8, to be applied in the event that any archaeological remains or culturally significant materials are discovered during construction.
- Ensure that all construction contractors and site personnel are informed and trained on the Chance Find Procedure prior to the commencement of ground-disturbing activities.
- In the event of a chance find:
  - Immediately suspend work in the vicinity of the discovery;
  - Secure and demarcate the area to prevent damage or unauthorized access;
  - Notify the relevant competent authorities; and
  - Resume work only after clearance and guidance are provided by the competent authority.
- Limit excavation and ground disturbance activities strictly to approved areas and depths.

Residual Impacts

With the implementation of the Chance Find Procedure and associated mitigation measures, the residual impact on cultural heritage is expected to remain **INSIGNIFICANT**. The project is therefore not anticipated to result in adverse impacts on known or unknown cultural heritage resources.

Table 6–2 shows the risk and impact assessment matrix for the construction phase.

Table 6–2: The Impact Assessment Matrix for the Construction Phase

Impacts/Risks		Without Mitigation						Significance of Residual Impacts after Mitigation
		Temporal scale	Spatial Scale	Severity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor	Significance of Impact before Mitigation	
PV project								
Construction Phase (36 months)								
Air Quality		**Short term**	***Localized***	***Moderate***	***Small***	***Medium***	***Minor***	***Insignificant***
Ambient Noise		**Short term**	***Localized***	***Moderate***	***Small***	***Medium***	***Minor***	***Insignificant***
Soil		**Short term**	***Localized***	***Moderate***	***Small***	***Medium***	***Minor***	***Insignificant***
Biological Environment	Habitat loss, modification, and fragmentation	**Permanent and irreversible**	***Study area***	***Moderate***	***Medium***	***Low***	***Minor***	***Insignificant***
	Disturbance to wildlife	**Short term**	***Study area***	***Moderate***	***Medium***	***Low***	***Minor***	***Insignificant***
	Attraction of pests and invasive species	**Short term**	***Localized***	***Moderate***	***Small***	***Low***	***Minor***	***Insignificant***
Socio economic Environment	Water resources	**Short term**	***district***	***Slight***	***Small***	***Low***	***Insignificant***	***No residual impacts***
	Worker Influx	**Short term**	***regional***	***Slight***	***Small***	***Medium***	***Minor***	***Insignificant***
Infrastructure	Land use	**Short term**	***Localized (project access roads)***	***Slight***	***Small***	***Low***	***Insignificant***	***No residual impacts***
	Traffic			***Moderate***	***Medium***	***Medium***	***Moderate***	***Minor***
Occupational Health and Safety		**Short term**	***Localized***	***Moderate***	***Medium***	***Medium***	***Moderate***	***Minor***
Site Security		**Short term**	***Localized***	***Moderate***	***Medium***	***Low***	***Minor***	***Insignificant***
Cultural Heritage		**Short term**	***Localized***	***Slight***	***Small***	***Low***	***Minor***	***Insignificant***

6.4.2 Potential risks and impacts during the Operation Phase

A. Potential risks and impact on the Physical Environment

- ***Potential Impacts on Ambient Air Quality***

During the operation phase, potential impacts on ambient air quality may arise from the intermittent operation of backup diesel generators during grid outages or scheduled maintenance activities. In addition, where gas-insulated switchgear is employed, there is a potential for limited releases of SF_6 during equipment servicing or decommissioning. SF_6 is a high-global-warming-potential gas commonly used in medium- and high-voltage electrical systems; however, modern GIS equipment is engineered to minimize emissions under normal operating conditions.

The environmental aspect related to operational air emissions will be confined to the project footprint and is expected to occur on an occasional and short-term basis, given the limited operating hours of backup generators and the controlled handling of electrical equipment. Accordingly, the intensity of this aspect is considered **slight**, and the overall magnitude of the impact is assessed as **MEDIUM**.

The project is located in a **remote desert setting**, characterized by the absence of nearby sensitive receptors. As a result, the susceptibility of air quality receptors is considered **LOW**. Based on the above considerations, the overall **significance of impacts on ambient air quality during the operation phase is assessed as MINOR**.

Mitigation Measures

The company will ensure the following

- Optimize the operation of backup generators to reduce usage and emissions.
- Conduct annual stack emission measurements for the emergency generators
- If SF6 is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair, use proper chamber vacuums during filling the SF6 into the GIS, and employee education/training.

Residual Impacts

By implementing the above mitigation measures, the residual impacts will be **INSIGNIFICANT.**

- ***Potential Impacts on Workplace Noise & Vibration***

Potential noise may arise from the following;

- Continuous functioning of electrical equipment, including transformers, inverters, and other components of the battery energy storage system.
- Intermittent operation of backup generators during grid outages or maintenance activities.

Table 6–3 below shows the expected noise levels from different Instrumentation in the workplace

Table 6–3: Expected noise levels from different Instrumentation in the workplace

Noise source	Noise level (dB(A)	Location
Invertors[23]	75dB	Inside the inverter room
Transformer[24]	64dB	Outside transformer room

**At 10m from the source*

The noise and vibration aspect associated with operational activities will be confined to the project footprint and will occur on a continuous but low-intensity basis for fixed equipment, and on an occasional basis for backup generators. Given the localized nature of the sources, the intensity of the workplace noise and vibration is considered **slight**, and the overall magnitude is assessed as **SMALL**. Accordingly, receptor susceptibility is considered **medium to low**, and the overall significance of operational noise and vibration impacts is assessed as **MINOR to INSIGNIFICANT**.

Mitigation Measures

- Potential noise-generating machines and equipment are designed to meet statutory regulations concerning noise.
- Workers at noise-generating machinery and equipment will be provided with suitable personal protective equipment (PPEs).

Residual Impacts

With the implementation of the proposed mitigation measures and occupational health and safety procedures, operational noise and vibration impacts will be effectively controlled. Accordingly, residual impacts during the operation phase are assessed as **INSIGNIFICANT**.

B. Potential risk on Biodiversity

- ***Disturbance to wildlife (excluding avifauna)***

Operational activities at the site will not generate air emissions, significant noise, or vibrations from machinery. Human presence is expected to be limited to approximately 100 personnel. The site fencing, installed during the construction phase, already restricts fauna movement; however, the design allows for small-scale passage underneath, maintaining connectivity for local terrestrial species. Consequently, habitat fragmentation within the project area is minimal.

Artificial light at night (ALAN) associated with operational activities may represent a potential source of disturbance to nocturnal fauna. However, operational lighting will be limited primarily to security-sensitive areas, substations, operation and maintenance facilities, access control points, and emergencies. The PV arrays themselves will not require continuous nighttime illumination.

Given the remote desert location, the absence of critical habitats and ecologically sensitive receptors within the Project footprint, and the use of appropriately designed lighting systems, any increase in ambient light levels is expected to be localized around illuminated infrastructure. Consequently, potential impacts on nocturnal wildlife behaviour, movement, foraging, or habitat use are anticipated to be limited and localized.

[23] https://www.solarctrl.com/blog/solar-inverter-noise-levels/
[24] https://new.abb.com/transformers/support/noise-in-transformers

Considering these factors, potential disturbances to wildlife are expected to be ***slight*** in intensity, of long term and localized. Their magnitude is considered **MEDIUM**. while the **vulnerability of the receptors** is low. Therefore, the overall significance of this impact is classified as **MINOR**.

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 the growth of marginal vegetation, attraction of vermin and opportunistic species and the potential consumption of waste from desert species;
- Provide awareness to the workers on the negative impacts of disturbing any wild fauna;
- Ensure proper housekeeping practice;
- Ensure that food storage areas are inaccessible to animals;
- Minimize artificial lighting to that required for operational safety and security purposes only.
- Use fully shielded, downward-directed luminaires to minimize light spill beyond operational areas.
- Avoid unnecessary upward lighting and excessive illumination levels.
- Utilize motion sensors, timers, or smart lighting controls where practicable.
- Use lighting with reduced blue-spectrum emissions where technically feasible to minimize attraction and disorientation of nocturnal fauna.Ensure speed control and the prohibition of off-track driving;
- Ensure the proper maintenance of equipment and any other equipment with high noise and vibration potential;
- Ensure that the generators are properly insulated to avoid noise emissions; and
- Ensure that workers do not disturb native fauna potentially encountered.

Residual Impacts

With the proper implementation of the mitigation and management measures the impacts on biodiversity are deemed to be **INSIGNIFICANT**.

- ***Risks and Impacts on Avifauna***

Lake effect

The smooth and uniform surface of PV solar plants similar to a sheet of water, as they reflect light like a lake or a pond, are said to attract birds. While there has been no sufficient evidence that PV is reflective surface to be mistaken by lake surfaces to attract birds[25], this might be particularly relevant in a desert environment where water bodies are scarce.

In the context of the project site, which is located in a desert environment with low ecological attractiveness, this potential effect is considered limited. For tracking systems, panel alignment occurs only during a short periods of the day, further reducing any potential reflectivity effect. In addition, PV modules are typically equipped with anti-reflective coatings, and aluminum panel framing interrupts continuous reflective surfaces, improving visibility to bird.

[25] Guidelines to minimize the impact on birds of Solar Facilities and Associated Infrastructure in South Africa. Smit, Hanneline A., BirdLife South Africa, 2012

Accordingly, the potential lake effect during operation is expected to be **very limited**, localized to the **study area**, of **slight intensity**, and thus **of small magnitude**.

Based on baseline findings, The avifauna passing over the area is considered of **Medium** importance due to their small number, low abundance and the potential presence of five threatened species. Therefore, the **overall significance of impact is assessed as MINOR**.

Collision risk

PV panels will have a maximum height of approximately 3 m above ground level, while operation and maintenance buildings will not exceed 5 m in height. These low-profile structures do not intersect with typical avian flight altitudes, particularly for migratory soaring birds.

In addition, the Project includes an internal 33 kV medium-voltage overhead transmission line (MV OHTL) network comprising 12 parallel lines supported by towers reaching up to approximately 32 m in height along a corridor of approximately 5.8 km, as described in Section 4

While overhead transmission lines may present a potential collision risk to birds, particularly due to the presence of conductors and earth wires, the likelihood of collision is expected to be limited given the low sensitivity of the Project area and the absence of significant bird concentrations within the Project footprint.

Furthermore, the project footprint lacks ecological features that could attract birds to rest, roost, or forage. Baseline assessments confirm that there is no functional relationship between avian movement patterns and the terrestrial characteristics of the project site. Birds are therefore expected to rarely fly low over or land within the project area, except under occasional or accidental circumstances.

Accordingly, the collision risk associated with the Project infrastructure, including the PV panels and internal 33 kV MV OHTL network, during operation is considered **long term but very limited**, **localized**, of **slight intensity**, and accordingly of a **SMALL magnitude**. The receptor (avifauna) is of **Low** vulnerability. The overall significance of impact is assessed **as INSIGNIFICANT**.

Mitigation Measures

- Maintain effective waste and wastewater management to avoid creating conditions attractive to birds.
- Ensure regular site inspections to remove any potential attractants.
- Maintain panel surfaces and frames to preserve visibility and minimize glare.

Residual Impacts

With the implementation of the proposed mitigation measures, residual collision impacts on avifauna during the operation phase will remain **INSIGNIFICANT**.

Electrocution risk

The project substation and associated internal electrical infrastructure, located entirely within the project footprint in East Minya, may pose a potential electrocution risk to avifauna during the operation phase. This risk could occur where energized electrical components are accessible for perching, particularly at conductor–structure interfaces within the substation yard.

Electrocution may occur if birds simultaneously contact energized conductors and grounded metallic components, or two energized components, particularly when perching or extending their wings. Large birds with wide wingspans are generally more vulnerable to such risks.

Although the probability of bird interactions with electrical infrastructure is considered low due to the limited avifaunal activity in the project area, a single electrocution event could be significant, particularly for large-bodied or threatened species.

Although avifaunal activity within the project area is considered **low**, a **precautionary approach** is adopted due to the possible presence of migratory or regionally important species in the wider desert landscape.

This potential impact is considered **long-term** and **localized to the study area**. Despite the low likelihood of occurrence, the **severity is precautionarily assessed as moderate**, and the **overall magnitude is considered MEDIUM**. Given the vulnerability of certain avifaunal receptors, the **overall significance of electrocution risk prior to mitigation is assessed as MODERATE**.

Mitigation Measures

To reduce the risk of avifaunal electrocution during the operation phase, the following mitigation measures will be implemented within the project substation and associated internal electrical installations:

- Adequate separation distances between energized components and earthed structures, in line with international good practice;
- Increase the use of insulated conductors and fittings at locations where birds could potentially perch;
- Cover exposed conductive elements with insulating materials where required, subject to engineering design constraints; and
- Conduct regular inspections and maintenance to ensure the continued effectiveness of avifaunal protection measures.

Residual Impacts

With the effective implementation of the above mitigation measures, the residual electrocution risk to avifauna during the operation phase of the East Minya project is expected to be **MINOR to INSIGNIFICANT**.

C. Risks and Impacts on Social Environment

- ***Water Resources and wastewater***

During the operation phase, water demand will be limited and primarily associated with sanitary uses, as PV module cleaning will be undertaken using a dry-cleaning method. Given the small number of operational staff present on-site, water consumption and wastewater generation will remain low.

The water-related aspect associated with operational activities will occur on a continuous but low-volume basis over the long term. Due to the limited quantities involved, the intensity of the impact is considered slight, and the overall magnitude is assessed as **SMALL**. Accordingly, the susceptibility of water resource receptors is considered **LOW**, given the absence of reliance on local community water resources. Accordingly, the overall significance of impacts on water resources during the operation phase is assessed as **INSIGNIFICANT**.

Management Measures:
No specific mitigation measures are required given the limited water consumption and wastewater generation during the operational phase. However, management measures are implemented, whereby wastewater generated during operation will be collected by a licensed contractor and transported to designated and approved treatment plants.

Residual Impacts
The implementation of management measures will ensure that the impacts remain **INSIGNIFICANT**

- ***Waste generation***
  Non-Hazardous Solid Waste
  Non-hazardous waste generated during the operation phase will mainly consist of domestic waste from staff activities. Waste quantities are expected to be limited due to the small workforce present on-site.

- **Hazardous Waste**
  Hazardous waste during the operation phase may include limited quantities of waste oils, electrical components, spent chemicals, and end-of-life lithium-ion batteries .

  Waste generation will be continuous but low in volume, localized within designated storage areas, and managed through licensed contractors and authorized treatment or recycling facilities. Given the controlled handling, and limited quantities, the intensity of the hazardous waste generation is considered **slight**, the overall magnitude is **SMALL**, and soil susceptibility is **LOW**. Accordingly, the overall significance of waste generation impacts during operation is assessed as **INSIGNIFICANT**.

Management Measures
No specific mitigation measures are required given the low volumes of waste generated during operation. However, the following management measures are implemented :
- Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors.
- Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors.
- End-of-life batteries and damaged PV modules will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available.

Residual Impacts
With proper waste management in place, residual impacts related to both hazardous and non-hazardous waste are assessed as **INSIGNIFICANT**.

- ***Visual effects***

The Project site is located in a flat desert landscape characterized by low visual sensitivity and the absence of distinctive visual features or valued views. Visual receptors in the surrounding area are limited, and the nearest residential area (New Minya City) is located approximately 11 km from the site.

Visual effects associated with the operational phase will be long-term. Given the distance to sensitive receptors and the low sensitivity of the surrounding landscape, the intensity of visual impacts is considered **slight**, the overall magnitude is **SMALL**, and receptor susceptibility is **LOW**. Accordingly, the overall significance of visual impacts during operation is assessed as **INSIGNIFICANT**.

- ***Glint and Glare***

Due to the presence of potential receptors in areas near the project, a solar glare (glint and glare) assessment was conducted for the proposed project. The assessment aims to determine whether glare occurs, evaluate its intensity, and identify any potential mitigation measures, if required, to ensure minimal adverse impacts on sensitive receptors during the early stages of project development.

Land use and activities within the area of influence were analyzed to identify observers potentially affected by solar glare from the photovoltaic (PV) panels, along with their locations and elevations.

The assessment was carried out using the Environics in-house solar glare model, an analytical tool designed to evaluate the probability of solar glare resulting from the reflection of solar radiation from PV surfaces toward observer locations. The model is based on a physical and engineering framework integrating solar geometry, surface reflection characteristics, and observer visual fields.

The model calculates the apparent position of the sun using established solar geometry algorithms, including solar azimuth and elevation angles, based on geographic location, time, and meteorological conditions (e.g., Michalsky algorithm). An average observer eye height of 1.6 meters was adopted, representing typical human eye level for pedestrians, drivers, and occupants of nearby receptors. The detailed methodology and the technical assessment results are presented in Annex (3).

Seven receptors were selected (with average height of 1.6 m) to represent the sensitive areas located within the solar glare impact zone, as follows:

- **Observer 1**: Located on the eastern side of the project in the southern section of the Assiut-Cairo Road, representing a road user for whom an exposure is expected during the morning hours of the project's operational period.
- **Observer 2**: Located on the eastern side of the project in the central section of the Assiut-Cairo Road, representing a road user for whom an exposure is expected during the morning hours of the project's operational period.
- **Observer 3**: Located on the eastern side of the project, representing a roadside rest area along the Assiut-Cairo Road. The potential for exposure is expected during the morning hours of the project's operational period.

- **Observer 4**: Located on the eastern side of the project in the northern section of the Assiut-Cairo Road, representing a road user approaching from the upstream direction, for whom exposure is expected during the morning hours of the project's operational period.
- **Observer 5**: Located on the western side of the project, representing a residential area for nearby farmers. The potential for impact is expected during late evening hours of the project's operational period.
- **Observer 6**: Located on the western side of the project, representing a small residential area. The potential for impact is expected during late evening hours of the project's operational period.
- **Observer 7**: Located on the western side of the project in the Minya-Wasta Road, representing a road user approaching from the upstream direction, for whom exposure is expected during late evening hours of the project's operational period.

The following figure illustrates the locations of the selected receptors.

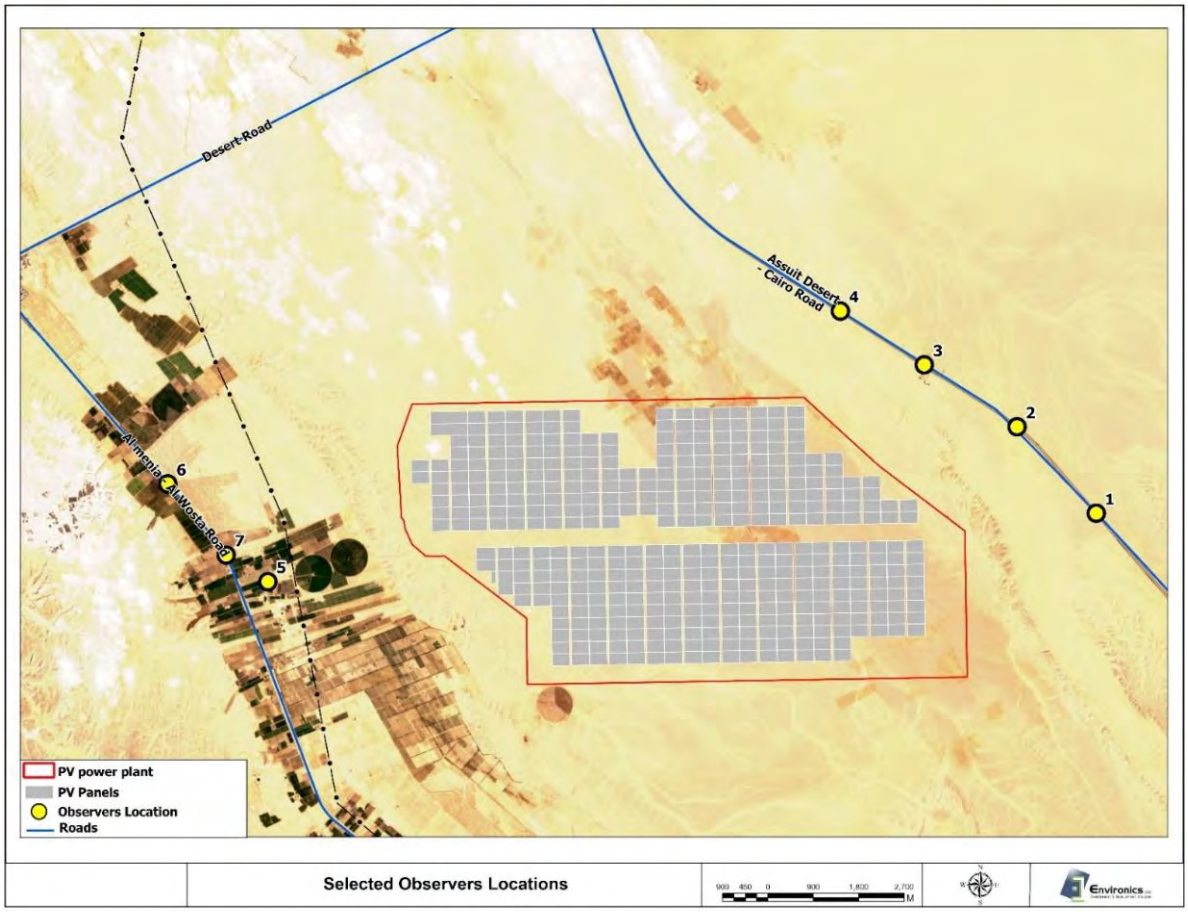


Figure 6–1: Selected observers' location

The following figure illustrates a snapshot from the model interface used for simulating and assessing solar glare.

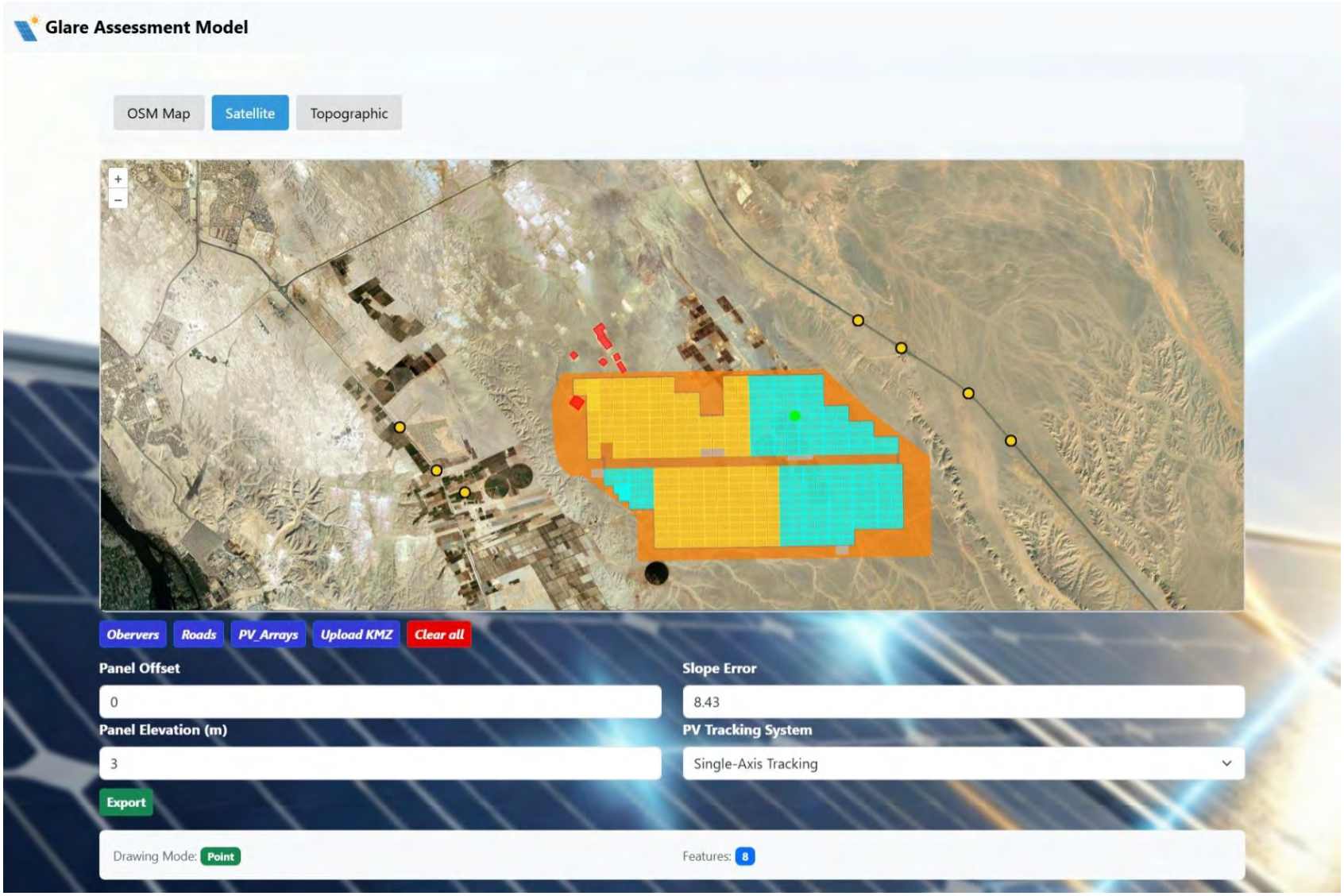


Figure 6–2: Snapshot from the model used for simulating and assessing solar glare

The following table summarizes the results and the potential impacts on receptors from the project's possible solar glare.

Table 6–4: The results and the potential impacts on receptors

Observer	Glare detection	Impact
Obs1	No glare exposure for observer1	No impact
Obs2	No glare exposure for observer2	No impact
Obs3	No glare exposure for observer3	No impact
Obs4	No glare exposure for observer4	No impact
Obs5	No glare exposure for observer5	No impact
Obs6	No glare exposure for observer6	No impact
Obs7	No glare exposure for observer7	No impact

Accordingly, no adverse impacts related to solar glare are expected during project operation. The absence of glare impacts is attributed to a combination of geometric, spatial, and optical factors:

- PV panels are oriented such that reflected sunlight is directed upward and northward, following sun path geometry.
- Differences in elevation between the panels and surrounding receptors reduce the likelihood of direct line-of-sight reflection.
- Observers are located at relatively large distances from the PV arrays.
- Increased separation reduces both the probability and intensity of potential glare exposure.
- PV modules are equipped with anti-reflective coatings, significantly reducing surface reflectivity.
- The resulting reflection spread angle is approximately 3.15°, which limits dispersion of reflected light.
- Reduced angular spread further minimizes the likelihood of exposure to observers.

Based on model results and site-specific conditions, no potential for solar glare exposure was identified for any of the selected receptors. Consequently, no associated impacts are anticipated during the operational phase of the project.

This outcome is supported by the combined effects of panel orientation, receptor distance, elevation differences, and the optical properties of PV modules, all of which effectively eliminate glare risk under the assessed conditions.

Management Measures

No additional mitigation measures are required beyond standard operational and maintenance practices, such as ensuring the cleanliness of panels and maintaining their anti-reflective coatings in good condition throughout the operational life of the project.

Residual Impacts

Based on the above analysis, the potential glint and glare impact of the Energy Valley Solar Power and Battery Storage Project is assessed as **INSIGNIFICANT.**

D. Occupational Health and Safety

During the operation phase, potential workplace impacts are primarily associated with the maintenance or replacement of modules, converters, transformers, and other electrical components. However, the likelihood of such replacements is low due to the expected long operational lifetime of these units.

The occupational health and safety aspect related to operational activities will be continuous but limited in intensity. Given the controlled working environment and low frequency of high-risk activities, the intensity of OHS is considered **slight**, the overall magnitude is **SMALL**, and the susceptibility of receptors (workers) is **MEDIUM**. Accordingly, the overall significance of occupational health and safety impacts during operation is assessed as **INSIGNIFICANT**.

Management Measures

No specific mitigation measures are required given the low-risk nature of operational activities. However, the following measures are implemented to ensure safe and compliant operations:

- Development and maintenance of a comprehensive OHS Management Plan, including risk assessment, incident reporting, and emergency preparedness.
- Implementation of a formal Health and Safety Policy.
- Compliance with all relevant national occupational health and safety regulations, including Labour Law 12/2003 and 14/2025.
- Provision of appropriate personal protective equipment (PPE) to all operational staff.

Residual impacts

With the implementation of the above management measures, potential operational health and safety impacts are effectively controlled and are therefore assessed as **INSIGNIFICANT**.

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.

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.

F. Impact of site security

During the operation phase, security services will be provided by a licensed company contracted on an annual basis, with trained security personnel deployed on rotating shifts within the project premises. If not properly managed, the presence and conduct of security personnel could give rise to potential social impacts on workers or surrounding communities.

The security-related aspect associated with operational activities will be localized within the project footprint and continuous throughout the operational phase. Given the controlled nature of security arrangements, the intensity of the impact is considered **slight**, the magnitude is **SMALL**, and the **susceptibility of receptors** (workers and nearby communities) is **LOW**. Accordingly, the overall significance of operational site security impacts is assessed as **INSIGNIFICANT**.

Mitigation measures

- Ensure security personnel are adequately trained and act in accordance with the law, company procedures, and appropriate codes of conduct.
- Develop a grievance mechanism to allow any affected community members to raise concerns regarding security arrangements or personnel conduct.
- Continuous monitoring and supervision of security operations to maintain compliance with established protocols.

Residual impacts

With the implementation of the above mitigation measures, there will be no residual impacts associated with site security during the operation phase.

G. Impacts on Climate Change

The proposed Energy Valley Solar Project is expected to contribute positively to climate change mitigation by displacing fossil fuel-based electricity generation and supporting Egypt's

transition toward a low-carbon economy, in line with Egypt Vision 2030 and the Sustainable Development Goals (SDGs).
During the construction phase, GHG emissions will primarily arise from:

- Fuel combustion by construction equipment (excavators, cranes, concrete mixers, generators);
- Transportation of materials, modules, and workforce (diesel trucks and vehicles); and
- Temporary on-site power generation from diesel gensets prior to grid connection.

These emissions are typically short-term, temporary, and intermittent in nature.
Based on available literature, GHG emissions from construction equipment for large-scale infrastructure projects can range depending on site conditions and equipment productivity. A study by Zhang et al. (2016)[26] estimated emissions from major construction activities to range between 256.52 and 376.70 tCO_2e, with an average of approximately 282.17 tCO_2e under typical conditions.

Given the temporary and limited nature of construction-phase emissions relative to project scale, the overall contribution of this phase to climate change is assessed as **Minor** (pre-mitigation), reduced to **Insignificant** with the implementation of mitigation measures in the construction phase.

It is during the operation phase that the contribution of the project to climate change mitigation is substantial. During this phase, the project will generate electricity from a solar energy source, resulting in negligible direct GHG emissions, which may occur from:

- Minor vehicle emissions related to site supervision and maintenance
- Intermittent use of backup diesel generators (if required), and
- Potential fugitive emissions of sulfur hexafluoride (SF_6) from gas-insulated switchgear, particularly during maintenance or decommissioning activities.

SF_6 is a high global warming potential (GWP) gas; however, emissions are expected to be minimal due to the use of modern equipment, adherence to international handling standards, and implementation of proper maintenance procedures.

In accordance with the Intergovernmental Panel on Climate Change IPCC[27], greenhouse gas emissions from energy systems are evaluated based on electricity generation (gCO_2e/kWh) rather than installed capacity (MW).

It is clear that solar energy systems have significantly lower emissions, often by an order of magnitude, compared to conventional fossil fuel-based power generation.

It should be noted that lifecycle emissions primarily reflect upstream and offsite impacts (e.g., manufacturing and material production), while direct onsite operational emissions remain negligible.

[26] Zhang, X. et al. (2016). Assessment of GHG emissions from construction equipment based on productivity under varying site conditions.
[27] IPCC (2011). Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) – Solar technologies do not produce direct emissions during electricity generation.

Renewable energy projects contribute to climate change mitigation by displacing electricity that would otherwise be generated from fossil fuels, resulting in substantial avoided emissions over the project lifetime[28].

In line with the European Bank for Reconstruction and Development Environmental and Social Policy (2024), projects are required to quantify and report GHG emissions where:

- Annual gross emissions exceed 20,000 tCO_2e, or
- The project results in a net change exceeding 20,000 tCO_2e per year.

While the project's direct GHG emissions remain limited and below the reporting threshold, the project results in a significant net reduction in emissions due to avoided grid electricity generation.

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

[28] Estimated avoided greenhouse gas (GHG) emissions were calculated based on projected annual electricity generation and Egypt's emission factor of thermal power plants, as per the 2025 Egyptian Electricity Holding Company ()EEHC) annual report
//based on an installed capacity of 1,950 MW (DC),a daily generation equivalent to 6 hours per day of full capacity, and 365 days per year, the gross annual electricity generation is approximately 4,270,500 MWh/year (DC). Applying a performance ratio of 0.75, the net electricity delivered is approximately 3,202,875 MWh/year (AC). Using the emission factor of 0.38 $kgCO_2e/kWh$, the avoided emissions are estimated at approximately 1,217,092 tCO_2e per year (~1.22 million tCO_2e/year), reflecting the displacement of fossil fuel-based electricity generation.

Table 6–5: The Risk and Impact Assessment Matrix for the Operation Phase

Impacts/Riks		Without Mitigation						Residual Significance after Mitigation
		Temporal scale	Spatial Scale	Severity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor	Significance Before Mitigation	
Operation Phase								
PV project								
Air Quality		**Long term**	***Localized***	***Slight***	***Medium***	***Low***	***Minor***	***Insignificant***
Ambient Noise and Vibration		**Long term**	***Localized***	***Slight***	***Small***	***Medium-Low***	***Minor to insignificant***	***Insignificant***
Biodiversity	Disturbance to wildlife (excluding avifauna)	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Minor***	***Insignificant***
	Avifauna (Collision / Lake Effect)	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Minor***	***Insignificant***
	Electrocution Risks	**Long term**	***Localized to Study area***	***Moderate***	***Medium***	***Medium***	***Moderate***	***Minor to Insignificant***
Social Environment	Water Resources and wastewater	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Insignificant***	***Insignificant***
	Waste Generation (hazardous &non-hazardous)	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Insignificant***	***Insignificant***
	Landscape effects	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Insignificant***	***Insignificant***
	Glint & Glare	**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Insignificant***	***Insignificant***
Occupational Health and Safety		**Long term**	***Localized***	***Slight***	***Small***	***Medium***	***Insignificant***	***Insignificant***
Site Security		**Long term**	***Localized***	***Slight***	***Small***	***Low***	***Insignificant***	***Insignificant***

6.4.3 Potential Impacts during decommissioning

The anticipated impacts during the decommissioning phase include potential impacts on soil and groundwater (due to improper management of waste streams), as well as impacts related to air quality, noise, and occupational health and safety. The mitigation measures for the potential impacts will focus on the proper handling, management and disposal of both non-hazardous and hazardous waste streams. 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.

6.5 Risks and Impacts of the Environment on the Project

- ***Potential Impact of Dust, Sand***

Based on regional climatic data and site characteristics, the key environmental stressors relevant to the project include haze events, wind-blown dust, rising sand, and occasional sandstorms, particularly during the late winter and early spring months.

Haze events

Seasonal haze events, typically occurring during winter months, are associated with low wind speeds and elevated concentrations of fine suspended particulates. These conditions may result in the gradual accumulation of fine dust on photovoltaic (PV) module surfaces, leading to temporary reductions in solar irradiance reaching the cells and a corresponding decrease in energy conversion efficiency. While haze events are generally not associated with mechanical damage, they increase the frequency of routine cleaning requirements to maintain optimal system performance.

Wind-Blown Dust and Rising Sand

During periods of increased wind activity, particularly in spring, dust and fine sand particles may be transported across the site. In conditions where wind speeds exceed typical background levels, larger sand particles may cause surface abrasion of PV modules and ancillary equipment. Given the single-axis tracking system design, modules may be partially exposed during specific operational orientations (e.g. afternoon westward tilt), increasing their exposure to wind-driven particulates.

Accumulation of dust and sand on module surfaces can reduce energy yield if not managed through appropriate operational maintenance practices.

Dust and Sand Storms

Occasional dust and sand storms may occur in the region, characterized by elevated particulate concentrations and increased wind speeds. These events may result in short-term reductions in visibility and PV performance due to surface deposition, and over the long term may contribute to gradual wear of exposed surfaces if unmanaged. However, such events are episodic in nature and do not represent continuous conditions.

Overall Impact

The impacts associated with dust and sand are expected to be localized within the project footprint and to persist over the long term, corresponding to the operational life of the project. Given the frequency of dust and sand movement in the region and the exposure of

PV modules under certain tracking orientations, the intensity of this aspect is considered moderate, and the overall magnitude of the impact is assessed as **MEDIUM**.

The project is located within a vacant desert area, with no nearby sensitive environmental or socio-economic receptors. As such, the sensitivity of receptors is considered **MEDIUM**, as impacts are limited primarily to project infrastructure and operational efficiency rather than off-site environmental or community receptors. Based on the above considerations, the overall significance of impacts associated with dust, sand, and related aeolian processes during the operation phase is assessed as **MODERATE**, prior to mitigation.

Mitigation measures

To minimize the impacts of dust, sand, and related aeolian processes on project infrastructure and performance, the following mitigation measures will be implemented:

- Implementation of a periodic PV module cleaning and preventive maintenance program, optimized based on site-specific dust deposition rates and seasonal conditions.
- Selection of PV modules and surface coatings suitable for desert environments and resistant to abrasion from wind-blown sand.
- Operational flexibility of the tracking system, whereby westward tilt during periods of high wind and sand movement may be temporarily adjusted or restricted, as feasible, to reduce direct exposure of module surfaces.
- Continuous monitoring of system performance to identify efficiency losses attributable to soiling or abrasion and to optimize maintenance interventions.

Residual impact

With the application of appropriate design specifications, adaptive operational controls, and routine maintenance and cleaning procedures, the impacts of dust and sand on project infrastructure and operational efficiency will be effectively minimized. Accordingly, the residual impacts of the operation phase are assessed as **MINOR**.

- ***Contextual Risks: Potential Impact of Climate Change***

The project's location in Minya Governorate, characterized by extreme temperatures, variable rainfall, and a history of flash floods, necessitates careful consideration of climate change impacts.

Potential Impact of Extreme Heat

Climate change projections, as indicated in Egypt's Second National Communication to the UNFCCC, indicate a potential increase in the frequency and intensity of extreme heat events. This could pose challenges to both the construction and operation phases of the project. During the construction phase, Extreme heat can lead to the following.

- Heat stress for workers, reducing productivity and increasing the risk of heat-related illnesses.
- Adverse effects on the operation of machinery.
- During the Operation Phase, high temperatures can reduce the efficiency of solar panels and the battery energy storage system.

Mitigation Measures

A. Construction Phase:

- Implement heat stress management plans, including providing shaded rest areas, frequent water breaks, and adjusting work schedules to avoid peak heat hours.
- Provide training to workers on recognizing and preventing heat-related illnesses.
- Utilize appropriate construction materials and techniques that are resistant to high temperatures.

B. Operation Phase

- Employ cooling technologies for BESS to maintain optimal operating temperatures.
- Utilize advanced monitoring systems to track temperature and performance data, enabling proactive maintenance and adjustments.
- Develop contingency plans for extreme heat events, including potential temporary shutdowns or reduced operations.
- The system is equipped with active cooling (a liquid-based) and real-time temperature sensors that automatically adjust cooling or operational settings as needed.
- Regular maintenance of both the PV and battery systems ensures the cooling infrastructure remains fully operational, preventing performance losses, minimizing wear and tear, and maintaining energy efficiency.

Residual Impacts

With the implementation of these mitigation measures, the residual impacts of extreme heat are expected to be minimal. However, ongoing monitoring and adaptive management will be essential to ensure the project's resilience to the changing climate**.**

Potential Impact of Flash Flood

The project area is located within an arid climatic zone characterized by very low annual rainfall, high evaporation rates, and significant temperature variation. Rainfall events are infrequent; however, when they occur, they are typically short in duration and high in intensity, which can result in rapid surface runoff.

Historical rainfall data obtained from Minya Meteorological Station were analyzed to support the hydrological assessment. The analysis indicates that although average annual rainfall is limited, extreme storm events (low frequency / high intensity) may occur and generate localized runoff, particularly in areas with limited infiltration capacity and sparse vegetation.

Flood Hazard Assessment

Assessment of flood hazards represents an important component of the project design, particularly in view of the rapid (“flashy”) hydrological response commonly associated with short-duration convective storm events in arid and semi-arid regions of Middle Egypt. Although rainfall is generally infrequent, intense storm events may generate significant surface runoff, localized ponding, and temporary flow within natural drainage channels (wadis).

A detailed hydrological assessment is presented in Annex 4. The assessment was developed using a combination of Digital Elevation Model (SRTM 30 m) data, historical rainfall records from Minya Meteorological Station, watershed delineation analysis, and numerical hydrological/hydraulic modelling using HEC-HMS and HEC-RAS 2D software.

The assessment identified six upstream sub-catchments that may influence runoff conditions within or adjacent to the project site.

The spatial relationship between the identified drainage basins and the project boundary is illustrated in Figures 1,2 confirming the natural runoff pathways and topographic gradients across the surrounding area.

The assessment evaluated catchment morphology, runoff generation potential, flow routing behaviour, flood depths, and flow velocities under simulated design storm events in order to assess potential flood impacts on the project site.

Table 6-6 (below) summarizes these morphological parameters,

Table 6–6: Morphological parameters of watersheds affecting the project boundary

WS Name	WS Area (km2)	LFP (m)	Tc	T_{Lag}
Subbasin-1	0.38	2051.01	52.22	31.33
Subbasin-2	0.41	2444.14	56.43	33.86
Subbasin-3	1.07	2865.42	68.60	41.16
Subbasin-4	3.79	7779.39	147.83	88.70
Subbasin-5	1.12	2706.34	62.37	37.42
Subbasin-6	8.08	8574.21	200.84	120.50

Table 6-6 provides the foundational data for the hydrological model, detailing the six primary sub-basins (Subbasin-1 through Subbasin-6) that impact the site. These parameters—specifically the Longest Flow Path (LFP) and Time of Concentration (Tc)—dictate how quickly runoff reaches the project area. Sub-basin areas range from 0.38 km^2 to 8.08 km^2, affect the accumulated water volume, with lag times (TLag) adjusted to reflect the rapid response typical of desert environments. Longer flow paths and higher times of concentration indicate slower runoff response, while smaller basins may respond more rapidly to short-duration rainfall events. Lag times were adjusted to reflect the relatively rapid hydrological behaviour typical of desert catchments.

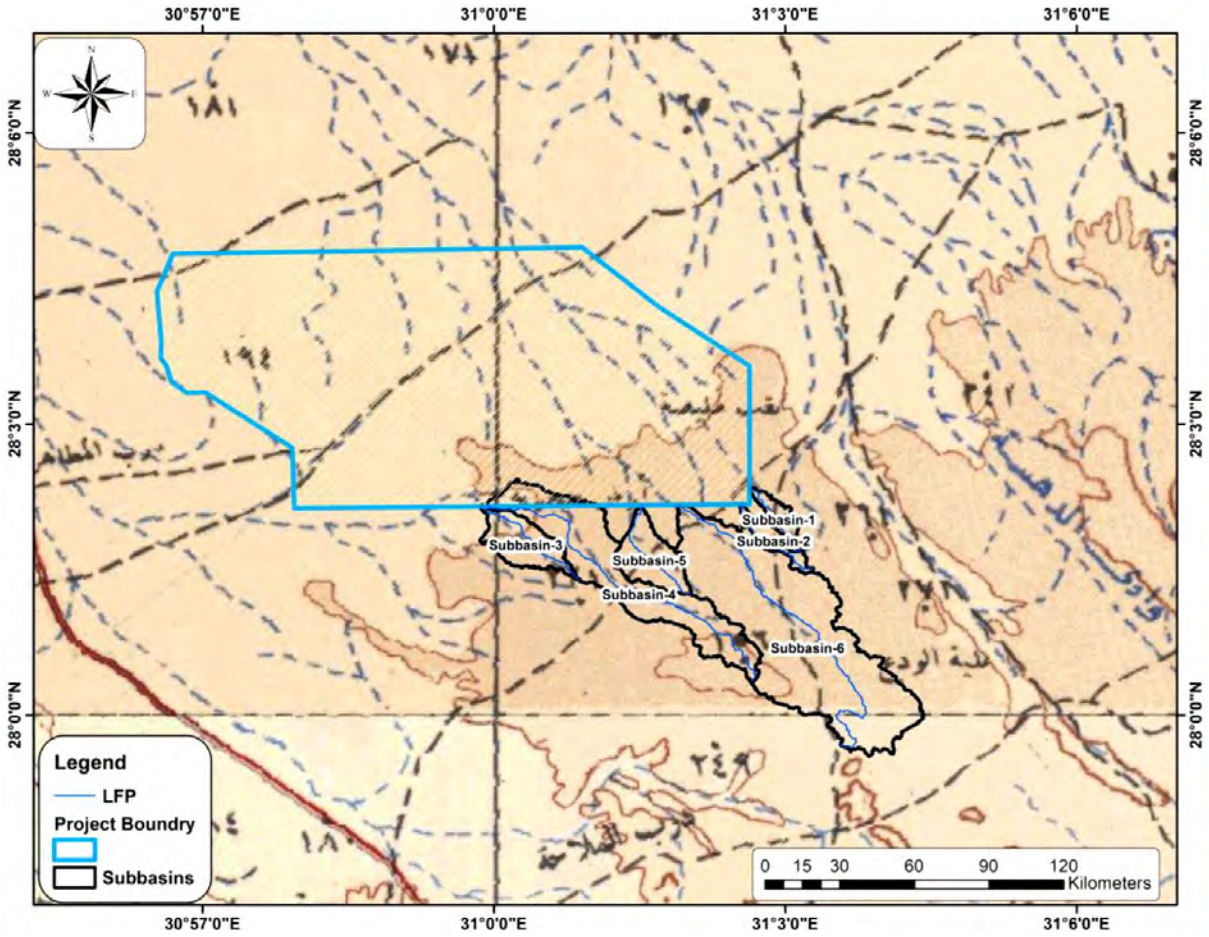


Figure 6–3: Hydrological Modelling Results

Flood hazard levels were assessed using the Department for Environment, Food & Rural Affairs (DEFRA) Hazard Rating methodology, which considers flood depth, flow velocity, and debris effects to classify hazard severity.

For return periods of 5, 10, 25, and 50 years, no significant surface runoff is predicted to reach the project boundary, confirming that the upstream catchments have limited runoff potential under typical storm conditions.

For the 100-year return period, the maximum simulated water depth and velocity within the project boundary reach approximately 2.1 m and 3.1 m/s, respectively.

For the 200-year return period, the maximum depth and velocity increase to approximately 2.3 m and 4.5 m/s, respectively.

These peak values, however, occur only in very limited and localized areas, typically associated with natural depressions or zones of relatively steeper slopes, and do not represent general site conditions.

The spatial distribution of water depths indicates predominantly shallow flooding conditions across the site. Depth values range from negligible levels up to approximately 2.3 m, with the majority of the site experiencing depths below 0.2 m. The mean water depth is approximately

0.038 m, with low variability (standard deviation ~0.052 m), confirming minimal variability and limited flood accumulation.

Similarly, flow velocities across the site are generally low. While localized peak velocities may reach up to 4.5 m/s, most of the site experiences velocities close to zero. The mean velocity is approximately 0.042 m/s, with limited variation, indicating that high-velocity flows (>1.5 m/s) are rare and confined to isolated areas such as channelized paths or localized slopes.

The modelling results further indicate that peak runoff discharges remain relatively low, even under the 100-year and 200-year return periods, including the applied climate change allowance. This is primarily attributed to the relatively high infiltration capacity of the site soils and the limited rainfall depths recorded for the design storm events as illustrated in the hazard mapping figures 2&3.

Overall, the absence of continuous flow across the site, combined with low runoff volumes and localized flow conditions, confirms that the site is exposed to low flood hazard. This is consistent with the flood hazard mapping results, which classify the site as Low Hazard, with minimal anticipated flood impacts on the proposed development.

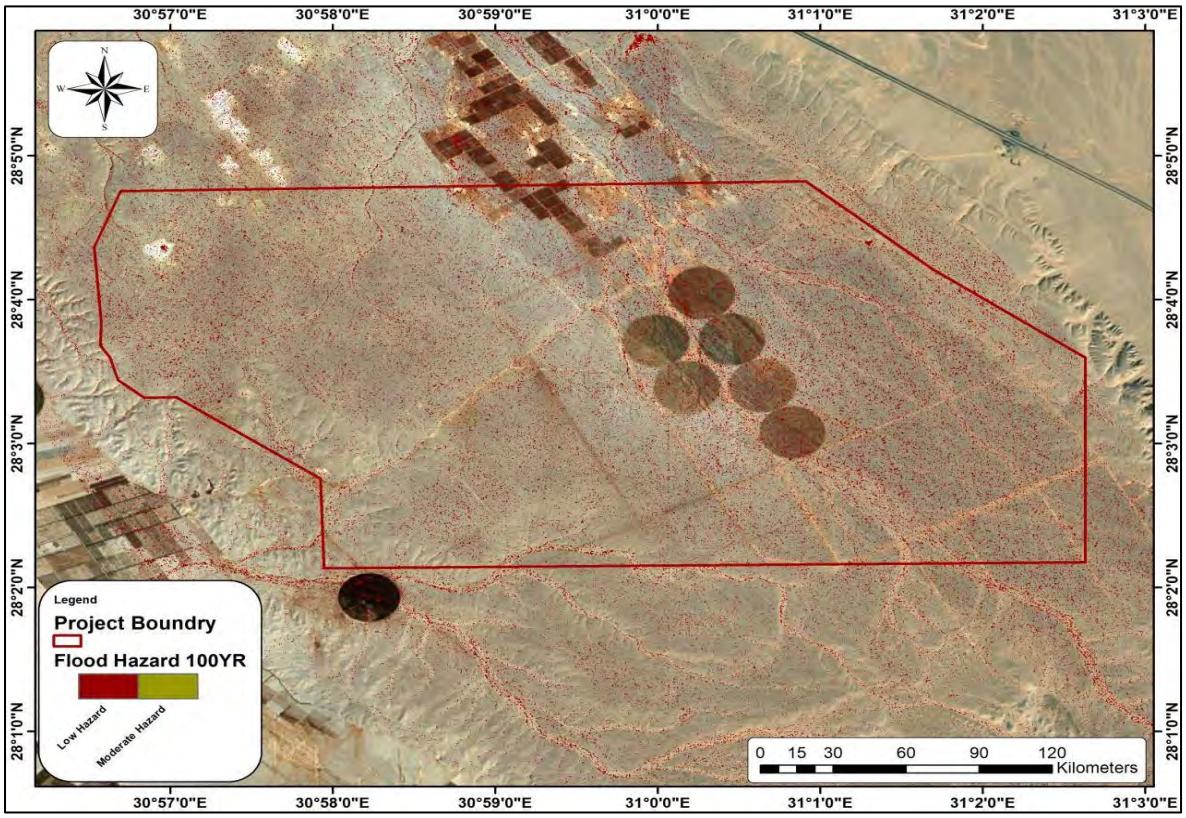


Figure 6–4: Flood Hazard in 100 Years Flood Storm

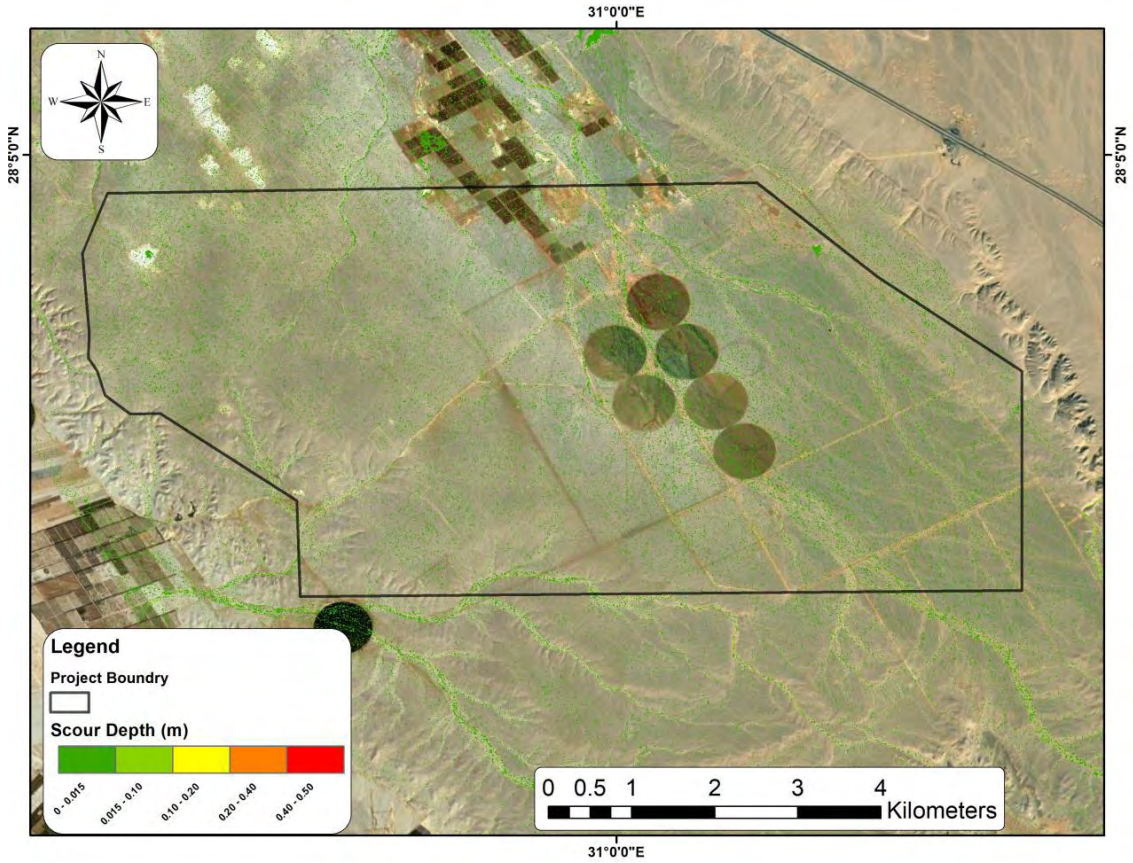


Figure 6–5: Scour Depth 200-year.

Recommended Flood Mitigation Measures

While the overall hazard is low, the following mitigation measures are recommended:

- Foundation designs should account for the mapped scour risk, with typical foundation depths (Df) ≥ 0.5 m to prevent erosion-related instability.
- Appropriate foundation depths and minor internal drainage interventions will mitigate localized scour and runoff issues, ensuring the resilience and sustainability of the solar infrastructure even under extreme storm events

6.6 Cumulative Impacts

IFC Performance Standard 1 (PS1) and Safeguard Operational Safeguard 1 (OS1) of AfDB Integrated Safeguards System (ISS, 2023) requires Environmental and Social Impact Assessments (ESIAs) to identify and assess cumulative impacts that may arise from the incremental effects of a project when added to other existing, planned, or reasonably foreseeable developments, where such impacts are of scientific concern and/or concern to affected communities.

According to the IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, cumulative impacts may arise from the combined effects of multiple projects or activities occurring within the same geographical area over time. 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;
- Increased sediment loads within a watershed;
- Interference with wildlife movement corridors or migratory routes;
- Increased traffic congestion and accident risks due to combined project-related transportation activities; and
- Cumulative socio-economic pressures resulting from workforce influx.

Based on the desktop research, satellite imagery, and baseline environmental assessment, New Minya City construction is considered an ongoing development baseline within the region. Construction activities in New Minya City are assumed to proceed at a steady and uniform pace.

Potential cumulative impacts were evaluated with consideration of foreseeable developments and regional environmental conditions, as described below.

Future PV projects

Potential cumulative impacts from other PV projects largely depend on the timing and spatial overlap of construction activities. The project site is located within a desert area allocated by presidential decree to NREA for renewable energy development, where additional PV projects may be constructed in the future.

Currently, no confirmed plans exist for nearby PV projects within the NREA concession. Even if other projects were to be developed, their construction schedules are expected to be coordinated to avoid overlaps with peak construction periods of the proposed Energy Valley Project. This proactive scheduling ensures that there will be no simultaneous peak workforce or traffic demands.

Given the absence of confirmed nearby PV projects and the expected scheduling coordination, no direct temporal or spatial overlap of construction activities is anticipated. Operational activities are characterized by minimal emissions and limited resource consumption.

Accordingly, cumulative impacts associated with other renewable energy developments are considered **INSIGNIFICANT**.

Traffic and Logistics

Construction of the Project will require the transportation of equipment, construction materials, and PV system components such as modules, mounting structures, transformers, and battery storage units.

Construction traffic will primarily utilize the regional desert road network, including the Ras Gharib–Minya Road located approximately 4 km north of the project site.

Considering New Minya City construction as a steady baseline, cumulative traffic impacts remain low due to:

- The relative separation from major urban centers;
- Low traffic density on regional desert roads;
- Distribution of deliveries over the 36-month construction period; and
- Implementation of a dedicated Transportation Management Plan.

Accordingly, the potential cumulative impact on traffic and road safety are assessed as **INSIGNIFICANT**.

Air Quality

Air emissions associated with the construction phase of the project will primarily arise from earthworks, vehicle movement on unpaved surfaces, and operation of diesel-powered construction machinery.

These emissions are expected to be localized within the project site and immediate surroundings and limited to the temporary construction period. The open desert environment, low receptor density, and large separation distances from residential areas reduce the potential for cumulative effects.

While ongoing construction in New Minya City contributes a baseline level of regional emissions, the large separation (~11.5 km) and the low receptor density in the project area limit any additive cumulative effects. Emissions from the Energy Valley Project are localized and temporary.

In the absence of other nearby construction activities contributing to regional emissions, cumulative impacts on ambient air quality are therefore assessed as **INSIGNIFICANT**.

Water Resources

The project is located in a desert environment with no surface water bodies within the project area. The nearest major water body, the Nile River, is located approximately 13 km west of the project site.

Operational water demand is expected to be minimal and limited primarily to domestic use for the small on-site workforce. In addition, PV module cleaning will rely primarily on dry-cleaning techniques, further reducing water consumption.

Given the absence of other water-consuming developments in the vicinity and the limited water requirements of the project, cumulative impacts on regional water resources are considered **INSIGNIFICANT**.

Worker Influx and Socioeconomic Effects

The construction phase of the project is expected to generate employment opportunities, with a peak workforce estimated at approximately 5,000 workers during the construction period.

However, due to the remote location of the site and the absence of nearby settlements within the project AOI, cumulative social pressures associated with worker influx—such as increased demand for housing, public services, or community infrastructure—are not expected.

Considering New Minya City as an ongoing development baseline, cumulative social pressures—such as increased demand for housing, services, or infrastructure—are not anticipated due to the remote location of the project and proper workforce management measures.

Workers will be accommodated in designated temporary facilities or will commute from nearby urban centers, and the project will implement workforce management measures consistent with international best practices.

Therefore, cumulative social impacts related to workforce influx are assessed as **INSIGNIFICANT**.

Cumulative Impacts with Other Energy Valley Components

The cumulative impact assessment has also considered the interaction between the project and the other components of the wider Energy Valley Program, including the Energy Valley Grid Connection OHTL, the Consumer Substation, the Consumer Substation OHTL, and the Abu Qir facilities.

Due to the substantial geographical separation between the Minya Project components and the Abu Qir facilities, no meaningful cumulative impacts on environmental receptors are anticipated. Potential interactions are limited to program-level planning, procurement, and management activities and are not expected to result in significant cumulative environmental or social effects.

The project represents the principal construction activity in the Minya area and is substantially larger in footprint, workforce requirements, construction intensity, and duration than the associated OHTL and substation components. Consequently, these components are expected to contribute only limited incremental impacts beyond those already assessed for the Hybrid PV+BESS Facility.

The Consumer Substation and associated OHTL infrastructure are located at a considerable distance from the project (approximately 25 km), reducing the potential for cumulative effects on localized environmental and social receptors such as air quality, noise, biodiversity, land use, visual amenity, and nearby communities.
Potential cumulative interactions are therefore expected to be limited primarily to:

- Shared transportation and logistics routes;
- Workforce mobilization and accommodation requirements;
- Concurrent construction activities, where applicable.

Current project planning does not anticipate significant overlap between peak construction activities of the different Program components. Nevertheless, coordinated Traffic Management Plans and Labour Influx Management Measures will be implemented across the Program to manage cumulative workforce numbers, transportation movements, accommodation arrangements, local recruitment procedures, worker code of conduct requirements, and grievance management mechanisms.

Given the geographical separation of the Program components, the relatively limited scale of the OHTL and substation works compared to the project, and the implementation of coordinated management measures, cumulative impacts associated with the wider Energy Valley Program are expected to remain **INSIGNIFICANT.**

7. Stakeholders Consultation

Consultation 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.

A first set of scoping consultation meetings took place with different stakeholders during the period 6th of January 2026 and 15-16th of February 2026 with the purpose of scoping the ESIA activities and identifying potential additional stakeholders. A second set of meetings took place on Monday 16th March 2026

The scoping meetings took place with various categories of stakeholders including:
- Minya Governorate; General Secretary of Minya Governorate; Minya Governor;;
- General Agency of the Public Property Protection – Minya governorate.
- New Minya Urban Authrority
- Minya City Council
- Samalout City Council
- Minya local council environmental units

- Minya Drinking Water and Sanitation Company
- Environmental Unit of Minya Governorate
- EEAA Regional Branch office
- Operators of agricultural farms at the eastern part of the site
- Non-Governmental Organizations (NGOs)

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 from all attendees, that all 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 by the stakeholders during discussions can be categorized as follows:

- ***General feedback on the project***
  - The project is highly welcomed, not only because of its benefits on the national level, but will also contribute to reducing power outage in the region. The Governor of Menya showed strong positive intention to cooperate and facilitate the resolution of any challenges that may face the project implementation

- ***Socio-economic issues:***
  - Labour and job opportunities: provision of job opportunities was the dominant topic in all stakeholders meetings. Stakeholders expressed satisfaction regarding the significant economic value of the project and its positive future impacts on investment opportunities within Minya Governorate
  - The provision of renewable energy to Sirarya industrial area
  - Stakeholders emphasised on the importance of provision of work opportunities for the communities and required that El Minya people should have the priority in employment.
  - Labour accommodation: was also discussed.
  - Provision of job opportunities in the project may affect availability of workers for other small economic activities in the area.
  - The project's grievance mechanism and complaint resolution procedures
  - Provision of capacity building and training to the communities on PV
  - Potential support to vulnerable groups in the communities
  - Role of NOGs in cooperation with the project.
  - Ability of water and wastewater treatment plants to meet the project demand during construction activities
  - Available waste management infrastructure within Minya governorate
  - Medical facilities in Minya governorate
  - Evacuation campaigns of informally used agricultural land within the site

- ***Impacts* of the project on the environment:** Issues related to project's need for utilities and services including quantities and sources of water, wastewater and fuel.

Annex (5) presents the detailed minutes of meetings of the stakeholders' consultation process.

7.2 ESIA Disclosure

According to the national EIA guidelines, the stakeholders consultation is to be undertaken twice during the ESIA preparation process for Category (C) projects (High Risk, corresponding to Category A according to international systems). Consultation during the ESIA scoping phase aims to agree on the aspects and impacts that will be addressed and analysed in the ESIA. Stakeholders' meetings could be held with each concerned party individually or can take the form of a collective meeting where the concerned parties are invited to attend the meeting.

However, since the Energy Valley PV and BESS Project is categorised under "**Scoped Category B**" according to the national system, it will not require undertaking public disclosure meetings, according to EEAA guidelines, and the consultation already undertaken during the scoping phase is sufficient. However, as per the Client/Lenders, a public disclosure meeting is to be organised.

Within the above context, the approach to undertake the disclosure meeting was based on:

1. **Focus on Local Stakeholders**
   The stakeholders to which invitations to be sent will be limited to those on the local level, the municipal level and the governorate level. Representatives of national organizations (such as EEAA and EETC) on the local/regional levels have also been invited. The public disclosure made ensure that vulnerable groups such as women and special needs were particularly invited to the meeting.

2. **Announcement**
   In addition to invitation of targeted stakeholders, the meeting will be open to other local stakeholders. Announcements will be issued within10-15 days before the meeting date.

3. **Material for Consultation**
   A Non-Technical Summary (NTS) in Arabic will be attached to invitations and will be made accessible through a link advertised on the Project website.

   In addition, a comment form will be prepared to be filled by stakeholders and submitted either in person or through mail/WhatsApp, for a period of 2 weeks after the meeting.

4. **Venue of Public Disclosure**
   Location of the disclosure venue will take place in Minya governorate (Location of venue to determined).

5. Meeting outputs

The outputs and results of the stakeholders scoping and disclosure meeting and all comments and contribution are provided in Annex (5) includes the discussion register together with the attendance sheets.

8. Environmental and Social Management Plan

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

The project's ESMP consists of a set of mitigation and monitoring measures that will be considered during the construction, operation, 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 Management Plans*** to ensure environmental protection and maintain efficient environmental and social performance and compliance with the relevant legislations, laws, and international E&S standards.
- ***Environmental Monitoring Plan*** during project implementation to provide information of the key environmental aspects of the project.
- ***Emergency Response Plan*** is prepared as a guiding document by which project supervisors and staff identify hazards and act appropriately in response to emergency events.

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 Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Construction Phase			
Air Quality			
• Air Quality	MINOR	- Implement policies/procedures to reduce idling times for vehicles and machinery. - Maintaining machinery and vehicles in good working conditions to minimize fugitive emissions and exhaust. - Ensuring workers are aware of safe driving and maintain good practices in machinery usage. - Emissions from power generator stacks will comply with Law 4/1994 and its relevant ERs. - Implement dust suppression measures	INSIGNIFICANT
Ambient Noise			
• Equipment and machinery • Vehicle Movement • Power Generators	MINOR	- 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.	INSIGNIFICANT
Impacts on Soil			
• Domestic wastewater tanks, material and wastes storage, and accidental spills	MINOR	- Maintain good housekeeping practices to ensure a clean and organized construction site. - Conduct maintenance of vehicles, trucks, and construction equipment off-site to reduce on-site effluents and spills. - Collect and dispose of spillages from tank filling or generator operation through licensed/authorized waste contractors. - Develop and implement a spill management plan - Collect and transport wastewater by authorized contractors to ensure proper disposal and prevent contamination. - Collect 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.	INSIGNIFICANT

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Use licensed contractors for the collection and disposal of hazardous waste	
Impacts on the Biological Environment			
• Habitat loss, modification, and fragmentation	MINOR	- Limit construction activities strictly to the approved project footprint to avoid unnecessary disturbance of surrounding areas. - Implement strict housekeeping practices onsite and offsite to prevent degradation of adjacent habitats. - Avoid disturbance of offsite areas where any vegetation may be present. - Enforce speed limits for all project-related vehicles to minimize fauna disturbance and collision risks. - Provide environmental awareness training to workers on the importance of protecting natural habitats and avoiding wildlife disturbance. - Where feasible, implement wildlife-friendly fencing designed to allow the safe movement of small fauna, including visible fencing and clearance at the lower fence line.	***Insignificant***
Disturbance to wildlife	MINOR	- Develop and implement solid waste, hazardous waste, and wastewater management plans to prevent attraction of fauna. - Maintain good housekeeping practices across all construction areas. - Provide environmental awareness training to workers on minimizing wildlife disturbance. - Enforce speed limits and prohibit off-track driving by construction vehicles. - Ensure regular maintenance of construction equipment to minimize noise and vibration emissions	***Insignificant***
• Attraction of pests and propagation of invasive species	MINOR	- Develop and implement a solid waste, hazardous waste, and wastewater management plan covering collection, storage, transport, and disposal. - Ensure food storage and eating areas are secured and inaccessible to animals. - Enforce strict housekeeping practices across all construction and accommodation areas. - Provide worker awareness training on the environmental risks associated with improper waste and wastewater management	***Insignificant***
Impacts on the Social Environment			
• Water Resources	INSIGNIFICANT	- The Contractor will source water only from licensed and approved water supply facilities and transport it to the site using authorized tanker trucks.	**No Residual impacts**

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- A Water Management Plan will be implemented as part of the Construction Environmental and Social Management Plan (CESMP), including procedures for water supply, storage, monitoring, and reporting. - Water consumption will be regularly monitored and recorded . - Water-saving practices will be applied during construction activities, including controlled use of water for dust suppression and equipment cleaning - Storage tanks and distribution lines will be regularly inspected to prevent leakage or water losses.	
• Worker Influx	MINOR	- Prioritise hiring local workers not only to increase benefits to local communities, but also to reduce the number of incoming workers and minimize social disruption. - Prohibit "hiring at the door" to control speculative job seekers. Job advertisement and applications receipt will be through the governorate labour office. - Provide adequate on-site accommodation facilities for workers to prevent overburdening local infrastructure. - Implement and monitor site-specific waste management procedures for on-site camp, including segregation, safe storage, and proper disposal of waste through licensed contractors. - Develop Workers' Code of Conduct to ensure respectful behavior toward local communities, compliance with health and safety standards, and prevention of GBV/SH incidents	INSIGNIFICANT
Infrastructure			
• Land use	INSIGNIFICANT	No land ownership claims or other types of land uses exist at the project site. This was confirmed during stakeholders' meetings with local government representatives and nearby land uses and no risks are perceived in this regard	**No Residual impacts**
• Traffic	MODERATE	Scatec shall develop Transportation Management Procedures that apply to Scatec projects and operations, as well as their contractors and subcontractors. The procedure defines the minimum safety requirements for Scatec's transportation activities. The requirements are supplementary to national regulatory specifications and project or business unit specifications and/or insurance requirements	MINOR
Occupational Health and Safety			
• Impacts on workforce health and safety	MODERATE	- The excavation sites will be surrounded with warning signs to prohibit access to these places;	MINOR

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Contractors will ensure that construction workers will be continuously supervised through the continuous presence of on-site supervisor(s) for close inspection and management of the construction activities; - Ensure proper training for operators, regular maintenance of equipment, and implementation of safety protocols. - Provide adequate hydration, schedule work during cooler parts of the day, and allow for regular breaks in shaded areas. - Restrict vehicles speed so that they do not exceed the safety limit inside the site premises (15-20 km/h) - All equipment will be inspected before the start of the job to ensure the safety of the workers; - Use of personal protective equipment (PPE) - Provide hearing protection, implement noise control measures, and schedule regular breaks for workers. - Provide training on proper lifting techniques, and the use of mechanical aids. - Implement fire prevention measures, maintain fire extinguishers on-site, and conduct fire safety training.	
• **Site Security**	MINOR	The security personnel will be adequately trained, have appropriate conduct toward workers and the 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	INSIGNIFICANT
• **Impact on Cultural Heritage**	MINOR	- Implement a Chance Find Procedure consistent with national legislation and IFC Performance Standard 8, to be applied in the event that any archaeological remains or culturally significant materials are discovered during construction. - Ensure that all construction contractors and site personnel are informed and trained on the Chance Find Procedure prior to the commencement of ground-disturbing activities. - In the event of a chance find: o Immediately suspend work in the vicinity of the discovery; o Secure and demarcate the area to prevent damage or unauthorized access; o Notify the relevant competent authorities; and o Resume work only after clearance and guidance are provided by the competent authority.	INSIGNIFICANT

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Limit excavation and ground disturbance activities strictly to approved areas and depths	
Operation Phase			
Air Quality			
• Emissions from emergency generator	MINOR	- Optimize the operation of backup generators to reduce usage and emissions. - Conduct annual stack emission measurements for the emergency generators - If SF6 is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair, use proper chamber vacuums during filling the SF6 into the GIS, and employee education/training.	INSIGNIFICANT
Ambient Noise & Vibration			
• Operation of Transformers, and other operational components of battery energy storage systems. • Use of backup generators during power outages	MINOR to Insignificant	- Potential noise-generating machines and equipment are designed to meet statutory regulations concerning noise. - Workers at noise-generating machinery and equipment will be provided with suitable personal protective equipment (PPEs).	INSIGNIFICANT
Impact on the Biological Environment			
• ***Disturbance to wildlife (excluding avifauna)***	MINOR	- Utilize motion sensors, timers, and smart lighting controls. Use lighting with reduced blue-spectrum emissions to minimize nocturnal fauna disorientation - Develop, implement and update a solid waste, hazardous waste and wastewater management plan ; - Provide awareness to the workers on the negative impacts of disturbing any wild fauna; - Ensure proper housekeeping practice; - Ensure that food storage areas are inaccessible to animals; - Avoid high intensity light that may disturb offsite fauna; - Ensure speed control and the prohibition of off-track driving; - Ensure the proper maintenance of equipment and any other equipment with high noise and vibration potential;	INSIGNIFICANT I

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
		- Ensure that the generators are properly insulated to avoid noise emissions; and - Ensure that workers do not disturb native fauna potentially encountered.	
Risks and Impacts on Avifauna			
• Bird collision with internal 33 kV MV OHTL conductors during operation	Insignificant	- Proper waste and wastewater management to avoid attracting birds to the site. - Monitoring of bird mortality incidents and implementation of corrective measures if required.	Insignificant
Electrocution Bird electrocution at substations and internal electrical infrastructure	MODERATE	- Adequate separation distances between energized components and earthed structures, in line with international good practice; - Increase the use of insulated conductors and fittings at locations where birds could potentially perch; - Cover exposed conductive elements with insulating materials where required, subject to engineering design constraints; and - Conduct regular inspections and maintenance to ensure the continued effectiveness of avifaunal protection measures	MINOR to INSIGNIFICANT
Impact on the Social Environment			
• Water Resources	INSIGNIFICANT	No specific mitigation measures are required given the limited water consumption and wastewater generation during the operational phase. However, management measures are implemented, whereby wastewater generated during operation will be collected by a licensed contractor and transported to designated and approved treatment plants	No residual impact
• Waste generation	INSIGNIFICANT	No specific mitigation measures are required given the low volumes of waste generated during operation. However, the following management measures are implemented : - Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors. - Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors. - End-of-life batteries and damaged PV modules will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available	

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
• Visual effects/ Glint and Glare	INSIGNIFICANT	No visual or ocular hazards are expected under the current system design and operational parameters. Therefore, no additional mitigation measures are required beyond standard operational and maintenance practices, such as ensuring the cleanliness of panels and maintaining their anti-reflective coatings	No residual impact
Impacts on Occupational Health and Safety			
• Impacts on the workplace	INSIGNIFICANT	- Development and maintenance of a comprehensive OHS Management Plan, including risk assessment, incident reporting, and emergency preparedness. - Implementation of a formal Health and Safety Policy. - Compliance with all relevant national occupational health and safety regulations, including Labour Law 12/2003 and 14/2025. - Provision of appropriate personal protective equipment (PPE) to all operational staff	No Residual Impacts
Potential Fire and Thermal Runaway Risks			
Presence and conduct of contracted security personnel and their interaction with workers and the surrounding community.	INSIGNIFICANT	- Ensure security personnel are adequately trained and act in accordance with the law, company procedures, and appropriate codes of conduct. - Develop a grievance mechanism to allow any affected community members to raise concerns regarding security arrangements or personnel conduct. - Continuous monitoring and supervision of security operations to maintain compliance with established protocols.	No Residual Impacts
Impacts of Site Security			
• Presence and conduct of contracted security personnel and their interaction with workers and the surrounding community.	INSIGNIFICANT	- Ensure security personnel are adequately trained and comply with applicable laws, company procedures, and recognized codes of conduct. - Establish a grievance mechanism for workers and community members to report concerns regarding security personnel or operations. - Implement continuous monitoring and supervision of security activities to ensure compliance with procedures and standards.	No Residual Impacts
Impacts On Climate Change			

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
• Minor vehicle emissions • Emergency backup diesel generator emissions	• INSIGNIFICANT	- Use modern GIS equipment with strict SF_6 handling, leakage prevention, and maintenance protocols. - Implement preventive maintenance for all electrical and mechanical systems to minimize emissions risks. - Ensure efficient operation of vehicles and limit unnecessary site movements - Apply internationally recognized battery safety systems (BMS, thermal monitoring, fire detection and suppression) for BESS. - INSIGNIFICANTComply with IPCC methodologies and applicable reporting thresholds (e.g., EBRD 20,000 tCO_2e criteria).	No Residual Impacts
Impacts of the Environment on the Project			
• **Dust and Sand**	**MODERATE**	- Implement periodic PV module cleaning and preventive maintenance. - Select abrasion-resistant modules. - Adjust tracking system tilt during high wind/sand events to reduce exposure	MINOR
• **Extreme Heat**	**MINOR**	- Use liquid-based active cooling and real-time temperature sensors for BESS. - Implement heat stress management for workers (shaded areas, hydration). - Continuous performance monitoring to identify efficiency losses	INSIGNIFICANT
• **Flash Floods**	**MINOR**	- Design foundations to account for mapped scour risk (depth ≥ 0.5 m). - Implement minor internal drainage interventions to manage localized runoff.	INSIGNIFICANT
Cumulative Impacts (Construction & Operation)			
• **Raffic, Air, Water, Worker Influx)**	INSIGNIFICANT	- Coordinate construction schedules with other foreseeable projects to avoid peak overlaps. - Utilize regional desert roads with low traffic density. - Adhere to the Program-wide Transportation and Labor Management Plans	INSIGNIFICANT
Decommissioning Phase			
Soil, Water, Air, Noise, OHS	MINOR	- Focus on proper handling, management, and disposal of hazardous and non-hazardous waste streams - .Restore the site to its original condition where feasible	Insignificant

Environmental and social Aspects	Expected Impacts	Mitigation Measures Summary	Residual Impacts
Waste Management End-of-Life Batteries and Hazardous Waste	MINOR	- Development of Battery Waste Management Procedure. - Temporary storage in dedicated hazardous waste areas. - Use of licensed hazardous waste transporters and recyclers. - Battery take-back arrangements with suppliers where feasible.	Insignificant

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8.2 Environmental and Social Organisational Arrangements

8.2.1 Establishment of HSSE Department

The guidelines require appointing roles and responsibilities of the HSSE department. In this context, the company will assign at least five HSSE dedicated personnel for HSE issues.

The social aspects, including workers influx, water resources, wastewater management, and waste management, will be under the responsibility of the contractor (supervised by the company) during the construction phase and under Scatec's responsibility during the operation phase.

The ESMP and its subsidiary management plans constitute the core operational instruments of the Project ESMS during both construction and operation phases.

ESMS will be established and implemented for the Project in accordance with Lender requirements and international good practice. During the construction phase, the EPC Contractor shall develop and implement a project-specific ESMS proportionate to the nature and scale of construction activities and associated risks. SCATEC shall retain overall accountability and will provide oversight, supervision, and periodic auditing of the Contractor's ESMS implementation.

During the operation and maintenance phase, SCATEC shall establish, implement, and maintain an ESMS for site operations, ensuring continued compliance with national regulations, Lender requirements, and applicable international standards throughout the Project lifecycle.

8.2.2 Staff Responsibilities

The HSSE personnel will be responsible for daily safety work (walks-over) at the site, for inspecting the 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 and the Labor Compliance Officer (LCO) will also be responsible for follow-up on compliance with labour issues as part of their role regarding contractors' monitoring and management.

- ***Site Manager/HSSE personnel***
  - Responsible for the implementation of the HSE management system and providing the necessary resources for the implementation of the system;
  - Responsible for the implementation of correction plans.
  - Reports on HSSE matters to company management and is part of the annual management review process
  - Inclusion of HSSE / E&S requirements in contractor contracts

- ***HSSE Team***
  - Implementation of the HSE management system.
  - Ensures that contractors and subcontractors adhere to the HSE management system

- Provides training, help, and support for workers and ensures that contractors and subcontractors provide similar training to their workers;
- Provides the necessary support and determines any deficiency and disparity in the HSE procedures;
- Attends weekly and/or monthly HSE meetings;
- Updates and manages correction plans.
- Audits the implementation of the contractor's HSE plan;
- Analyses reports and corrects potential HSE issues;
- Organizes and completes all relevant HSE introductory training and awareness for workers;
- Reports any accident/incident on site and investigates the reason of accident/incident;
- Records and updates HS statistics, and submits monthly reports;
- Prevents and corrects potential safety risk behaviour;
- Update the environmental register;
- Resolves all environmental issues on site; and
- Plans and supervises all environmental monitoring aspects and proposes potential corrective actions.
- Responsible for attending to and closing worker grievances

- ***Community Liaison Officer***
  - Maintaining dialogue with the communities and relevant stakeholders as per the stakeholder engagement plan
  - Responsible for attending to community grievances
  - Identification of local communities for the sourcing of labour and contractors

- ***E&S Corporate team***
  - Periodic reporting on E&S matters to lenders
  - Following up on the closure of worker and community grievances
  - Auditing the site during the construction and operation & maintenance phases
  - Provide on-site training on E&S matters

8.2.3 Environmental and Social Reporting to AfDB

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 AfDB 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.

8.3 Institutional Arrangements

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.

8.3.1 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.

8.3.2 HSE Policy

Scatec will develop comprehensive HSSE policies and procedures in accordance with the international requirements and national regulations, as available. The construction contractors will be required to abide by these policies and procedures and develop project-specific HSE management plans. The policies and procedures rely on the pollution reduction approach to protect the environment and community, as well as provide a safe and healthy work environment.

In this context, the outline of the HSSE policy requirements is summarized as follows:

- Ensuring the provision of appropriate institutional capacity with clearly defined roles and responsibilities for managing HS issues.
- Ensuring that all HS personnel are properly trained and competent to fulfill their respective duties.
- Ensuring the availability of adequate resources and continuous support from top management.
- Communicating HS 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 IL 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.

Scatec project company will require from the main construction contractors and the subcontractors the appointment of:

- A HS Officer
- An Environmental Control Officer,
- Risk Assessor
- Details and specifications of responsibility for all appointments shall be defined in the HS plan and described in a suitable organizational chart.
- The company requires that contractors and subcontractors implement a system of reporting, including workers' attendance records, vehicle records, minutes of meetings, audit reports, and incident reporting.

8.3.3 Human Resources(HR) Policy

HR policies and procedures will be developed in line with local and international laws/legislation and best practice as well as Scatec's Diversity, Equity, Inclusion and Belonging (DEIB) Policy.

Under these policies, the company provides employees with information regarding their rights under national labour and employment law, including their rights related to wages and benefits. This policy will be clear and understandable to all employees. Accordingly, an HR policy will cover the following topics:

- Hiring policy
- Entitlement to and payment of wages; permissible wage deductions;
- Overtime payments; hours of work and any legal maximums;

- Entitlement to leave for holidays, vacation, illness, injury, maternity, and other reasons;
- Entitlement to benefits;
- The employees' right to form and join workers' organizations of their choosing without any interference or employment consequences and to bargain collectively with the employer;
- Disciplinary and termination procedures and rights;
- Conditions of work;
- Occupational safety, hygiene and emergency preparedness;
- Promotion requirements and procedures;
- Vocational training opportunities;
- Child labor and equal opportunity.
- Discrimination or favouritism due to race, ethnicity, nationality, gender, age, gender, disability, national origin, religious conviction or cultural belief
- Promoting inclusivity and cultural differences
- Develop workers code of conduct
- Human rights
- Female leadership
- Zero Tolerance for GBV and SH: This policy encompasses forms of SH, including SEAH.

With respect to contracted workers, the company will ensure that the third parties who engage these workers abide by the project's HSSE management requirements through a contractor management plan. This is to be included in the contractor's scope of work (contract). This is to include ensuring proper transportation, housing, and accommodation conditions for workers during construction and/or operation, as relevant[29]. In this context, Scatec policies and procedures will ensure management and monitoring of third-party performance.

8.4 EMPs

Within its commitment to ensure environmental protection and maintain efficient environmental performance as well as social integrity, Scatec 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.

[29] Workers' accommodation: processes and standards A guidance note by IFC and the EBRD, 2009 and ILO Housing Standards
https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:R115

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

8.4.1 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 the 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.

- **OHS Management Plan**

  A comprehensive OHS Management Plan will be developed and implemented for the construction phase by the EPC Contractor, based on detailed task-specific risk assessments. This plan will be separate from, but aligned with, the 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 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.

- **Transportation Management Plan**
  Scatec company has developed an overarching transportation policy and procedures that are to be adopted for all its projects. The purpose of this policy is to ensure the safety and security of all employees, contractors, and stakeholders while promoting sustainable and responsible driving practices. A project-specific transportation plan will be developed, including the following key components:
  - Driver Requirements
  - Requirements for vehicles and their use
  - Maintenance program
  - Local road transportation safety Requirements and additional Scatec safety requirements
  - Driving time and rest period

- **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.
  - Maximize the distance between noisy equipment and sensitive receptors;
  - Workers shall be provided with adequate PPE (earplugs), and ensure that workers are always wearing PPE while working near equipment that emits high noise levels.

- **Solid waste management**
  Domestic solid waste generated from the construction labour camp will be collected, properly stored according to the national regulations, and finally disposed of by a licensed waste contractor.

  Construction waste will be collected in a separate onsite location and periodically disposed of off-site by the contractor. Demolition and construction waste will be safely transported to officially designated sites. Recyclable wastes will be reused by the contractor at other construction sites.
  Solid waste management will be conducted in accordance with the requirements of laws 4/1994 and 202/2020.

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

HW generation

Different hazardous wastes will be generated from the construction activities. The type of generated hazardous waste is mentioned in Chapter 2.

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. On the other hand, spent oils will be disposed of through specialized contractors approved for the collection of oils, to send them for recycling to Petrotrade Company.

HW register

A HW register will be established, including information about the types and amounts of the generated waste and methods of its disposal.

- **Water and wastewater management**

  A project-specific water and wastewater management plans will be developed. The emergency response plan is to include responses to potential acute leakage scenarios. Wastewater will be collected in an isolated internal sewage system and will be periodically collected by an authorized contractor for disposal.

- **Emergency Management 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.

  Scatec will ensure that the contractors have developed a 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.

- **Biodiversity Management**

  The Project will ensure that the contractors are aware of the importance of the biological environment and their compliance with the law, international regulations, and conventions. Contractors and subcontractors should be aware of species that are prohibited from being hunted, captured, or killed. In case of the presence of vagrant animals, Annex 4 of the ERs of law 4/1994, amended by Decree 1095 /2011, defines the wild animals and plants prohibited from being hunted, traded, killed, or captured.

  Awareness sessions on the impact of hunting, trading, or killing wild animals will be provided to workers. Strict measures will be taken by the Project in case of non-compliance with the laws and regulations (including taking legal action).

  Additionally, the Project will ensure that contractors are following proper mitigation measures, including proper waste and wastewater management according to legal requirements, to avoid the attraction of pests and other alien/invasive species and the growth of marginal vegetation.

- **Chance Find Procedure**

  As indicated in section 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, as well as the 2018 SESA results. However, 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.

- **Staff Training and Awareness**
  Construction workers will be trained and educated according to their respective responsibilities and assigned tasks. A workers' training program will involve training staff on safe handling of equipment, wastes, and 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 developing measures for reporting these cases needs 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.

8.4.2 Environmental Management Plans During the Operation Phase

Scatec 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.

  The Environmental Register, as well as the Hazardous Materials and Waste Register, will be updated on an annual basis. Scatec will make both registers available for inspection by competent authorities.

  In general, the register will include data on the following topics:
  - General information;
  - General description of the establishment;
  - Laws and regulations related to the project;
  - Operation activities and utilities;
  - Liquid waste;
  - Solid waste;
  - Work environment; and
  - Self-monitoring plan.

- **OHS Management Plan**
  During the operation phase, Scatec 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),traffic movement, and emergencies. 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 Scatec's designated OHS/HSE Officer.

- **Hazardous Wastes (HW) Management**
  Hazardous wastes generated from various 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 HW register in accordance with the legal requirements stipulated in Article 33 of the Environment Law 4/1994.

  The project will endeavor to find sustainable means for the disposal of broken PV panels through recycling.

- **Solid Wastes Management**
  The main source of solid waste is domestic activities from workers, as municipal solid waste will be generated from the warehouse, offices, and catering. In addition, it includes wooden pallets and PV panels, and plastic packaging materials. Other waste will be disposed of with the domestic solid waste by authorized waste contractors.

- **Preventive and corrective maintenance**
  The main objective of maintenance is to maximize the utilization of the equipment in its proper operating conditions.

  <u>Planned maintenance</u>
  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 Scatec.

  <u>Preventive Maintenance</u>
  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 inspecting modules, inverters, structures, the electric system, weather stations, 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 in order to return to normal operation levels. Corrective maintenance may involve the participation of specialized maintenance contractors.

- **Wastewater Management Plan**

  A wastewater management plan will be developed. The emergency response plan is to include responses to potential acute leakage scenarios. Wastewater will be collected in an isolated internal sewage system and will be periodically collected by an authorized contractor for disposal.

- **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 to the 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 PV plant 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;
  - 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.
  - Train, inform, communicate, and instruct all workers regarding World Bank Equator Principles, worker rights, as well as workplace hazards and risks before any work commences and thereafter at regular intervals as the risks change and as new risks

develop. This training will be carried out in the form of risk assessment and toolbox talks. A record of attendance will be kept on file, and
- Ensure that Sub-Contractors will conduct their own task-specific risk assessments and keep records in the Health and Safety file.

- **Housekeeping and Cleanliness**
  About the housekeeping and cleanliness of the site, good housekeeping and cleanliness activities will be applied, such as:
  - Obstacles should not be placed in front of emergency exits or firefighting equipment;
  - Minimize water usage during cleaning to conserve resources;
  - Regularly inspect the panels for dirt, bird droppings, and other contaminants that can affect performance; and
  - Ensure that all personnel involved in cleaning and maintenance are properly trained in safe handling and cleaning techniques as well as waste management procedures.
  - Keep the flood protection channels clear, especially before the rainy season

- **Biodiversity Management**
  The Project will ensure that personnel are aware of the importance of the biological environment. Awareness sessions on the impact of hunting, trading, or killing wild animals will be provided to workers. Strict measures will be taken by the company in case of non-compliance with the laws and regulations (including taking legal action). Moreover, the Project will ensure that waste management is done properly and according to the national regulations.

  In order to raise the awareness of its onsite personnel with regard to issues relevant to the protection and preservation of biodiversity, the following is proposed:
  - Display posters demonstrating the Project's commitment to the conservation of biodiversity throughout the site;
  - Display throughout the site warning signs indicating that hunting or disturbance of wildlife is strictly prohibited;
  - Display throughout the site signs prohibiting unauthorized wandering into the surrounding desert, outside the project boundaries;
  - Good practice as related to protection of wildlife on the site should be included during toolbox talks or morning meetings; and
  - Reminders of proper handling and disposal of food leftovers, as well as waste and material hazardous to wildlife, should be posted throughout the site.
  - Install bird deterrents on the internal and external transmission lines at specific intervals along the transmission lines
  - Increase the number of insulators with conductors that prevent birds from landing on them, forcing birds to perch on crossarms only.
  - Cover the crossarms of pylons with insulating materials to ensure that birds are not earthed.
  - Implement good housekeeping and waste/wastewater management to avoid the presence of water and the growth of marginal vegetation that would make the site “attractive” to birds.

- **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/wastes used or stored; and
  - Potential failure of the safety measures and procedures
  - 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, making sure that they are aware of the nature of the risk, and providing 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 off-site control.

Medical assistance and services

A communication line for access to an ambulance shall be available to provide medical care for the potentially 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.

Scatec 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 thorough 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.

8.4.3 Social Management Plan

It is of key importance for Scatec to have close and proactive communication with the local community and to disclose the project information for transparency and to enhance credibility. A detailed stakeholder engagement and management plan (SEP) will be developed for the project. Main aspects of the plan are summarized in the following sections.

a. Accommodation and Labour Influx Assessment and Management Plan

The Scatec project will develop an accommodation and labour influx assessment and management plan. The plan aims to assess socio-economic baseline setup, identify areas suitable for accommodation of non-local workers, highlight potential influx impacts and mitigation measures, and outline contractors' responsibilities.

The scope of the assessment will cover contractor(s) and subcontractor(s) workers' accommodation during the construction phase.

The accommodation will include on-site accommodation (camps), as well as off-site accommodation in several rented apartments/houses. Nearby local villages will be avoided, and accommodation will take place in larger urban centers, if possible.

Additionally, the plan will define accommodation requirements as per international standards (IFC/EBRD/ILO).

b. Recruitment Procedure

The recruitment instructions for Scatec's project will be developed for contractors to hire workers, subcontractors, and equipment for the project. It will be guided by "equal opportunity", "transparency", and a non-discrimination approach, which maximizes the participation of the local community and increases female inclusion.

Mainly, the job announcement and Ads, along with an official request letter, will be submitted to the Governor for approving the publishing of the Ads on Minya Governorate's Official Page on Facebook. The project CLO will share links with the contractors. The Youth Employment Office (YEO) within the governorate will handle applications for manpower.

c. Scatec's SEAH and GBV Management Plan

Diversity, Equity, Inclusion, and Belonging (DEIB) Policy: Scatec's DEIB policy encompasses the following key components:

- Zero Tolerance for Sexual Harassment: The policy strictly prohibits all forms of SH, including SEAH.
- GBV: Scatec is committed to human rights and equal opportunities, with a comprehensive stance against all forms of GBV.

Integration with HR Policies: Scatec integrates its HR policies with the SEAH and GBV Management Plan to foster a safe and respectful workplace. This integration includes the establishment of clear protocols to prevent and respond to incidents. Implementation of this plan ensures non-discrimination and equal pay for all employees. To further address and resolve related issues, the project team will appoint a female Community Liaison Officer, providing a significant opportunity for female leadership within the project. The CLO will also participate in workers' awareness related to issues of GBVH / SEAH, and develop measures for reporting these cases.

d. Labour and Working Conditions

During construction, the project will ensure that contractors are implementing suitable health and safety measures, and that workers are not exposed to forced or compulsory

labour including child labour. The project's hiring policies will ensure that priority employment would be for local hires. During operation, the project will adhere to the requirements of the Labour Law 14/2025[30] and the general international workplace health and safety guidelines.

e. On-going Consultation

Scatec has already undertaken various activities to communicate and engage with key stakeholders and is willing to continue its engagement activities. Annex 5 includes the stakeholders' consultation 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 in the eastern part of Minya governorate.

f. 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.

g. 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.

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 PRs 10 (2019) and AfDB OS10, 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 concern"[31]. 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 during during construction, operation, and decommissioning phase. A detailed Stakeholders engagement plan including details of the GRM has been prepared for the overall Energy Valley project.

Figure 8–1 shows the proposed project's grievance mechanism system.

[30] The new Labour Law has recently come into effect, the executive decrees of the previous labour law (law 12/2003) shall be applicable until issuance of the new executive decrees.

[31] IFC PS 2012, para. 35 (Grievance Mechanism for Affected Communities)

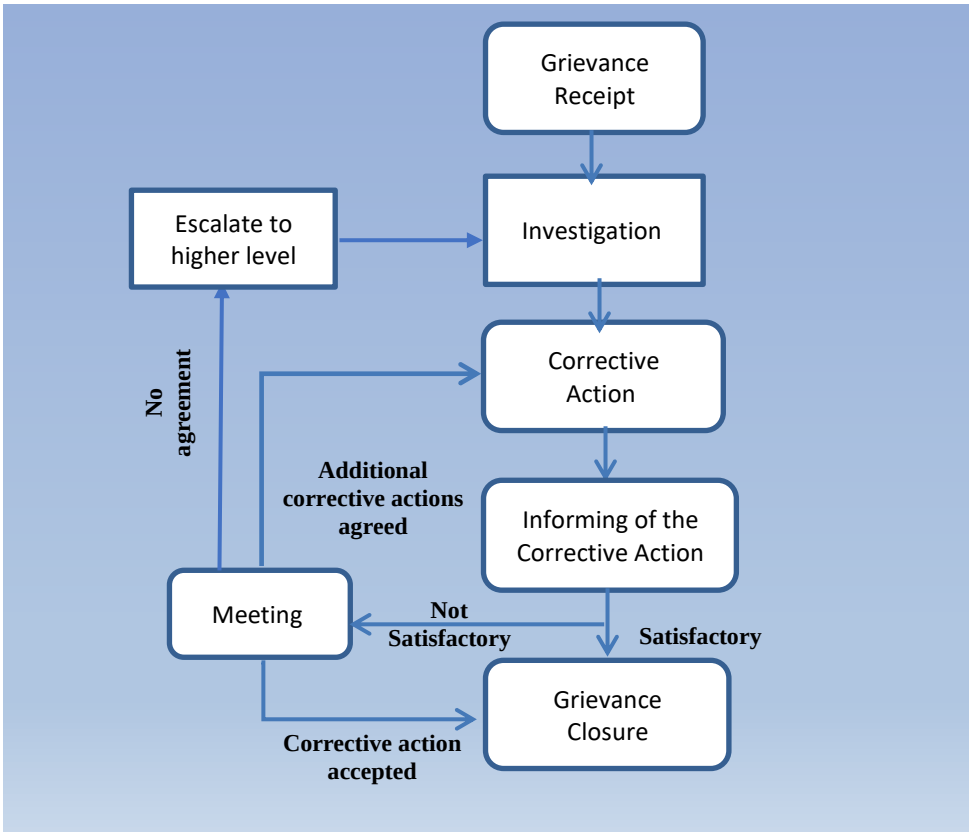

Figure 8–1: Proposed grievance mechanism system

- Grievances can be lodged in writing or verbally, as appropriate.
- 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.
- 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.
- 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.

Grievance Handling Process

The grievance management process will include the following steps:

Step	Responsibility	Timeframe
Receipt and registration of grievance	CLO[32] / 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.

8.5 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

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

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
- 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.

h. Socio-economic Monitoring

The project will monitor the following socio-economic aspects on a regular basis:
- Satisfaction of the local community with the project activities;
- Local community's needs (healthcare, water, etc.);
- GM is fully understood by the local community; and
- Any unsolved grievances;

8.5.1 Project Decommissioning Plans

Decommissioning is defined as the close down of operations, the removal of process equipment, buildings, and structures, and carryout site cleanup and remediation, if required. The expected lifetime of the project ranges between 25 and 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.

A detailed Decommissioning Plan will be developed by energyvalley prior to the end of the operational phase, in accordance with applicable national legislation and internationally recognized good practice.

The following are the main issues addressed by the facility's decommissioning plan:
- Preparation of detailed procedures for safe dismantling and removal of all above-ground infrastructure, including mounting structures, inverters, transformers, cabling, and auxiliary facilities.
- Safe disassembly, handling, and removal of PV modules and BESS components (including batteries), ensuring appropriate risk controls for hazardous materials where applicable.
- Prioritization of reuse, recycling, and recovery of materials to the maximum extent practicable, and environmentally sound disposal of residual waste through licensed facilities;
- Management of hazardous materials and wastes in accordance with applicable legal requirements and good international industry practice;
- Assessment and implementation of site restoration and rehabilitation measures, including soil stabilization and re-vegetation where required to restore pre-project land conditions or agreed post-closure land use;
- Health and safety management plans for decommissioning workers and contractors, including risk assessment, training, and emergency preparedness;

8.5.2 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 the ESMP Plans

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Construction Phase						
Air Quality	Dust emissions	- Reduce idling times for vehicles and machinery; - Maintaining machinery and vehicles in good working order - Speed restriction on sites; - Ensuring workers are aware of safe driving and maintaining good practices in machinery usage; and - Periodic measurements for stacks of generators	Construction contractor	- Monitoring plan - Air quality measurements	15,000 – 20,000 / year	Throughout the construction phase period
	working conditions of machinery	- Ensure good working conditions through frequent inspection of all construction equipment - Implementation of OHS plans	Construction contractor	Maintenance logs OHS plan	50,000 – 70,000 (included in EPC O&M allowance)	
Noise Level	working conditions of machinery	- Regular maintenance of construction equipment - Use low-noise equipment, where possible; - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels; - Schedule high-noise activities to take place in morning hours - Implementation of OHS plans	Construction contractor	OHS plan Noise measurements and Maintenance logs	10,000 – 15,000 / year	Throughout the construction phase period
	Provision of PPEs	- Providing necessary PPE for workers	Construction contractor		20,000 – 40,000 (PPE supply - total project period)	
Soil	housekeeping practices	- Develop and implement site management plan, solid waste management and wastewater	Construction contractor Developer (include provisions in the construction contracts.	- Waste and wastewater management plans	6,000 – 80,000 (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						
	Waste/wastewater management	management plans and spill prevention plan - Proper collection, containment, and disposal of sanitary wastewater - Proper collection, containment, and disposal of sanitary wastewater - hazardous materials storage and handling according to the WBG General EHS Guidelines, - Transportation and disposal to be carried out through authorized waste contractors	Developers to ensure contractors' compliance)	- Solid/hazardous waste and wastewater management contract - Contractor follow-up documents - Contracts with authorized waste contractors		
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	60,000 – 80,000	Before construction activities
Emergency Response plans	Site Staff and Workplace Safety	- Develop procedures for emergency control	Contractor	Emergency response plan	30,000 – 80,000	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	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)	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						
Biological Environment	Pests and invasive species	- Good housekeeping and proper waste management	Construction contractor	Waste management contract	10,000 – 25,000 (one-time)	Throughout the construction phase
	Disturbance to wildlife	- Awareness (toolbox talks and awareness signs) - Implementation of mitigation measures - Supervision and implementation of deterring measures	Construction contractor	Requirements specified in contracts		Throughout the construction phase
Social Environment	Workers influx	- Prioritize hiring local workers - Implement and maintain a community grievance mechanism; and, - Selection of labour accommodation, away from existing communities, as possible, and considering establishing a labour camp on site. - Develop HR policies including GBV and SEAH plans	Developer/Construction contractors	Labour management plan, workers accommodation inspection checklist GBV and SEAH policies Workers Awareness	50,000 – 150,000 / year	Throughout the construction phase period
	Community health, safety and security- risks from road traffic accidents	- Develop Traffic Management Plan (TMP) and associated procedures	Construction contractors	TMP and procedures	40,000 – 100,000	
	Cultural heritage	- develop chance find procedure	Developer/Construction contractors	Developed procedures	5,000 – 15,000	Before construction activities

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
Operation Phase						
Air quality	Backup generator emissions	- Optimize the operation of backup generators to reduce usage and emissions. - Conducting regular maintenance and periodic emissions monitoring of generators to ensure efficient operation and minimize air emissions	Developer	Emission measurements Maintenance records	15,000 – 20,000 / year	Periodically throughout the operation stage
Noise	Transformers and BESS	- Workers at noise generating machinery and equipment will be provided with suitable (PPEs). - A grievance mechanism will be adopted for assessing complaints	Developer	Noise measurements	10,000 – 15,000 / year	Periodically throughout the operation stage
Biological Environment	Same as for the construction phase	- Same as for the construction phase	Developer	Reports	10,000 – 25,000 (one-time)	Throughout the project lifetime
Impact on the social environment	Water consumption	- Water demand stewater generated during the operation phase is minimal and will be collected coordination between the project and the water company to plan the sources of waterby an approved contractor and discharged to designated treatment plants	Developer	Water management plan	10,000–30,000 / year (mainly contractor fees)	Throughout the project lifetime
	Wastewater management	- Wastewater generated during the operation phase is minimal and will be collected by an approved contractor and discharged to designated treatment plants	Developer	Wastewater management plan		Throughout the project lifetime
Labour rights and welfare	working conditions	Develop Human Resources policy	Developer	Contracts (with workers)	Included in OPEX (negligible direct ESMP cost)	Throughout the project lifetime

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required completion Date
Training and Awareness	competence of the project personnel	training for the personnel according to their particular responsibilities	Developer	Training plans	10,000–25,000 / year	Throughout the project lifetime
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing HSE procedures	Developer	Development of HSE policies	15,000–40,000 / year	Before project commissioning
Emergency Preparedness and Response	Operational risk management	- Adopt a probabilistic risk assessment framework	Developer	Emergency response plan	5,000–20,000 / year	Before project commissioning
Community health, safety, and site security	- risk of road traffic accidents - Site security	- Develop site security and safety plan - Develop a grievance mechanism	Developer	- security plan - SEP and grievance mechanism and register	25,000–70,000 / year	Throughout the project lifetime
Decommissioning Phase						
Decommissioning Planning	- Inadequate planning and coordination	- Prepare and implement a Decommissioning Plan .	Energy Valley	- Approved Decommissioning Plan	40,000 – 80,000	Prior to decommissioning
Air Quality	- Dust and air emissions from dismantling and demolition	- Apply dust suppression measures	Decommissioning Contractor	Emission measurements	20,000 – 40,000	Throughout decommissioning
Noise	- Noise from demolition and equipment removal	- Limit noisy activities, maintain equipment in good working condition, and provide PPE where required.	Decommissioning Contractor	- Noise measurements	15,000 – 30,000	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	-Waste management contracts	150,000 – 300,000	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	60,000 – 120,000	Throughout decommissioning
Site Restoration	- Residual contamination and disturbed land	- Remove remaining structures, clean up the site, remediate if	Decommissioning Contractor / Energy Valley	- Site restoration completed and approved	500,000 – 1,500,000	Before project closure

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	**Estimated Cost (USD)**	Required completion Date
			required, and restore the site where feasible.				
Consolidated Estimated Annual Environmental and Social Monitoring Budget							
		Construction Phase	**Operation Phase**	**Decommissioning Phase**			
Estimated Total Annual Cost	(USD)	≈ 845,000 USD	≈ 380,000 USD / year	≈ 785,000–2,070,000 USD			
	(EGP)	≈ 42,250,000 EGP	≈ 19,000,000 EGP / year	≈ 39,250,000–103,500,000 EGP			

8.6 Environmental and Social Monitoring Plans

8.6.1 Environmental Monitoring

Although most potential impacts can be mitigated through management procedures, the monitoring plan is an essential element for the environmental management scheme of the project. It provides data for periodic review and necessary adjustments to the environmental management plan, ensuring environmental protection through the early detection of negative impacts.

- The project will develop and implement a monitoring program for various environmental aspects during both the construction and operation phases. Monitoring results will inform the decision-making process, triggering corrective actions to maintain compliance with environmental laws and regulations, ensure environmental protection and workplace safety, and ensure the effective operation of mitigation measures and management plans.

According to Law 4/1994, establishments should maintain an environmental register to track the environmental aspects of their activities during the operational phase. This register will be updated annually. Moreover, a detailed monitoring plan will be made available by the company at the beginning of the operation phase.

It is worth mentioning that environmental monitoring is a dynamic process. Consequently, regular updates and modifications, as needed, shall be carried out based on the results of the first monitoring round. Moreover, as mentioned in Chapter (5), if different standards for the same parameter are mentioned, the project shall adopt the most stringent standard.

- Air Quality Monitoring During Construction
  Workplace air monitoring of equipment exhaust will be performed quarterly. Emissions are generated from exhaust from construction equipment and motor vehicles, and particulates during site works. Monitoring results will be compared with the allowable limits of Law 4/1994 provided in Chapter (5) of this study.

  The following parameters shall be measured:
  - Carbon monoxide, CO
  - Sulfur dioxide, SO_2
  - Nitrogen oxides, NO_x
  - PM_{10}

- Workplace Monitoring
  Labour Audit
  Labour audits are the most common spot-check mechanism used to monitor labour standards during both the construction and operation phases. Essentially, they serve as tools to ensure and support the application of labour standards through a thorough formal examination of the labour practices at a specific workplace or company, based on corroborated evidence.

The purpose of an audit is to evaluate these practices against a defined standard, and it will extend to the supply chain, in accordance with Scatec Human Rights policy, EBRD PR2, ILO and relevant guidelines and Egyptian Labour law. Additionally, monitoring will include tracking grievances received from workers and external stakeholders, as well as documenting how these grievances were resolved.

Workplace Noise
During Construction
During construction, the project will ensure that the noise level from all construction equipment would not exceed the allowable limit set by Law 4/ 1994 for 8 hours duration shift (90 dB). In case the noise levels exceeded this limit, the exposure periods will be carried out according to those indicated in Annex (7) of Law 4/1994. Moreover, ear plugs will be provided for the workers at the locations generating increased noise levels. Noise level measurement will be carried out quarterly.

During Operation
Sources of noise result mainly from transformers and inverters. The measured noise levels will be compared to the levels set in Annex (7) of Law 4/1994. In case the noise exceeded the maximum limit of 90 dB, exposure periods will be proceeded as stipulated in Law 4/1994.

- *Solid and Hazardous Wastes*
  Non-hazardous solid wastes will be recorded in the Environmental register of the plant. On the other hand, according to Law 4/1994, a register will be prepared for hazardous wastes. Information on the HW register should include types and quantities of hazardous wastes, storage means, and disposal.

  An independent consultant would be hired to carry out the monitoring activities. The following Table 8–3 provides the proposed monitoring plan. The costs only cover analysis and field measurements. However, they do not include specific sample collection costs.

- *Biodiversity monitoring*
  Visual inspection will be conducted on a daily basis. This inspection will cover aspects related to the status of biodiversity and the presence of potential hazards to wildlife and habitats. The inspection will also check to ensure proper implementation of measures outlined in this ESIA to minimize potential risks associated with day-to-day activities.

  A basic fauna encounter procedure will be established and implemented to keep records of animal sightings, including dead animals due to vehicle collisions or other reasons. A Fauna Encounter Form will be developed and distributed to selected onsite staff. A form will be filled for each encountered species and will contain basic information, including:
  - Name of the animal;
  - Brief description;
  - Sighting location(s) (including coordinates, if possible);
  - Number of sightings;
  - Number of sighted animals;
  - Notable behaviour;

- Interaction with the project; and
- Photos of the animal.

All compiled forms will be kept in a register and used for the development of monthly reports.

Moreover, visual inspection carried out by onsite project staff will be sufficient to monitor aspects that could attract vermin and pests (such as water accumulation, unsafe disposal of solid waste and wastewater) and assess the potential presence of pests (rodents, insects, etc.).

In addition, the visual inspection and Fauna Encounter Procedure will also report the potential occurrence of any species alien to the area.

Table 8–3: Proposed 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 and neighbouring industrial area	Noise measurements		Project site	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD PR4; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	All contractors and subcontractors, supervised by Scatec	Third party (research entity or certified lab)	~10,000 EGP
	Air emissions		Project site	Compliance with air emission standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	All contractors and subcontractors, supervised by Scatec	Third party (research entity or certified lab)	~ 35,000 EGP
	Biodiversity	Habitats and biodiversity	Project site and Vicinity (AoI)	- Absence of hazards to wildlife and habitats - Proper implementation of mitigation measures	Law No. 4/1994; IFC PS6; EBRD PR6; AfDB OS3; EIB ESS3	Daily	All contractors and subcontractors, supervised by Scatec	Enegy Valley Company and contactors EHS personnel	USD 10,000 – 25,000
		Fauna		- Number of fauna encounters - No or reduced number of fatalities (such as road mortalities)		Chance encounters			
		Pests		- Good housekeeping - Absence of pests		Daily			

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	Waste management	Project site and waste storage areas	Proper management of the different types of waste	Waste Managemnet Law No. 202/2020; Law No. 4/1994; IFC PS3; EBRD PR3; AfDB OS4; EIB ESS3	Regular	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS personnel	200 – 600 USD/ton (hazardous waste) 80 – 150 USD/ton (non-hazardous)
	Wastewater management	Project site	- Good housekeeping Absence of alien vegetation		Regular	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS personnel	USD 10,000–30,000 / year (mainly contractor fees)
	Workers influx	Project site and offsite accommodation	Number of community grievance	Egyptian Labour Law No. 14/2025; IFC PS2; EBRD PR2; 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 (AoI)	- No road accidents - No community grievances Proper implementation of traffic management plan	IFC PS4; EBRD PR4; AfDB OS4; EIB ESS9	Regular during construction phase	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS personnel	USD 2,000–4,000/year

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Operation phase								
Workplace	Noise measurements	Transformers and inverters are	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD PR4; AfDB OS4; EIB ESS3	Annually	Energy Valley company	Third party (research entity or certified lab)	~10,000 EGP
Emergency generators stacks	Exhaust measurements	Stacks of emergency generators (SO_2, NO_2, CO, PM_{10})	Compliance with point source air emissions standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Annually	Energy Valley company	Third party (research entity or certified lab)	~ 35,000 EGP
Project site and vicinity	Biodiversity (same as for the construction phase)	Same as for the construction phase	Same as for the construction phase	Law No. 4/1994; IFC PS6; EBRD PR6; AfDB OS3; EIB ESS3	Same as for the construction phase	Energy Valley company	Project personnel	10,000 – 25,000
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.	AfDB Integrated Safeguards System (ISS); AfDB OSs; IFC Performance Standards; EBRD PRs; Applicable National Legislation	Annually	Energy Valley company	Independent external E&S consultant/auditing firm	USD 10,000–20,000 per audit

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
			– incident management and applicable legal requirements					
Decommissioning Phase								
Air quality (dust from demolition and dismantling)	Measurement Report	Project site and site boundary	– Compliance with air emissions standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Quarterly during decommissioning and during major dismantling activities	Decommissioning Contractor supervised by Energy Valley	Third party (certified laboratory)	USD 500–1,000/year
Noise from dismantling activities	Noise measurements	Project site and site boundary	– Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Quarterly during decommissioning	Decommissioning Contractor supervised by Energy Valley	Third party (certified laboratory)	USD 300–800/year
Hazardous and non-hazardous waste	Waste management inspections and documentation review	Waste storage areas, dismantling areas, waste transfer points	– Proper segregation and storage of waste – Waste transfer manifests maintained – Disposal through licensed contractors	Waste Management Law No. 202/2020; Law No. 4/1994; IFC PS3; EBRD PR3; AfDB OS4; EIB ESS3	Regular throughout decommissioning	Decommissioning Contractor supervised by Energy Valley	Energy Valley and Contractor EHS personnel	USD 2,000–5,000/year *(excluding disposal fees)*
Soil contamination from	Site inspections and spill monitoring	Project site, dismantling areas, temporary	– No uncontrolled spills – Proper containment of	Law No. 4/1994 and law 202/2020 /	Weekly and after any spill event	Decommissioning Contractor	Contractor and Energy Valley EHS personnel	USD 1,000–3,000/year

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
waste, fuels, oils, or transformer components		waste storage areas	hazardous materials – No evidence of soil contamination	IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3		supervised by Energy Valley		
Occupational Health and Safety (OHS)	OHS inspections and incident reporting	Entire Project site	– No fatalities or major incidents – PPE compliance – Training records maintained – Emergency preparedness implemented	Egyptian Labour Law No. 14/2025; IFC PS2; IFC PS4; EBRD PR2 & PR4; AfDB OS5; EIB ESS9	Daily inspections and monthly reporting	Decommissioning Contractor supervised by Energy Valley	Contractor HSE Team and Energy Valley EHS personnel	USD 5,000–15,000/year
Community Health and Safety	Inspection of traffic management, access control, and public safety measures	Project site and site boundary	– No traffic accidents attributable to Project activities – No community safety incidents – No unresolved grievances	IFC PS4; EBRD PR4; AfDB OS4; EIB ESS9	Regular throughout decommissioning	Decommissioning Contractor supervised by Energy Valley	Contractor and Energy Valley EHS personnel	USD 1,000–3,000/year
Site Restoration	Site restoration inspections	Entire Project site	– Removal of temporary facilities and infrastructure – Site restored to agreed post-closure condition – No residual contamination identified	Law 4/1994 and Waste Management law 202/2020; IFC/WBG General EHS Guidelines; AfDB ISS; EIB ESS3	Periodically during restoration and upon completion	Decommissioning Contractor supervised by Energy Valley	Independent consultant and Energy Valley	USD 5,000–8,000 (one-time)

Receptors / Source of impact/risk		Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Site restoration									
		Construction Phase			**Operation Phase**			**Decommissioning Phase**	
Estimated Total Annual Cost*	(USD)	Approx.USD 4,000–9,000			Approx. USD 10,000–20,000			Approx. USD 15,000–40,000.	
	(EGP)	Approx. EGP 65,000–100,000			Approx. EGP 55,000–70,000			≈ 750,000–2,000,000 / year	

*The above costs are indicative estimates intended to provide an order-of-magnitude assessment of environmental and social monitoring expenditures .

8.6.2 Social Management Plan

The main aspects of the social management plan are summarized in the following sections.

- Labour and Working Conditions
  During construction, the project will ensure that contractors are implementing suitable health and safety measures, and that workers are not exposed to forced or compulsory labour, including child labour.

  During operation, the project will adhere to the requirements of Law 14/2025 and the general international workplace health and safety guidelines.

- On-going Consultation
  Scatec has already undertaken various activities to communicate and engage with key stakeholders and is willing to continue its engagement activities (Annex 5).

- 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 detail and presented in an accessible manner (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.

- Grievance Management
  A project grievance management plan will be developed will include external and internal grievance mechanisms.

  Handling grievances related to GBV, SEAH will be undertaken in accordance with the requirements set within the AfDB[33] ISS Best Practice Note addressing SEAH, GBV, and EBRD[34] Good Practice: Addressing Gender-Based Violence and Harassment. For grievances related to the above, the steps to be undertaken will be in compliance with the project SEP.

- Socio-economic Monitoring
  The project will monitor the following socio-economic aspects on a regular basis:
  - Satisfaction/concerns of the neighbouring communities/activities with the project;
  - Local community's needs (healthcare, water, etc.);
  - Grievance mechanism is fully understood by the local community, and
  - Any unsolved grievances;

[33] https://www.afdb.org/sites/default/files/borrower_guidance_note_on_gender_in_es_safeguards .pdf
[34]EBRD, Emerging Good Practice for the Private Sector Addressing Gender-Based Violence and Harassment, https://www.ebrd.com/news/2020/new-guidance-for-private-sector-on-addressing-risks-of-genderbased-violence-and-harassment.html

The grievance mechanism will also entail a process for monitoring community grievances related to GBV and SEAH.

- Management Plan Review
  The ESMPs will be reviewed to reflect any potential E&S changes, and procedures will be reissued, as/if needed. The Site Manager will be responsible for ensuring that the workforce is complying with procedures, informing the staff of any changes, and ensures that the personnel are aware of changes before starting any work.Table 45

Table 8–4: Proposed Social Monitoring Plan

Receptors / Source of impact/risk	Monitoring location	Target / Indicators	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Labour and Working Conditions	Project site	Health and safety measures No instances of forced or child labour reported.	Ongoing during construction and operation	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries
Information Disclosure	Project's Disclosure channels	– Publicly available information. – Semi-annual updates provided. – Information in Arabic with infographics where beneficial.	On-going basis during construction and operation and updated semi-annually	Energy Valley company	Energy Valley Company EHS personnel	Included in staff salaries
Grievance Management	Project site	– Grievance management plan developed for internal and external grievances. – Compliance with EBRD good practice for GBV and SEAH grievances.	Ongoing during construction and operation	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries
Socio-economic Monitoring	Project site and AoI	– Regular monitoring of community concerns and needs. – Grievance mechanism understanding assessed. – Monitoring of unresolved grievances.	On regular basis (quarterly)	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries

*The above costs are indicative estimates intended to provide an order-of-magnitude assessment of environmental and social monitoring expenditures .

9. Conclusion

The Energy Valley Solar Power and 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 (ESIA) has identified and evaluated the potential environmental and social impacts associated with the Project across its construction, operation, and decommissioning phases.

To ensure environmental and social sustainability, the project will implement rigorous dust suppression, waste management, and spill prevention protocols throughout the construction phase.

Operational risks are mitigated through specialized avifaunal protection, such as insulated fittings, alongside BESS safety systems featuring continuous thermal monitoring and automated fire suppression. Furthermore, socio-economic integrity is maintained by prioritizing local labor to minimize influx disruption and ensuring transparent communication through a robust, accessible grievance mechanism.

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 845,000 during the construction phase and approximately USD 380,000 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.

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Annex 1: East Minya Project Land Status Review and Resettlement Applicability Assessment

Minya Hybrid Land Status and PR5 Considerations Note

As the project site was unoccupied at the cut-off date, PS5 does not apply.

The Project site is identified to be part of a government-designated renewable energy development area prior to the reported agricultural use, and the available evidence indicates that agricultural activities commenced after the applicable cut-off date for that purpose.

The Cut-off Date

1. The project site is part of the East Nile concession allocated to NREA via a presidential Decree (116 for 2016) on 23 March 2016 amended by the presidential Decree (126 for 2022).
2. Presidential Decrees are published in the official Journal (the Egyptian Gazette)
3. Moreover, a quick media review reveals that the Presidential Decrees and the allocation of land for renewable energy development were widely disseminated through multiple channels, including:
    a. Elmasdar on 27 March 2016 قرار جمهوري بتخصيص أراضي لإقامة مشروعات توليد الكهرباء من الرياح
    b. El Watan on 22 October 2017 قرار جمهوري بتخصيص بعض أراضي الدولة لإنتاج الطاقة المتجددة - الوطن
    c. Ministry of Electricity and Renewable Energy on 9 January 2020 الأخبار - هيئة الطاقة الجديدة والمتجددة
    d. Albawabh news on 14 April 2022 https://www.albawabhnews.com/4561160
    e. Shorouk news on 14 April 2022 https://www.shorouknews.com/news/view.aspx?cdate=14042022&id=eb92c6b2-cb5b-4c8c-a776-c694a40f4232
    f. Egyptian Laws on 14 April 2022 https://egyptianlaws.com/?p=159496
    g. Instagram on14 April 2022 https://www.instagram.com/p/CcU3P7No9aw/
    h. Among many other publications

4. In addition, the East Nile concession was subject to a Strategic Environmental and Social Assessment (SESA) in 2018 supported by EBRD, which:
    a. Identified the area as a designated renewable energy development zone for NREA.
    b. Included stakeholder consultations in Minya Governorate.
    c. Publicly disclosed the intended land use for renewable energy projects.

    This demonstrates that the allocation and intended use of the land were widely communicated and known to relevant stakeholders well before any recent informal occupation.

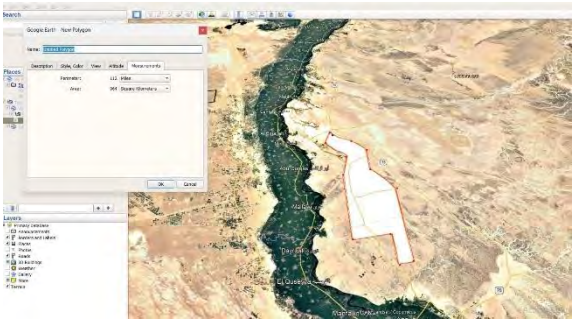
    EBRD website: Egypt: Strategic Environmental and Social Assessment of Renewable Energy Projects in the East Nile Area | We invest in changing lives

As per the Environmental and Social Requirement 5: Land acquisition, restrictions on land use and involuntary resettlement EBRD Guidance Note of December 2025, “the cut-off date as defined by ESR 5, paragraphs 28-29, is usually established by a legal act taken by the

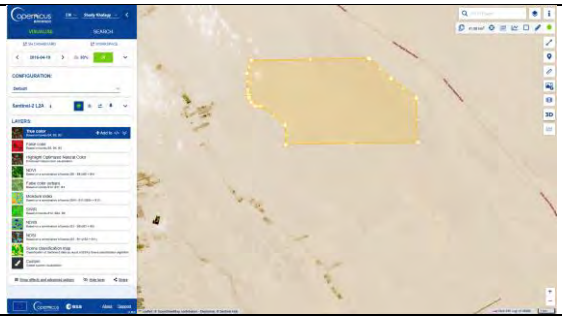
government, such as a declaration of public interest (or in some jurisdictions by a specific decree or order taken in application of the declaration of public interest).

The cut-off date is therefore March 2016

A. **B. Land Occupancy at the Cut-off Date** The project site is part of the broader East Nile renewable energy concession, as defined in the Presidential Decree, representing approximately 4% of the overall designated area.



B. The proposed project location within the NREA East Minya concession was completely empty back in 2016. Informal land users started to use the lands for agricultural activities only in 2023/2024, which is evident in satellite imagery, shown below
C. In 2022, Presidential Decree 126 for 2022 was issued. Decree 126 slightly modified the east Minya concession area. The modified area still includes the proposed project location and avoids small locations that were utilized by farmers in the western part of the old concession.



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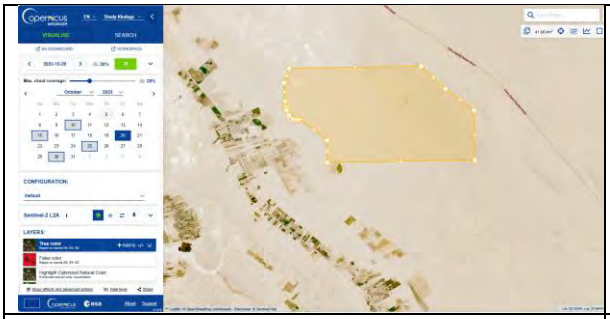
April 2018

April 2020

April 2022



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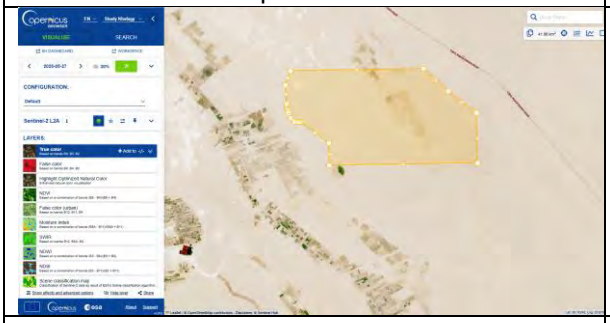

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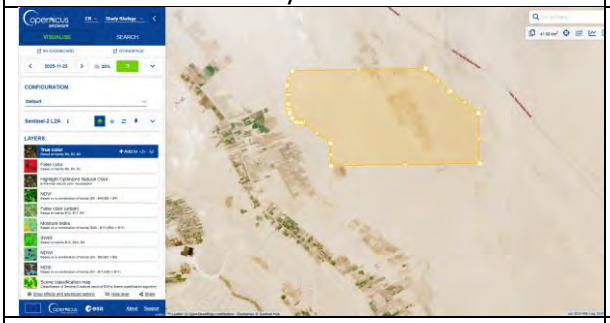
August 2025



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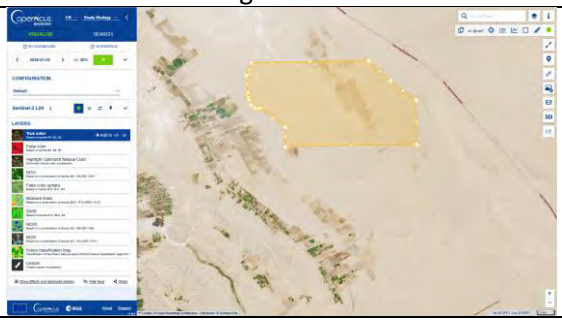

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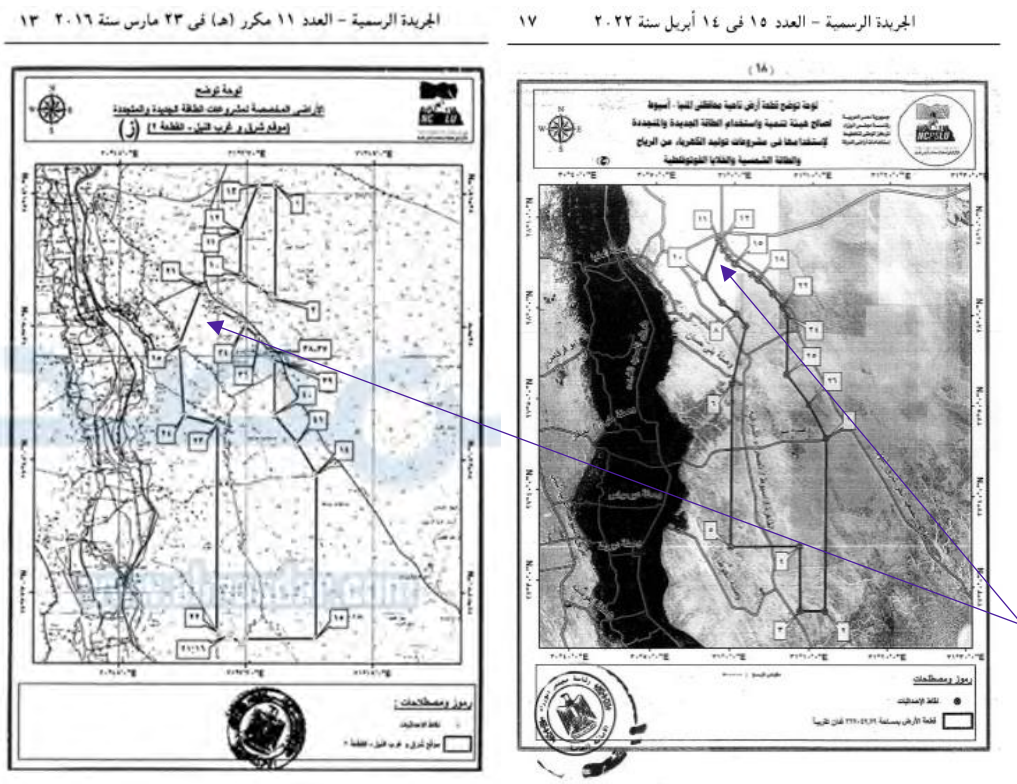

Figure demonstrating the modification of the NREA concession area from Decree 116/2016 (to the left) and Decree 126/2022 (to the right), both including the proposed project location

Second: Reasons related to the expropriation process

1. The land clearance process took place before handing the location to Scatec
2. This was part of a wider Governorate programme, which was clearly announced and covered on the Minya Governorate official site (Portal News - main page), as well as Facebook posts (محافظة المنيا - محافظ المنيا يعلن انطلاق اليوم السبت... | Facebook). The programme covered the NREA concession and several other locations in Minya Governorate.
3. The land was formally handed over to Scatec as vacant land.
4. The Project recognizes that the government-led clearance process was not implemented as a PS5 / PR5-compliant resettlement process. However, current evidence indicates that the agricultural users entered the land after the 2016 legal designation of the area for renewable energy development and therefore are not expected to be eligible for compensation under IFC PS5 on the basis that all users were post-cut-off occupants.

Annex 2: Gap analysis between AfDB Operational Safeguards (OSs) and the National Regulation

National and AfDB's Environmental and Social Operational Safeguards Requirements Gap Analysis

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
OS 1: 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).	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.
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 gap is significant for projects with large contracted workforces.
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).	--	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.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
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.	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.
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).	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.	No national requirements for assigning specific personnel for environmental issues. The updated ISS 2023 adds the requirement for E&S personnel to receive training on SEAH/GBV prevention and response — a gap not addressed by Egyptian law.
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.	--	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.
Supply Chain Management	Where there is a high risk of significant E&S issues in the supply chain (child labour, forced 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	--	Supply chain E&S management is not addressed by Egyptian national law. The 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.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	(OS2, paras. 41–44). Where remedy is not possible, the Borrower shall within a reasonable period shift to compliant suppliers.		
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.	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.
OS 2: 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 (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.	The Egyptian Labour Law No. 14/2025 addresses working conditions and management of worker relationships, covering rights, duties, and occupational health and safety requirements.	The national law is broadly aligned with the general requirement, but does not mandate the preparation of formal Labour Management Procedures (LMPs). The LMP concept is new to the updated ISS 2023 and represents a gap relative to both the 2013 ISS and Egyptian law.
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.	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.
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	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	--

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	in fragile or conflict contexts. All wages, social security benefits, and entitlements shall be paid on termination of employment (OS2, para. 13).	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.	
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).	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.	National law addresses child and forced labour, which is broadly aligned. However, Egyptian law does not explicitly prohibit 'modern slavery' and 'human trafficking' in the labour context as introduced by the updated ISS 2023. This is a gap requiring specific policy and LMP provisions.
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).	--	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.
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.	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.
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	Article 4 of Law 213/2017 (amended by Law 142/2019) concerning trade union organizations states that workers have the	--

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	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).	right to form trade union organizations and freely join or withdraw from them.	
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.	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.
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).	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.
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).	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.	--
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 prepare a Labour Influx Management Plan covering: community health impacts; SEAH/GBV risks; provision of services	--	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 entirely absent from Egyptian legislation. For projects involving significant labour influx, a dedicated management plan will be required.

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	for incoming workers; and measures to avoid conflicts between workers and host communities.		
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.	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.	--
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.	--
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.	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.	--
OS 3: 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	Articles 49 and 50 of Electricity Law No. 87/2015 concern annual energy efficiency planning and policies. No specific	--

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	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.	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.	
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.	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.
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.	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.
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 international benchmarks for hazardous substances management.	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 not been fully integrated into Egyptian regulatory requirements.
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	--	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

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	aligns with Sustainable Development Goals.		develop GHG assessments as a supplementary requirement.
OS 4: 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.	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.
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.	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.
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.	Article 34 of Decree 211/2003 requires selection of less hazardous substances and evaluation of chemical risks with air concentration monitoring.	--
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.	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.
Exposure to Disease	Procedures shall deal with avoiding/minimizing communicable diseases (including those related to influx of project labour) that could result from	--	Labour influx and disease exposure are not addressed in Egyptian national law. The updated ISS 2023 significantly expands this requirement — particularly

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	the project. The updated ISS 2023 strengthens this to include epidemic and pandemic preparedness measures, informed by COVID-19 experience (OS1, para. 3; OS4).		regarding pandemic preparedness — creating a gap relative to Egyptian legislation.
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.	Article 215 of Law 14/2025 and Article 3 of Decree 211/2003 require each facility to prepare an emergency response plan.	--
OS 5: 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, 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).	Law 10/1990 (amended by Laws 1/2015 and 24/2018) enables land acquisition for 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.	National laws do not include requirements for developing a written Land Acquisition 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.
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.	--	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.
Socio-Economic Assessment and Census	A detailed census shall be carried out to: identify displaced persons; determine	--	Egyptian law provides for a census/inventory through the Survey

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	eligible persons for compensation; and develop an inventory of affected land and property. The updated ISS 2023 requires the census to include documentation of informal land rights and customary tenure arrangements.		Authority. However, informal land rights and customary tenure are not recognized in Egyptian law — a gap relative to the updated ISS 2023 requirements.
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).	--	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.
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.	--	Egyptian regulations do not specify income restoration allowances for losses of business income. This is a gap relative to the ISS requirements.
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.	--	There is no cut-off date mechanism under Egyptian law. This is a gap relative to ISS requirements.
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).	--	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.
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	--	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.

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	the basis of sexual orientation and gender identity.		
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.
OS 6: 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).	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.	--
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.	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.
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.	--	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.

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OS 7: 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.	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.
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 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).	--	There are no FPIC requirements under Egyptian law. HVRM groups are not recognized as a legal category in Egyptian legislation. This is a comprehensive new requirement under the updated ISS 2023 with no national law equivalent.
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.	--	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.
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	--	No equivalent requirement exists under Egyptian law. Vulnerable group plans are an entirely new requirement with no national law basis.

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	adverse impacts and ensure equitable benefit-sharing.		
OS 8: 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).	According to EIA guidelines (EEAA, 2009), the baseline environment including tourist attractions shall be described in the EIA.	--
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).	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.	--
OS 9: Financial Intermediaries (NEW STANDALONE OS — ISS 2023)			
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 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.	--	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 original Gap Analysis document and absent from Egyptian legislation.
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	--	No equivalent requirement exists under Egyptian law.

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	high risk regardless of the FI's own system (OS9, para. 19).		
OS 10: 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.	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.
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).	--	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.
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).	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.
Grievance Redress Mechanism (Community)	The Borrower shall provide a grievance mechanism to receive and facilitate resolution of concerns from project-	Egyptian law does not require a dedicated community grievance mechanism for	No written community grievance mechanism is required by Egyptian law. The updated ISS 2023 strengthens this

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	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.	project operations beyond general civil litigation recourse.	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.
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).	--	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.

Annex 3: Glare Assessment

Energy Valley

Glare Assessment

For Energy Valley solar power and battery storage – East Minya Region

Prepared by:

Environics SAE
Environment & Development Advisors

6 Dokki St. 12th Floor, Giza 12311
Tel.: (+2010) 164 81 84 – (+202) 376 015 95 – 374 956 86 / 96
Fax: (+202) 333 605 99
Email: environics@environics.org
Website: www.environics.org

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1. Introduction

Scatec plans to develop a 1,950 MWp (DC) (1700MW) Energy Valley PV plant combined with approximately 1,500 MWh BESS in East of Minya Governorate, South of the Sarirya Industrial Zone.

Photovoltaic panels are characterized by low reflectivity, as their primary function is to absorb light rather than reflect it, and sunlight is directly utilized to generate electricity within the panels. Accordingly, they are typically manufactured from dark-colored materials, such as black or dark blue.

Studies have shown that the reflectance of photovoltaic panels is comparable to that of a water surface[1]. However, the glass surfaces of solar PV systems also reflect sunlight to varying degrees throughout the day and year, based on the incidence angle of the sun relative to ground-based receptors. Lower incidence angles amount to increased reflection.

Due to the presence of potential receptors in areas near the project, a solar glare assessment for the proposed project was undertaken. This is intended to identify whether glare occurs and its intensity as well as propose appropriate mitigation measures, if needed, ensuring the project's minimal adverse impacts on sensitive receptors during the early stages of the project.

[1] https://www.sciencedirect.com/science/article/pii/S0303243422000332

2. Reference Literature

2.1. Glint and Glare

The Federal Aviation Administration (FAA) has defined both terms as follows[2]:

- Glint: A momentary flash of bright light.
- Glare: A continuous source of bright light.

Glare can also be categorized causing:

- Visual discomfort: Observer is compelled to look away.
- Visual disability: Observer can't physically see an object.

The ocular impact resulting from solar glare is classified into three categories:

- **Low**: Low probability of causing a temporary after-image effect (momentary blindness).
- **Moderate**: Likely to cause a temporary after-image effect after looking at the source.
- **Strong**: May cause retinal burn (permanent eye damage).

These classifications are based on the human blink reflex, it is worth noting that retinal burns are generally not possible in the case of glare from solar panels, as photovoltaic panels do not concentrate the reflected sunlight.

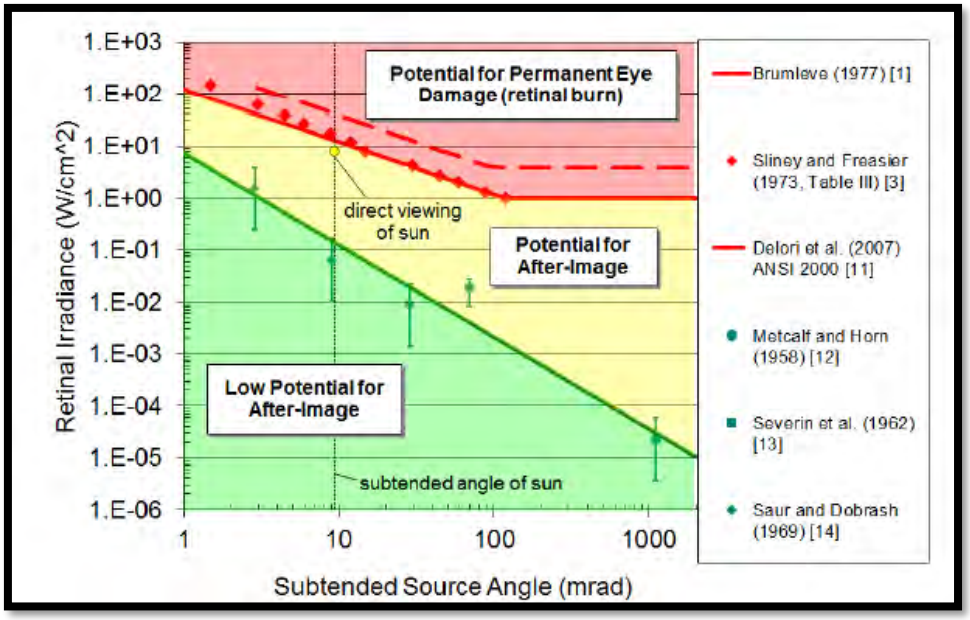

Figure 1: Glare hazard plot depicting ocular impact

[2] FAA. (2018). *Airport Solar Guide*. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/airports/environmental/FAA-Airport-Solar-Guide-2018.pdf

2.2. Overview of reflectivity

The amount of light reflected by a solar panel is influenced by several factors, including the intensity of incoming solar radiation, the angle of incidence between the sunlight and the panel surface, as well as the optical properties of the panel materials and surrounding environmental conditions. Among these factors, the relative orientation between the sun and the panel plays a dominant role.

Although photovoltaic panels are designed to absorb more than 90% of incident sunlight, reflectivity increases at higher incidence angles. In particular, when the angle between the panel normal and the sun exceeds approximately 60°, a greater portion of the incoming light is reflected rather than absorbed. This condition commonly occurs during early morning and late afternoon hours, especially for fixed-tilt systems.

In simple terms, as the panel surface becomes less directly oriented toward the sun, the proportion of reflected light increases. It is important to note that this behavior is not unique to photovoltaic systems, but is also observed in other common reflective surfaces such as vehicle windshields and residential windows.

To mitigate potential visual impacts, photovoltaic panels are typically manufactured with anti-reflective coatings (ARC) and surface texturing, both of which reduce reflectivity and minimize the intensity of glint and glare effects.

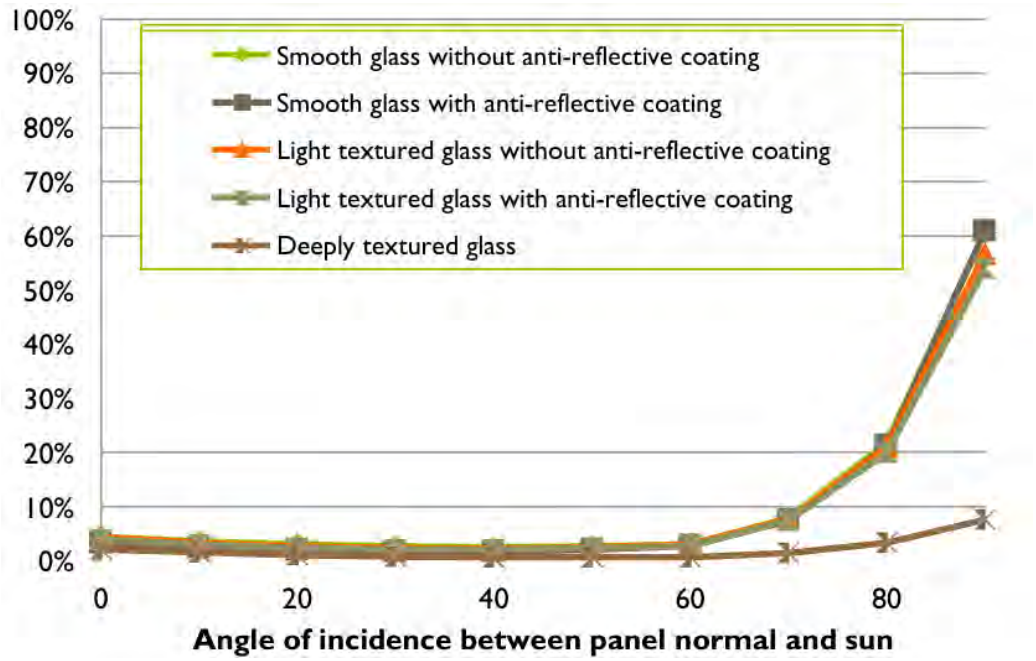

Figure 2: PERCENT OF LIGHT REFLECTED AS A FUNCTION OF INCIDENCE ANGLE[3]

[3] *Source: HTTPS://SHARE.SANDIA.GOV/PHLUX/SGHAT/REFLECTIVITYDATA/*

3. Objectives

This study aims to support the facility's management in adopting an integrated approach to risk management for the ongoing project. It focuses on analyzing and evaluating solar glare risks associated with the operation of photovoltaic (PV) arrays. The purpose of this assessment is to estimate the likelihood of such risks occurring and to determine the potential magnitude of their impact on the surrounding environment. The findings will enable management to make informed decisions regarding appropriate control measures and to identify the most effective preventive or corrective alternatives.

4. Scope

The scope of this study focuses on analyzing the potential exposure of surrounding observers to solar glare resulting from the installation of photovoltaic (PV) arrays covering an area of approximately 41 square kilometers, located in the eastern part of Minya Governorate.

The analysis of potential solar glint occurrences is considered outside the scope of this study, for the following reasons:

1- Solar flash is a very brief and momentary phenomenon that does not persist over time.

2- Solar glint occurs only within a very limited range, when the angle of solar incidence exactly matches the angle of reflection, a condition that can only take place under ideal and rare circumstances.

5. Methodology

5.1. Project site assessment

The project site study forms the basis for the preliminary evaluation of potential observer locations and the delineation of the area of influence.

At this stage, the project boundaries are defined, and the actual area allocated for the installation of photovoltaic (PV) panels is identified in order to determine the area of influence.

The area of influence depends on several factors, including the surface area covered by the photovoltaic panels and the intensity of solar radiation incident on their surface. Based on these factors, the maximum distance at which an observer may be affected is determined. While this distance does not dictate whether solar glare will occur for a given observer, it does influence the intensity of the reflected rays. Therefore, even if there is a potential for solar glare at a certain location, the effect may become negligible at greater distances due to the reduced intensity, and can thus be negligible beyond the defined area of influence.

According to the inverse square law, the intensity of radiation is inversely proportional to the square of the distance between the receiver and the radiation source, accordingly, the following equations are used to establish the relationship between the intensity of reflected radiation and the distance between the reflecting source and the receiver.[4] [5]

$$\mathbf{d_r = f \,.\, \omega}$$

$$\boldsymbol{\omega} = \frac{\mathbf{d_s}}{\mathbf{r}}$$

$$\boldsymbol{E_c = DNI \,.\, R}$$

$$\boldsymbol{E_r = E_c \left(\frac{d_p^2}{d_s^2}\right) \tau}$$

After defining the area of influence, the directions in which solar glare is unlikely to occur are identified in alignment with the solar panel design. Subsequently, the directions most susceptible to solar glare are determined, and the sensitive receptors within these directions are identified in preparation for selecting observer locations.

5.2. PV panels design study

The design of the solar panels and their layout characteristics are analyzed to define the model inputs. Accordingly, the following parameters are determined:

- Height of the PV panels above ground level.
- Type of glass used in the design.
- Maximum tracking angle to the east and west.
- Orientation of the tracking axis (north–south or south–north).
- Tracking system used for the panels (fixed or single-axis tracking).
- Offset angle of the panels on the tracking axis (offset angle).

All of the above constitute the model inputs prior to the assessment process.

5.3. Selection of observers

Land use and activities within the area of influence are analyzed. Accordingly, observers potentially affected by solar glare from the photovoltaic panels are identified, and their locations and elevations above sea level are determined.

[4] Ho, C. K., & Khalsa, S. S. (2011). *Methodology to assess potential glint and glare hazards from concentrating solar power plants*. Sandia National Laboratories.

[5] d_r: Image projected diameter, f: Eye focal length, w: Subtended source angle, d_s: Source width, r: Radial distance, E_c: Irradiance at the source, DNI: Direct normal irradiance, R: Reflectance factor, d_p: Pupil diameter, t: Transmission coefficient

In defining observer height, each observer type is classified and an average representative height is assigned accordingly, as observer types may vary and thus differ in eye-level elevation (e.g., vehicles, pedestrians, or occupants in buildings). In most cases, a standard height of 1.6 meters is adopted, representing the average human eye level.

5.4. Glare model

The assessment of solar glare probability is conducted using Environics in-house model. This model is an analytical tool developed to assess the probability of solar glare resulting from the reflection of solar radiation from photovoltaic panel surfaces toward observer locations. It is based on a physical and engineering framework that integrates detailed solar geometry modeling, surface reflection characteristics, and the visual field of observers.

The model relies on an integrated set of inputs that can be categorized into three main groups: (1) site and system geometry inputs, including the location, height, orientation of the solar panels, rotation and tilt angles, and the tracking system type; (2) optical and material properties, such as glass type and its associated reflectance characteristics; and (3) environmental inputs, including weather conditions such as temperature and surface pressure, which indirectly influence atmospheric and radiative behavior. In addition, observer data are incorporated, including their locations, heights, and field-of-view characteristics.

The model operates through a sequence of interconnected computational modules. In the first stage, the apparent position of the sun relative to the project location is determined using established solar geometry algorithm to calculate key solar angles, such as the solar azimuth and solar elevation angles, taking into account geographic location, time, and meteorological conditions. Methods such as the Michalsky algorithm are applied for solar position determination[6].

In the second stage, the incoming solar radiation on the photovoltaic panel surface is evaluated, accounting for atmospheric effects and meteorological conditions, in order to define the characteristics of incident radiation prior to reflection. The reflection behavior is then modeled based on material properties, glass type, and tracking angles.

In the third stage, the reflected rays from the panel surface are simulated relative to observer locations by analyzing the geometric relationship between the reflected ray direction and each observer's field of view. This stage evaluates the geometric alignment

[6] https://www.researchgate.net/publication/222131147_The_Astronomical_Almanac's_algorithm_for_approximate_solar_position_1950-2050/link/5c5071fb299bf12be3eb8ff3

condition, which represents the fundamental requirement for glare occurrence, whereby exposure is only possible when the reflected rays align with the observer's line of sight within their visual field boundaries.

From a physical perspective, the model is based on the principle of geometric reflection of solar radiation, where glare occurrence is determined by the alignment between the incident angle, reflection angle, and the relative positioning of the sun, reflecting surface, and observer. Accordingly, solar glare is not a random phenomenon but a direct outcome of precise geometric interactions between the radiation source, reflective surface, and observer.

Finally, the model evaluates the likelihood of glare occurrence for each observer over a defined time period, identifying specific time intervals during which exposure may occur through time-dependent solar position analysis. In the event that solar glare occurs for a given observer, the model calculates the intensity of the solar glare resulting from the reflection of radiation from the photovoltaic panels. It then evaluates the potential impacts associated with the observer's exposure to this glare, in accordance with the assessment methodology previously illustrated in Figure (1).

The model consists of a user-friendly interface, where an interactive map allows the user to delineate the boundaries of the solar panel site and define observer locations. The interface requires four main inputs: the height of the panels above ground level, the type of glass used, the offset angle of the panels relative to the tracking axis, and the type of tracking system.

Overall, the model provides a comprehensive analytical framework that integrates solar radiation physics, geometric reflection modeling, and spatiotemporal analysis to support decision-making in solar project design and operation, while minimizing potential visual impacts on observers and surrounding environments.

Figure (3) illustrates the architecture of the solar glare model.

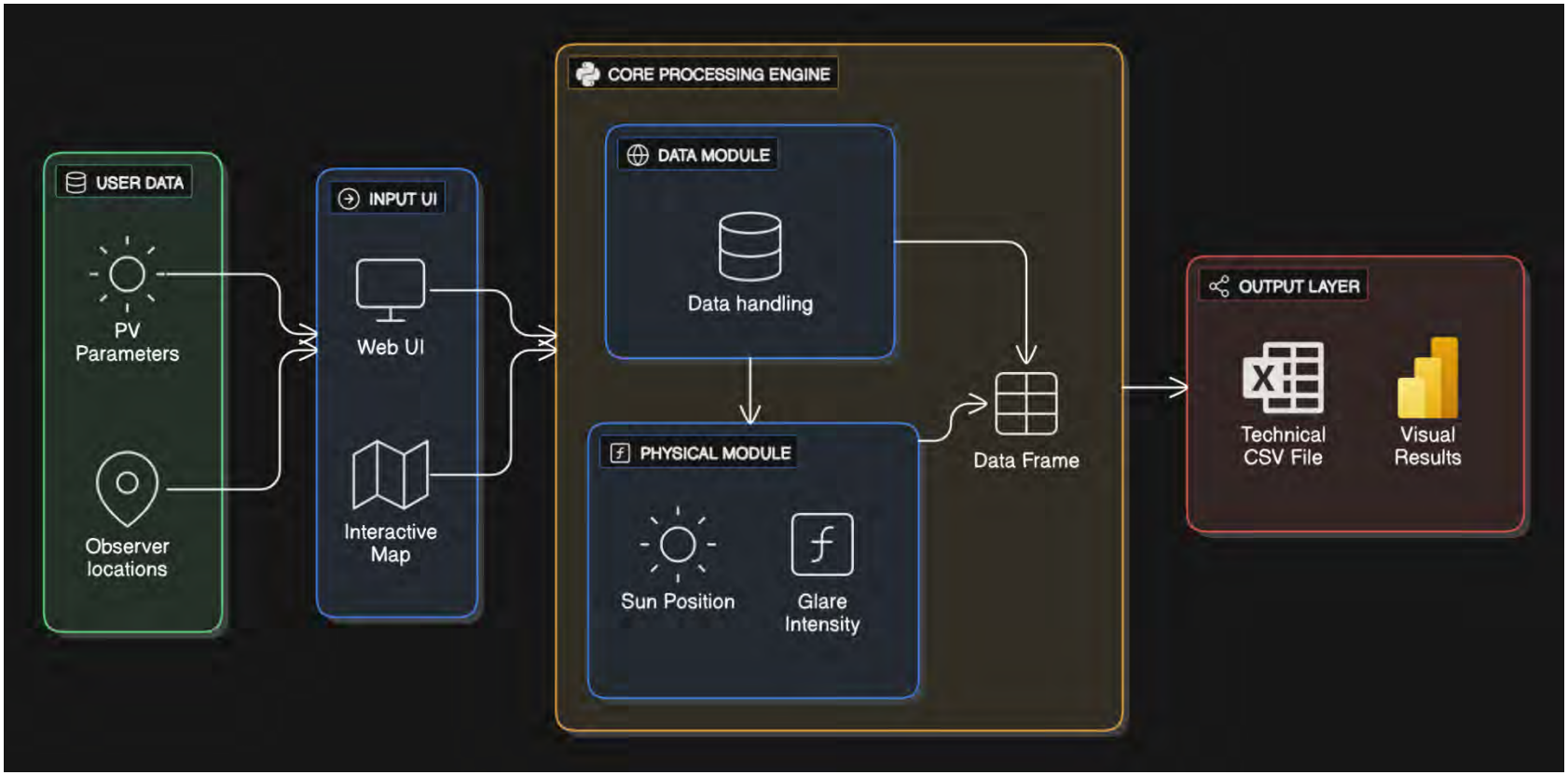

Figure 3: Solar glare model architecture

6. Glare model analysis

6.1. Site description

The PV solar array modeled in this assessment is located within an undeveloped desert in East of Minya Governorate, South of the Sarirya planned Industrial Zone.

The surroundings of the project site are as follows:

- **North:** To the north of the project site lies a vacant desert land, followed by The New Minya desert road, connecting the Sheikh Fadl–Ras Gharib Road and the Minya–Assiut Road (hereafter referred to as the New Minya desert road).
- **South:** To the south of the project site lies a vacant desert land.
- **East:** To the east of the project site lies a vacant desert land, followed by the Cairo–Assiut Desert Road.
- **West:** To the west of the project site are some agricultural lands and residential buildings, followed by the Minya–Wasta Road.

6.2. PV array description

The project comprises a photovoltaic (PV) power plant with a total DC capacity of approximately 1,950 MWp, utilizing around three million mono-crystalline silicon modules, each rated at 640–660 W.

To optimize energy yield, the modules will be installed horizontally on a single-axis horizontal tracking system with a maximum height of approximately 3 meters and a tracking range of ±55°, enabling continuous alignment with the sun's path throughout the day and enhancing overall power generation efficiency.

The following table presents the coordinates of the PV modules section of the project along with their elevations.

Table 1: PV modules coordinates

Point	Long (E)	Lat (N)	Elevation (m)	Total elevation (m)
P1	31.0352°	28.0603°	204	207
P2	31.0151°	28.0789°	187	190
P3	30.9818°	28.0747°	178	181
P4	30.9480°	28.0779°	184	187
P5	30.9484°	28.0592°	193	196
P6	30.9561°	28.0566°	193	196
P7	30.9633°	28.0473°	183	186
P8	30.9698°	28.0379°	187	190
P9	31.0232°	28.0386°	207	210
P10	31.0365°	28.0426°	211	214

Figure (4) illustrates the PV panels vertex locations.

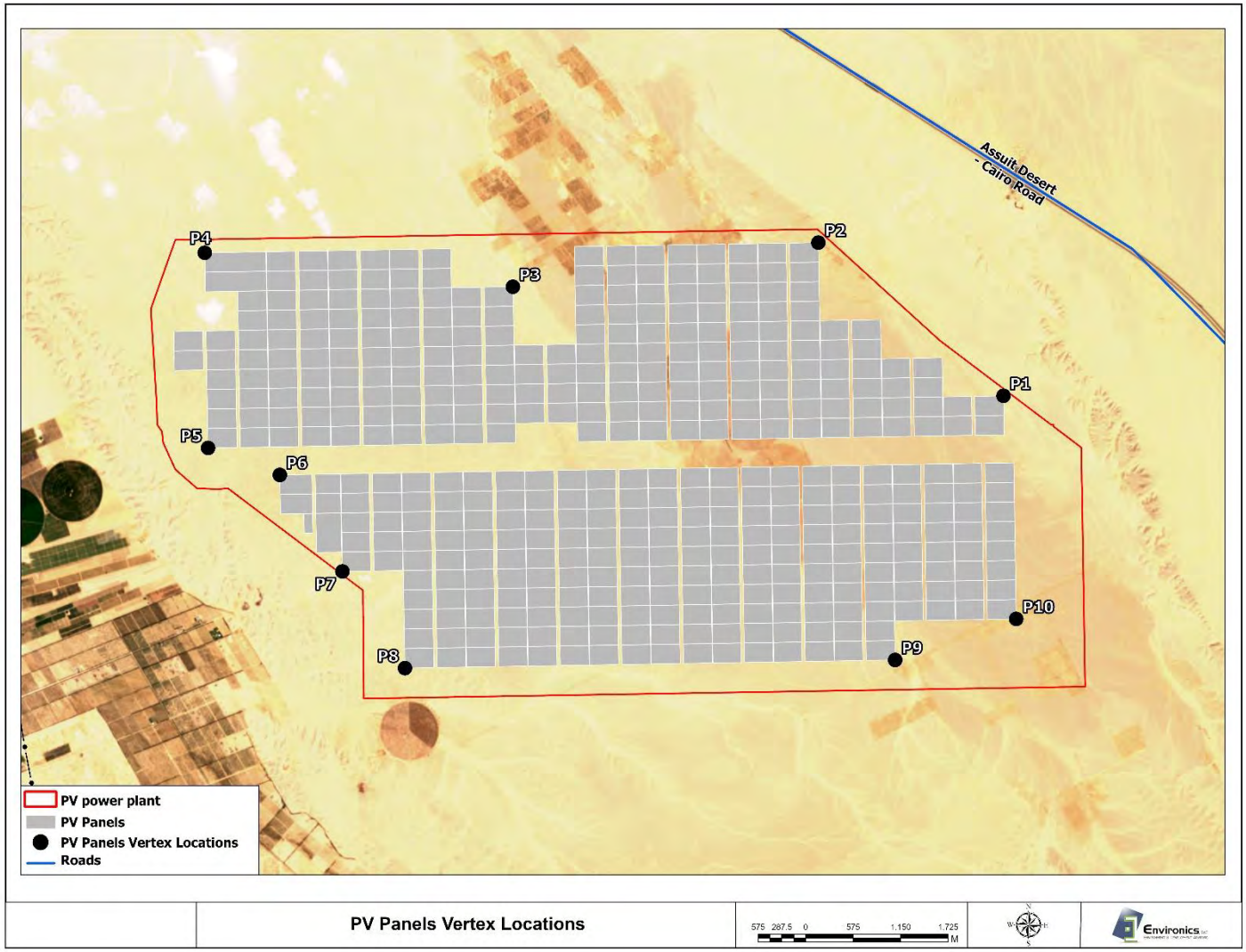

Figure 4: PV panels vertex locations

6.3. Observer selection

By studying the area surrounding the project and evaluating the locations that could potentially be affected by solar glare from the photovoltaic panels, the following was concluded:

- Since the panels are completely horizontal with no offset angle, it is unlikely that any observer to the north of the project would be affected (including the northern section of the Assiut–Cairo Road and the eastern section of the new Minya Desert Road).
- It is unlikely that any observer would be affected in the southern part of the project (vacant land), due to the horizontal orientation of the panels as previously mentioned and given that the area is currently devoid of observers.

Seven receptors were selected (with average height of 1.6 m) to represent the sensitive areas located within the solar glare impact zone, as follows:

- **Observer 1**: Located on the eastern side of the project in the southern section of the Assiut-Cairo Road, representing a road user for whom an exposure is expected during the morning hours of the project's operational period.
- **Observer 2**: Located on the eastern side of the project in the central section of the Assiut-Cairo Road, representing a road user for whom an exposure is expected during the morning hours of the project's operational period.
- **Observer 3**: Located on the eastern side of the project, representing a roadside rest area along the Assiut-Cairo Road. The potential for exposure is expected during the morning hours of the project's operational period.
- **Observer 4**: Located on the eastern side of the project in the northern section of the Assiut-Cairo Road, representing a road user approaching from the upstream direction, for whom exposure is expected during the morning hours of the project's operational period.
- **Observer 5**: Located on the western side of the project, representing a residential area for nearby farmers. The potential for impact is expected during late evening hours of the project's operational period.
- **Observer 6**: Located on the western side of the project, representing a small residential area. The potential for impact is expected during late evening hours of the project's operational period.
- **Observer 7**: Located on the western side of the project in the Minya-Wasta Road, representing a road user approaching from the upstream direction, for whom exposure is expected during late evening hours of the project's operational period.

The following figure illustrates the locations of the selected receptors.

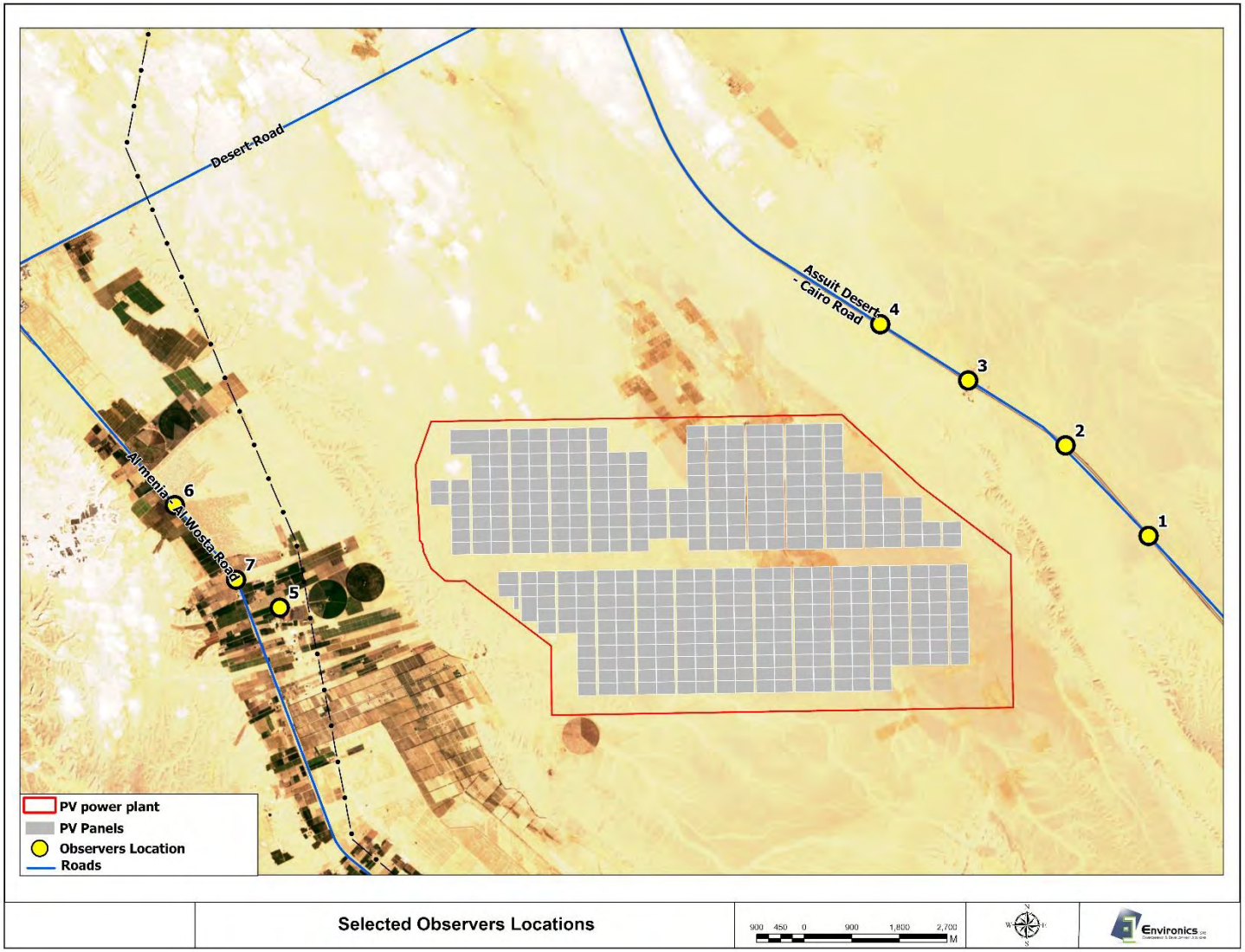

Figure 5: Selected observers' location

The following table presents the coordinates of the selected receptors and their elevations above sea level.

Table 2: Observers' coordinates and elevation

Observer	Long (E)	Lat (N)	Elevation (m)	Total elevation (m)
Obs1	31.0655°	28.0635°	182	183.6
Obs2	31.0539°	28.0747°	172	173.6
Obs3	31.0361°	28.0853°	165	166.6
Obs4	31.0244°	28.0920°	163	164.6
Obs5	30.9188°	28.0512°	158	159.6
Obs6	30.9014°	28.0667°	153	154.6
Obs7	30.9113°	28.056°	157	158.6

6.4. Input data

A. Sun position data

- The first module of the model relies on initial inputs, including the solar panel location and weather conditions. These inputs are processed to determine the sun's position relative to the solar panels. As a result of this processing, the solar azimuth angle and solar elevation angle are derived, which are then used as primary inputs for the subsequent modules of the model.

B. Observers' data

- The second module of the model processes observer-related data, using the observer's location as an initial input. This processing is used to determine the observer's height and define their field-of-view angle, as shown in the previous table (table 2).

C. PV data

- The third module of the model utilizes the outputs of the previous modules, in addition to user-defined inputs (including solar panel location, panel height, rotation angle, axis offset angle, glass type, and tracking system type), to simulate the rays reflected from the solar panels relative to the observer. These simulations are then used as inputs for the processing stage to assess the potential occurrence of solar glare.

  In this project, the user-defined inputs were as follows:
  - Panel height: 3 m above ground level.
  - Tracking system: single-axis tracking system.
  - Panel offset angle on the axis: 0°.
  - Glass type: smooth glass with an anti-reflective coating (110 mrad).
  - Rotation angle: +55°/−55°.

6.5. Model instructions

- The modeling was carried out over the period from January 1, 2025 to April 1, 2026, in order to account for both seasonal variations and short-term changes in weather and atmospheric conditions. This includes changes in the sun's position throughout the year, as well as variations in temperature and surface pressure, which may affect the sun's apparent position and both direct and reflected radiation.
- A daily time step of 15 minutes was defined for the assessment period in order to enhance the accuracy of the analysis and evaluation.
- Taking into account the modeling time period, as well as the solar tracking angle limits of the panels (-55°/+55°), the simulation results were analyzed over a single daily time window from 8:15 AM to 3:45 PM for the entire modeling period.
- Considering the type of glass used in the solar panels, which consists of smooth glass coated with an anti-reflective layer, the results indicated an average reflected radiation of 110 milliradians, with a reflectance coefficient ranging between 0.018 and 0.02.

6.6. Modeling results

The following figure illustrates a snapshot from the model interface used for simulating and assessing solar glare.

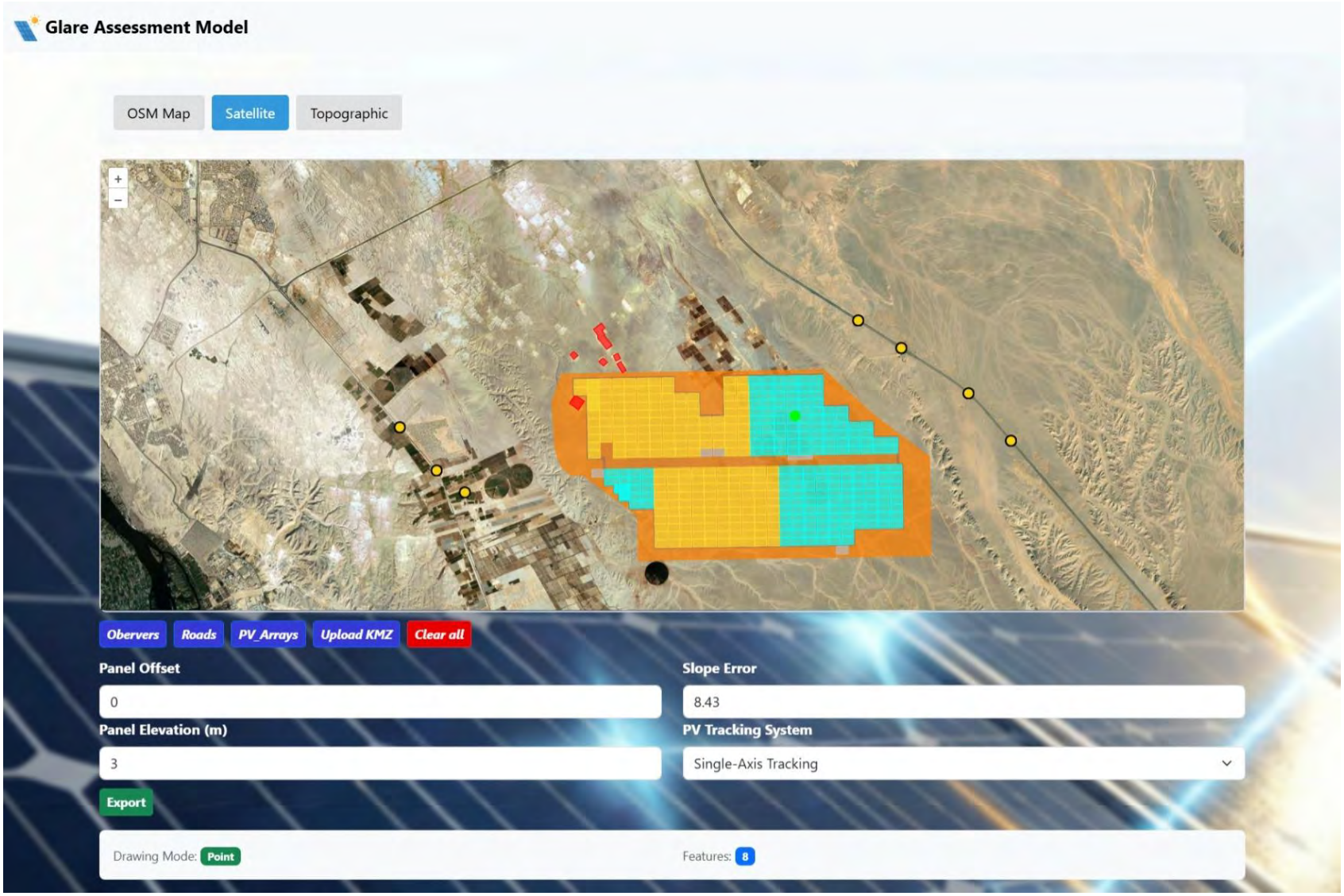

Figure 6: Snapshot from the model used for simulating and assessing solar glare

The following table summarizes the results and the potential impacts on receptors from the project's possible solar glare.

Table 3: the results and the potential impacts on receptors

Observer	Glare detection	Impact
Obs1	No glare exposure for observer1	No impact
Obs2	No glare exposure for observer2	No impact
Obs3	No glare exposure for observer3	No impact
Obs4	No glare exposure for observer4	No impact
Obs5	No glare exposure for observer5	No impact
Obs6	No glare exposure for observer6	No impact
Obs7	No glare exposure for observer7	No impact

According to the modeling results, no potential for solar glare exposure was detected for selected observers. Therefore, there are no associated impacts on these observers during the project's operational periods. This is attributed to the following:

- In principle, a lower elevation of the observer relative to the reflection source may reduce the likelihood of exposure to reflected radiation by limiting the field of view. Since the solar panels are located at relatively higher elevations ranging between 181–214 meters above sea level, compared to observer elevations range between 153–182 meters above sea level, it is therefore unlikely that these observers will experience solar glare from the panels.

  Although ground elevation generally increases toward the south, which may result in higher-elevation observer locations along the same road, these receptors are not expected to experience solar glare. This is due to the geometric relationship between the sun position (predominantly in the southern sector) and the panel orientation, which directs the main reflected beams northward, away from the southern and higher-elevation observers. Accordingly, these locations fall outside the primary reflection pathways and are unlikely to be affected by solar glare.

- Since the solar panels are positioned at a higher elevation than the observers, the reflected rays are directed upward, which effectively diverts the reflected light away and thus eliminates solar glare from the observers' field of view.

- The observers are located at relatively large distances from the solar panels, which is elevated relative to the surrounding observers. The tilt angle results in rays being reflected upwards. Accordingly, the horizontal distance between an observer and the panel array influences the likelihood and extent of potential glare exposure.

- The type of glass used in manufacturing the solar panels, along with the anti-reflective coating, significantly reduces the spread angle, which is approximately 3.15 degrees in this case. A smaller spread reduces the likelihood of observers being exposed to glare.

Annex 4: Hydrological Study

SCATAC

Minya Solar Station,
New Boundary

Hydrological Study Report

Rev. 04

16 April 2026

ACE CONSULTING ENGINEERS
MOHARRAM.BAKHOUM

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1 INTRODUCTION

This report presents a comprehensive hydrologic assessment of a 43.0 square kilometer area located in South 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.

Solar Project - Minya, situated in the South part of Egypt, experiences a predominantly arid climate, which significantly influences the hydrologic patterns and water resource availability. The assessment includes an evaluation of precipitation patterns, surface runoff, 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 South side of Egypt Next to Minya Center , Minya city.

Between **Latitude:** 29.40°N and 29.52°N - **Longitude:** 30.10°E and 30.30°E

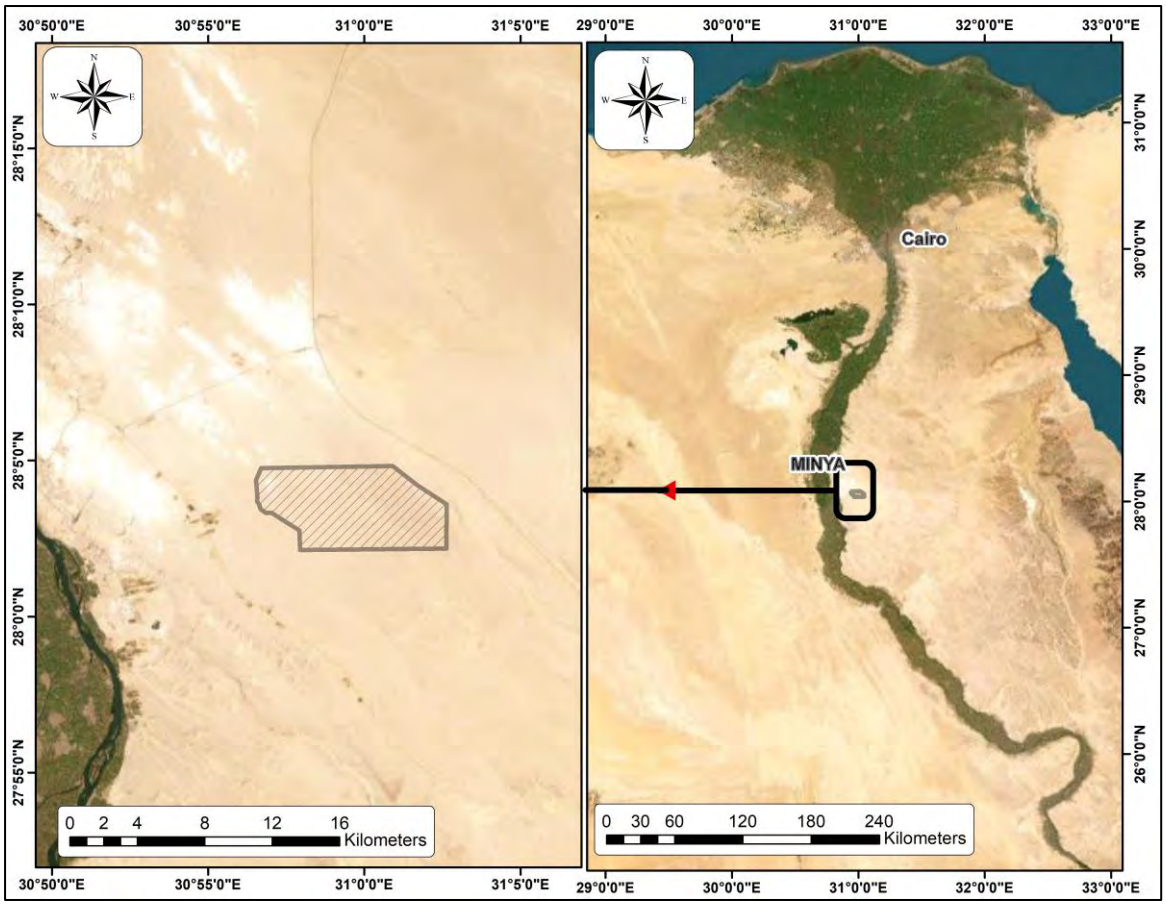

Figure 1-1: project location.

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 both sites' information.
- Analytical studies and assessment of the collected data.
- Runoff peak flow estimation for effective watersheds.

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 visit.
- Digital Elevation Model (DEM) SRTM 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

A site visit was conducted in Minya Governorate, Upper Egypt, to support the hydrological assessment of the proposed solar power station. The visit aimed to evaluate the existing topographic, drainage, and surface runoff conditions within and around the project area.

Minya is characterized by arid climatic conditions with low annual rainfall; however, intense short-duration storm events may generate significant surface runoff, particularly in desert and wadi environments. Therefore, field verification was necessary to validate available topographic data, review natural flow paths, and identify potential upstream catchment contributions.

During the site visit, observations were conducted to assess the site elevations, soil characteristics, natural drainage paths, potential flow obstructions, and any visible evidence of previous flood events, as illustrated in the following figures.

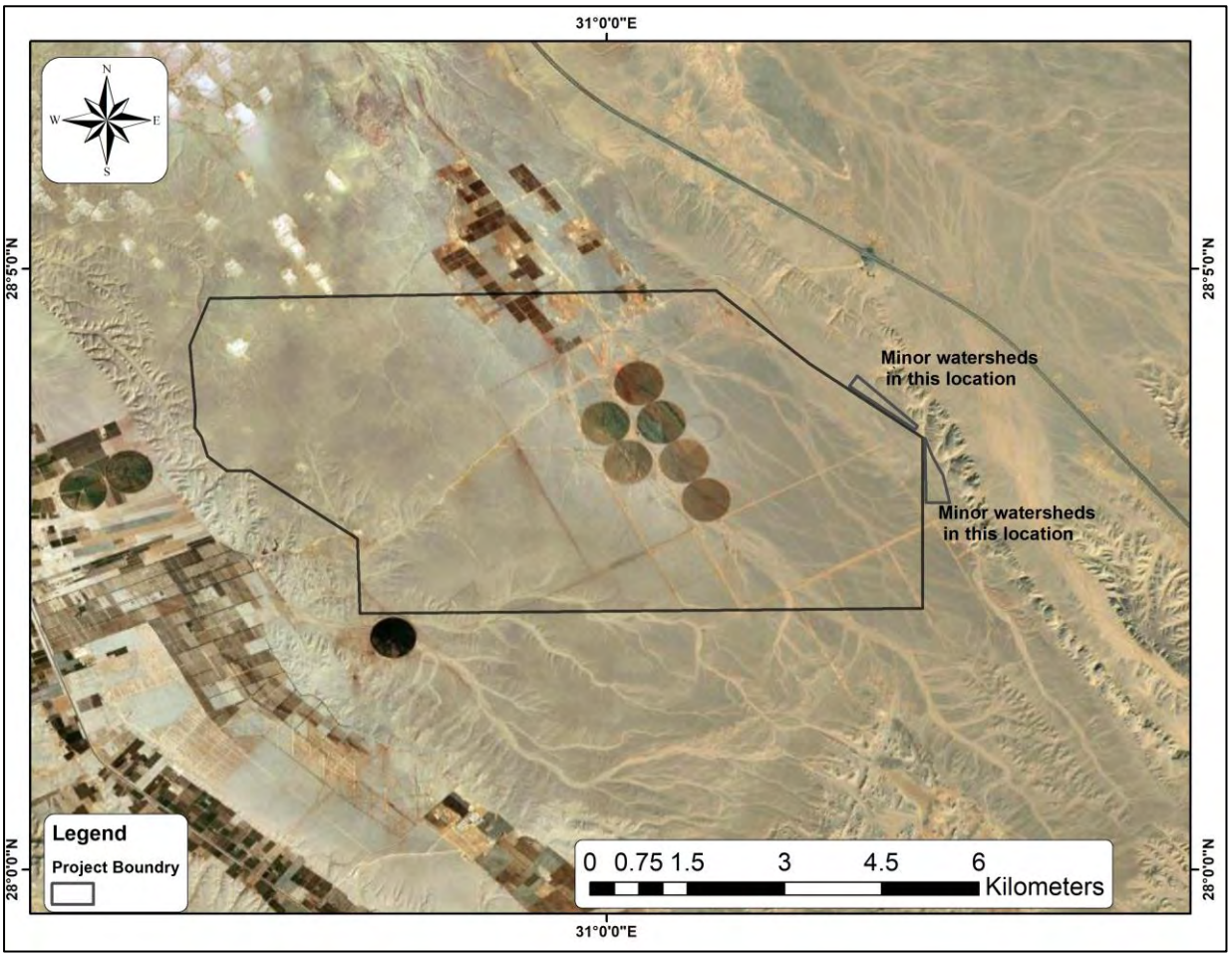

Figure 2-1: Minor locations identified during the site visit.

During the site visit, minor drainage features were identified, as shown in the following images.

Figure 2-2: Insights from the site

In addition, the major streams were identified based on topographic maps, Google satellite imagery, and observations during the site visit. However, due to the extensive area of the site, these streams were observed from a distant location.

Figure 2-3: Main streams in the site

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 SRTM 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 SRTM data are widely used in the identification of drainage basins for hydrological analysis work in many research and advisory bodies. Figure 2-4 presents the Study Area on the digital elevation model of the SRTM data

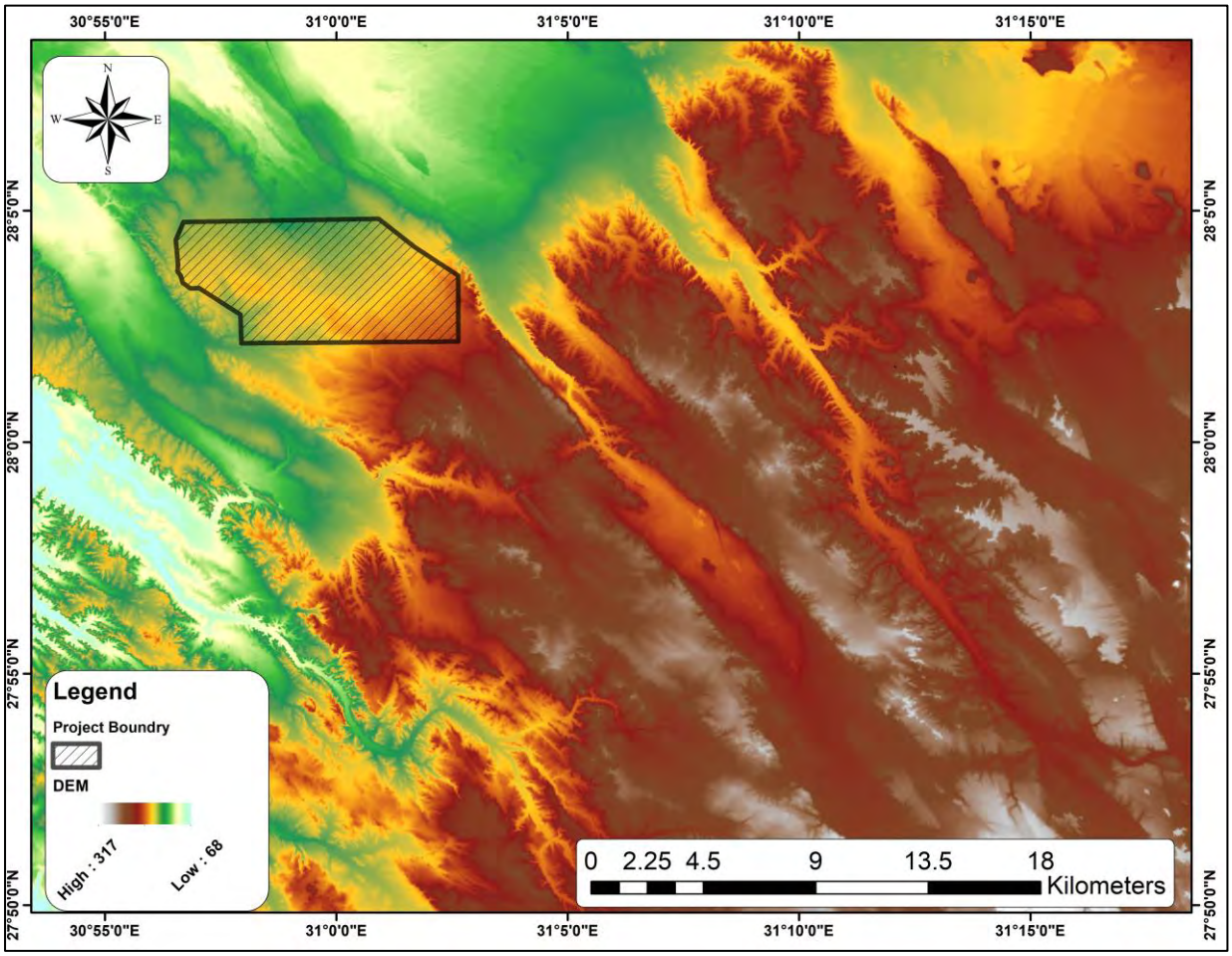

Figure 2-4: Digital Elevation Model (DEM) of the SRTM data for the study area.

2.2.2 Topo Maps

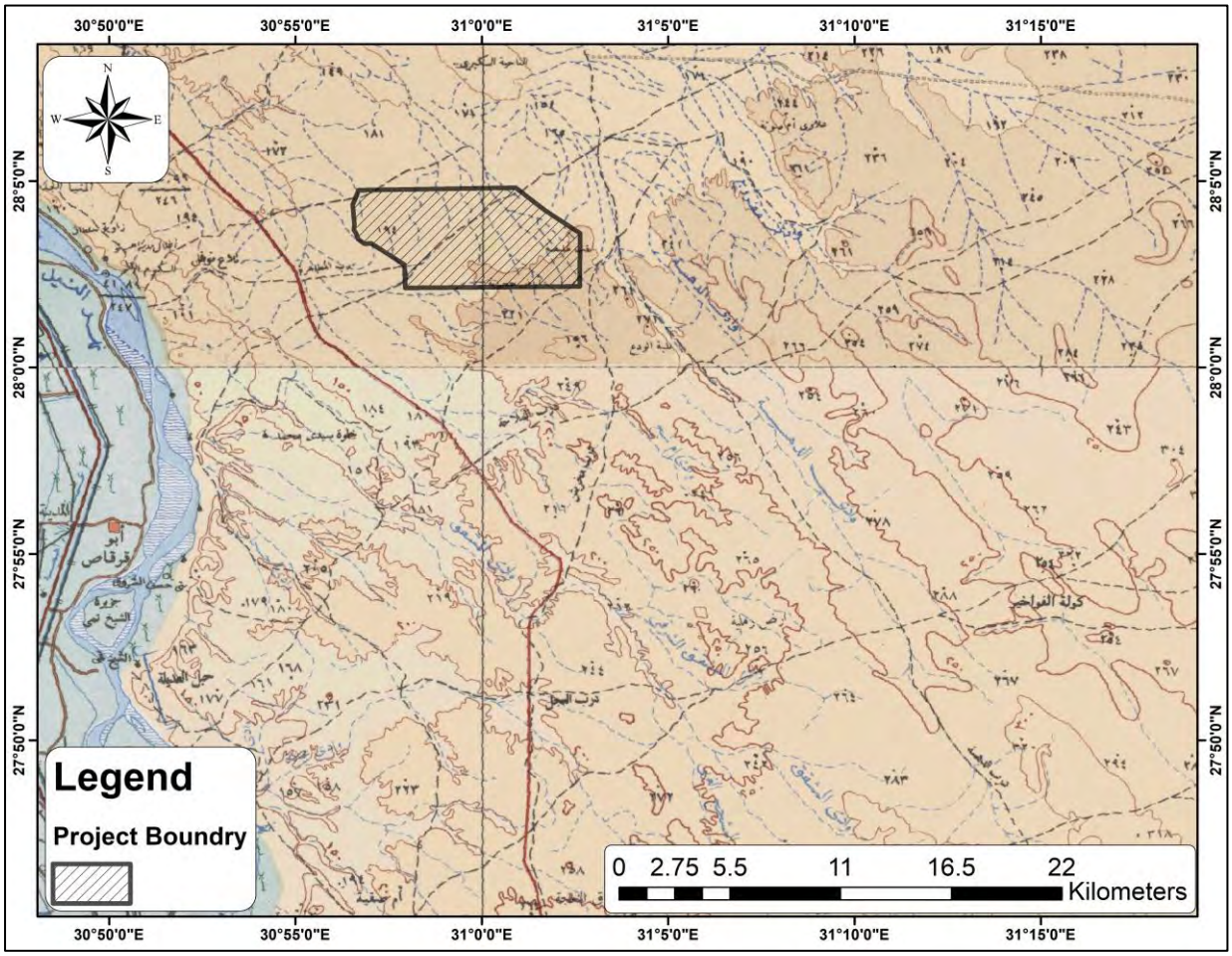

Figure 2-5: Topo map showing the streams and main wadis in the study area.

2.3 Soil information

Figure 2-6 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

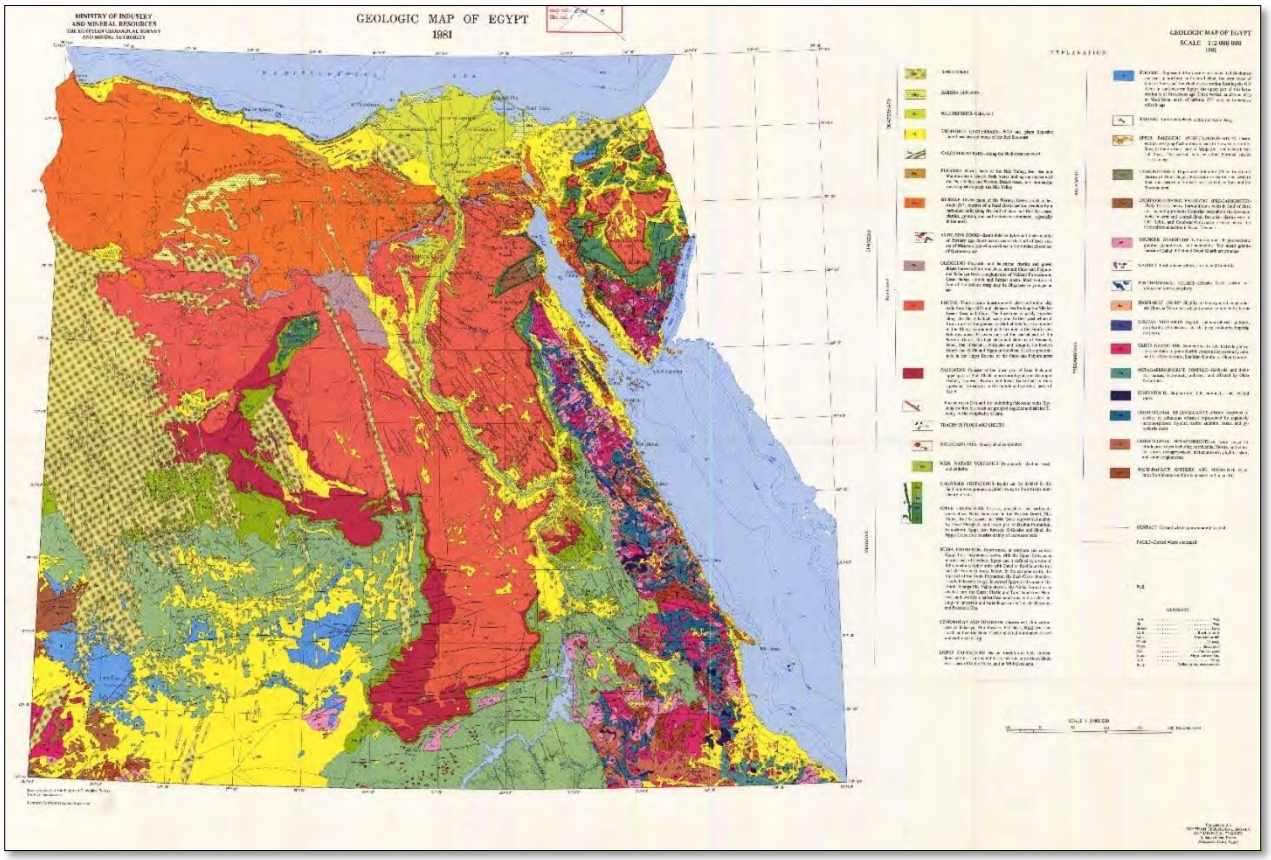

Figure 2-6: Geological map of the study area

2.4 Rainfall data

According to the Egyptian Meteorological Authority gauge network, the project site is best represented by the Minya station, which is located approximately 21 km from the project location. The rainfall data used in this study has been officially obtained from the Egyptian Meteorological Authority, with records updated up to the year 2025, as presented in *Figure 2-7* and *Figure 2-8*

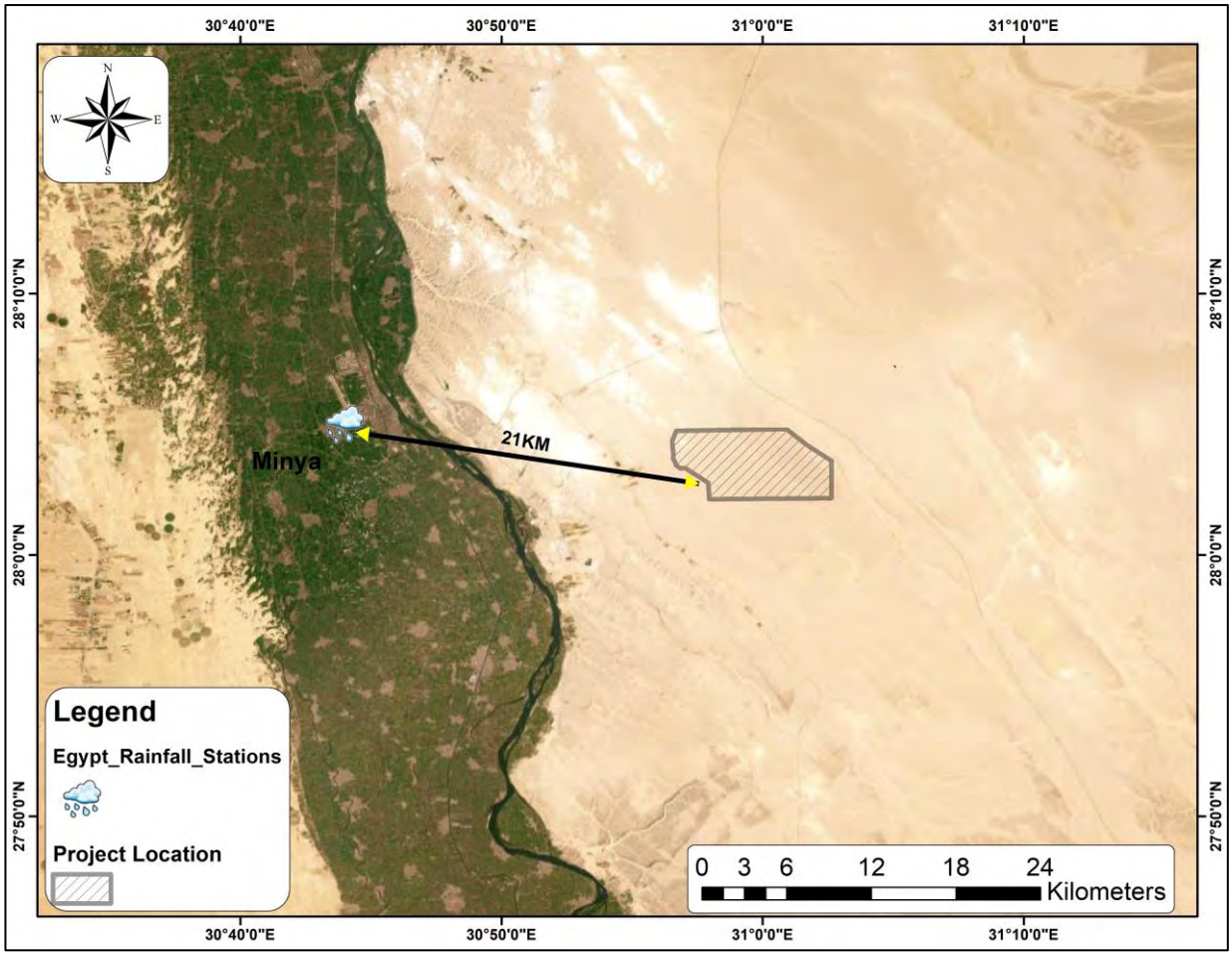

Figure 2-7: Location of adjacent to the rainfall station

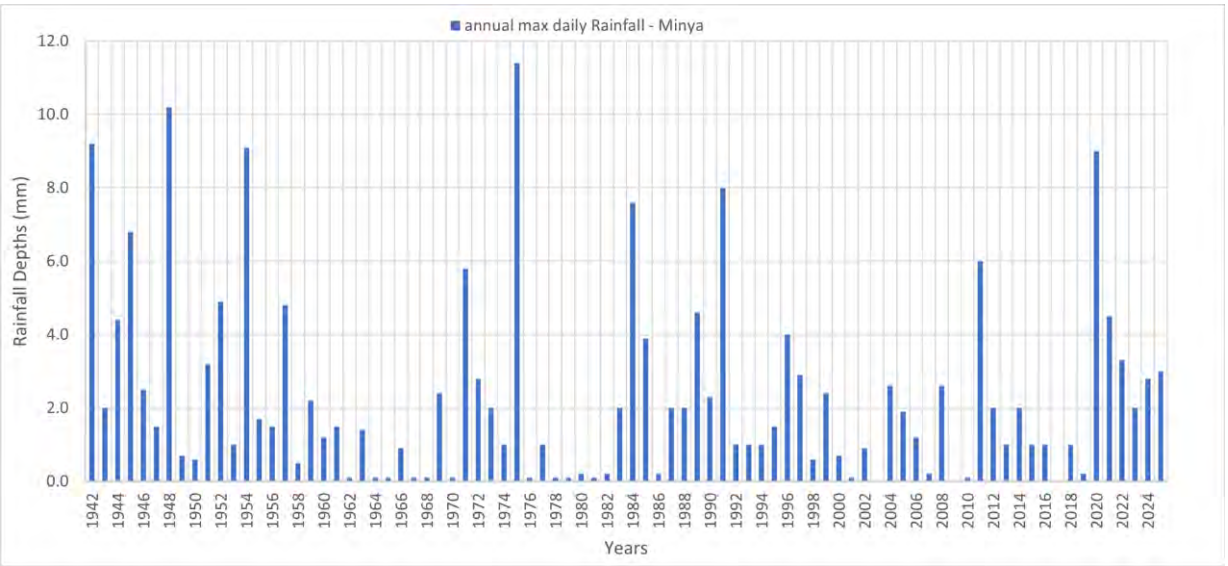

Figure 2-8: Maximum daily Rainfall during each year

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, the hydrological 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.
- Flow Master or Culvert Studio in the hydraulic design of the proposed protection works such as channels and dikes, and to determine the different hydraulics parameters.
- Civil 3D for developing corridors and surface of Existing and proposed structures.
- HEC-RAS 2D 6.3 (by USACE) in determining the floodplain boundaries of the main streams that affect the study area.

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 ≥ 80 Ha.	SCS Method
A < 80 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.
Ia - 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 (Ia) 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 limp on the hydrograph and the recession limp), and it can be estimated as follows:

$$TL\ (min.) = 0.6\ Tc\ (min.)$$

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:

$$Q_{peak} = \frac{2.08 \text{ x } A}{T_R}$$

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 the 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 Steep rugged terrain; average slopes greater than 30%	**0.20** No effective soil cover; either rock or thin soil mantle negligible infiltration capacity	**0.20** No effective plant cover; bare or very sparse soil cover	**0.20** 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:

$$C = \frac{C_1A_1 + C_2A_2 + \ldots + C_nA_n}{A_2 + A_2 + \ldots + A_n}$$

Whereas: C1, …, Cn are the runoff coefficients for the sub-catchment areas A1, …, An 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, Tc: The time of concentration is the time required for runoff 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:

a. Raised Roadway to act as a dike.
b. Open channel

3.5 Aggradation and Degradation Analysis (Scour calculation)

Aggradation and degradation are the vertical raising and lowering, respectively, of the streamed 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 show Definition Sketch of Sediment Continuity Concept.

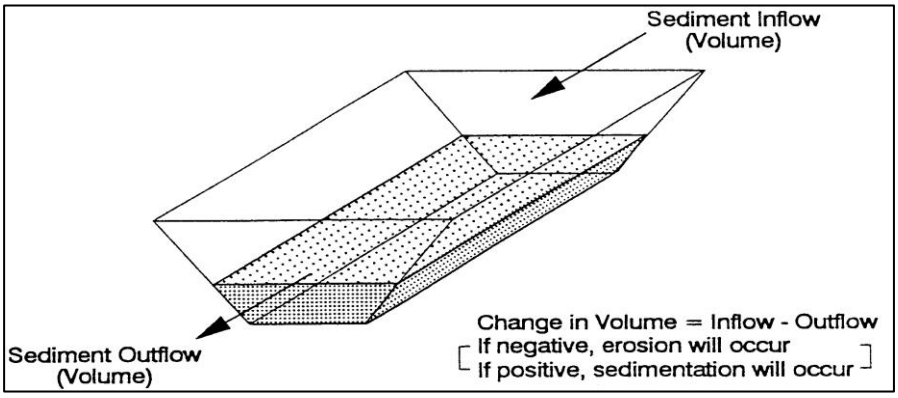

Figure 3-1 Definition Sketch of Sediment Continuity Concept

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.

$D_C \rightarrow$ Diameter of the sediment particle at the critical condition, ft
$\tau_0 \rightarrow$ Boundary shear stress lb/ft^2
$\gamma \rightarrow$ Specific weight of Water lb/ft^3
$\gamma_s \rightarrow$ Specific weight of sediment lb/ft^3
$k_s \rightarrow$ 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.

$n \rightarrow$ Manning roughness coefficient
$v \rightarrow$ Average channel velocity, ft/s
$R \rightarrow$ 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.

$$y_s = y_a\left(\frac{1}{P_c} - 1\right)$$

$y_s \rightarrow$ Depth of degradation or scour required to form the armor layer, ft

$y_a \rightarrow$ Thickness of the armor layer, ft

$P_c \rightarrow$ 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 (Dc) 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.

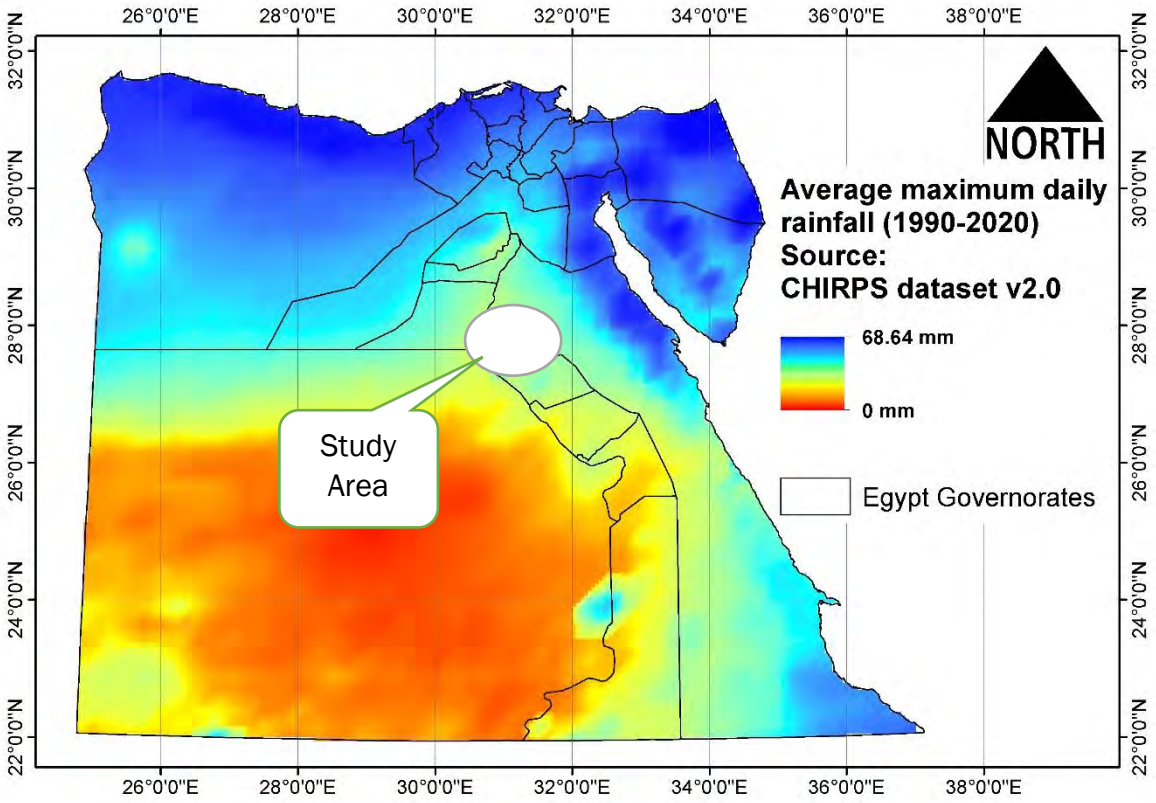

Figure 4-1: Distribution of average annual rainfall depth values over Egypt

4.1 Meteorological Analysis

According to project location, the Station (Minya) is found near the study area as shown in **Figure** *4-2* the records of this station will be utilized in further analysis. The maximum recorded daily rainfall depth at Minya Station is 11.4 mm, which occurred in 1975.

Figure *4-3* present the maximum daily rainfall values recorded at Minya Station.

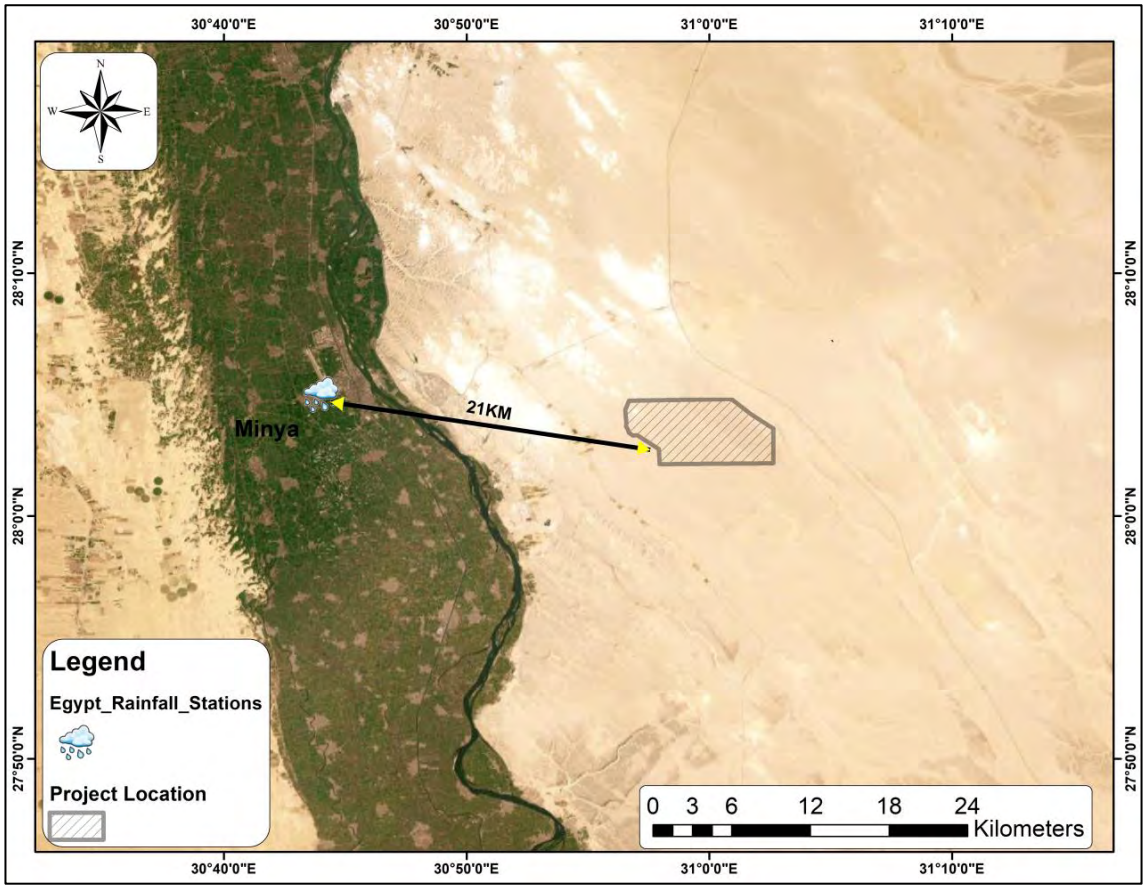

Figure 4-2: Location of adjacent to the rainfall station

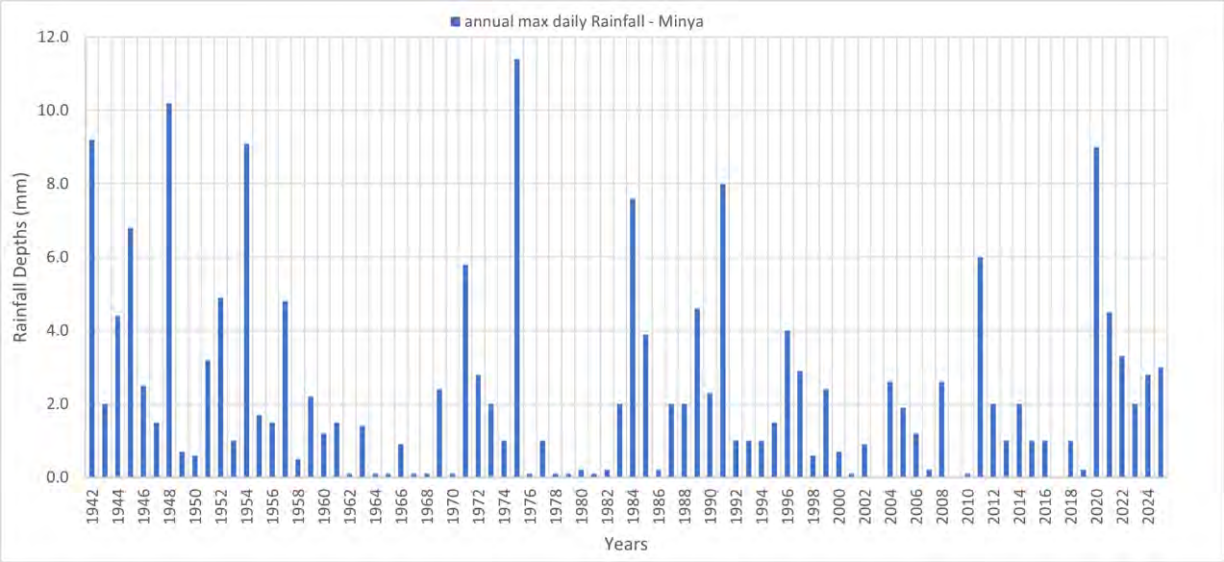

Figure 4-3: Maximum daily Rainfall during each year

Rainfall frequency analysis was initially conducted using Hyfran Plus, and the Pearson Type III distribution (Method of Moments) was identified as the best-fitting model based on the statistical performance indicators. However, a significant proportion of the dataset—approximately 18% of the total records—consists of zero rainfall values. The presence of these zero events can influence the statistical characteristics of the sample, potentially biasing the estimation of rainfall depths if not properly treated.

To address this issue and improve the accuracy of the estimated rainfall depths, a zero-adjusted frequency analysis was performed. The HEC-SSP software was used to apply the procedures outlined in Bulletin 17C, which provide a systematic method for handling zero and low-flow values in hydrologic frequency analysis. The following section presents the results from both the Hyfran Plus analysis and the HEC-SSP zero-adjusted analysis.

4.1.1 Rainfall Analysis Using Hyfran

The following figures illustrate the different probability distributions generated using Hyfran Plus software. Based on the graphical fit—particularly the alignment of the data within the upper and lower confidence limits—and the statistical indicators, including skewness, the Pearson Type III distribution was identified as the best-fitting model. However, zero rainfall values constitute approximately 18% of the total sample. Because this proportion is significant, a zero-adjusted frequency analysis must be applied to ensure more accurate selection of the appropriate distribution and reliable estimation of rainfall depths.

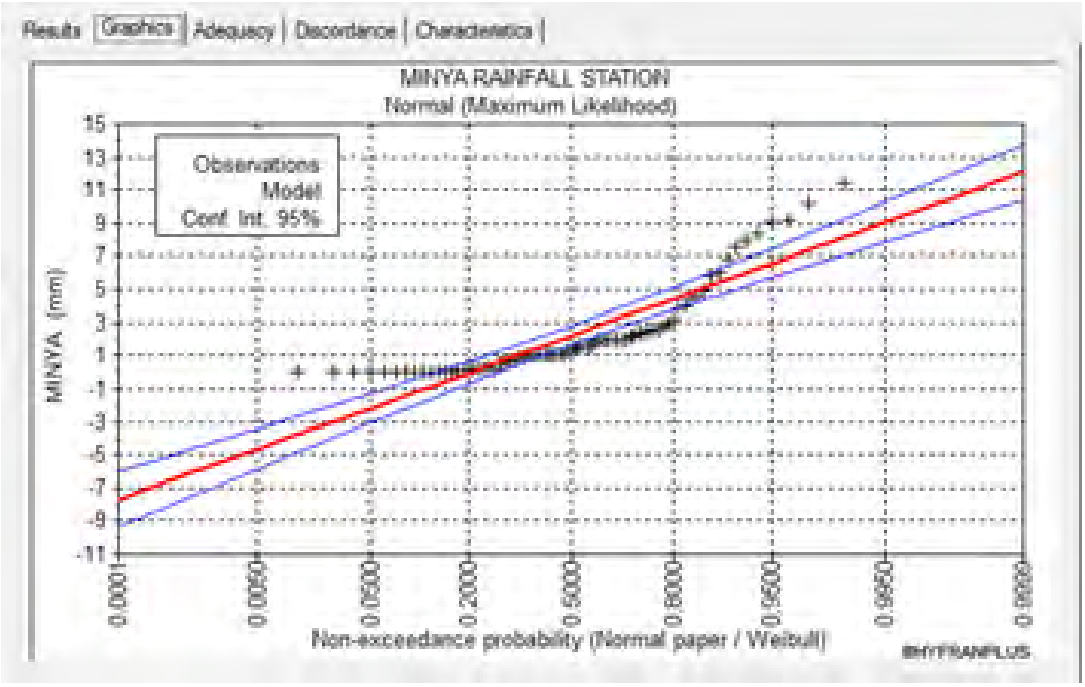

Figure 4-4 : Normal distribution graph

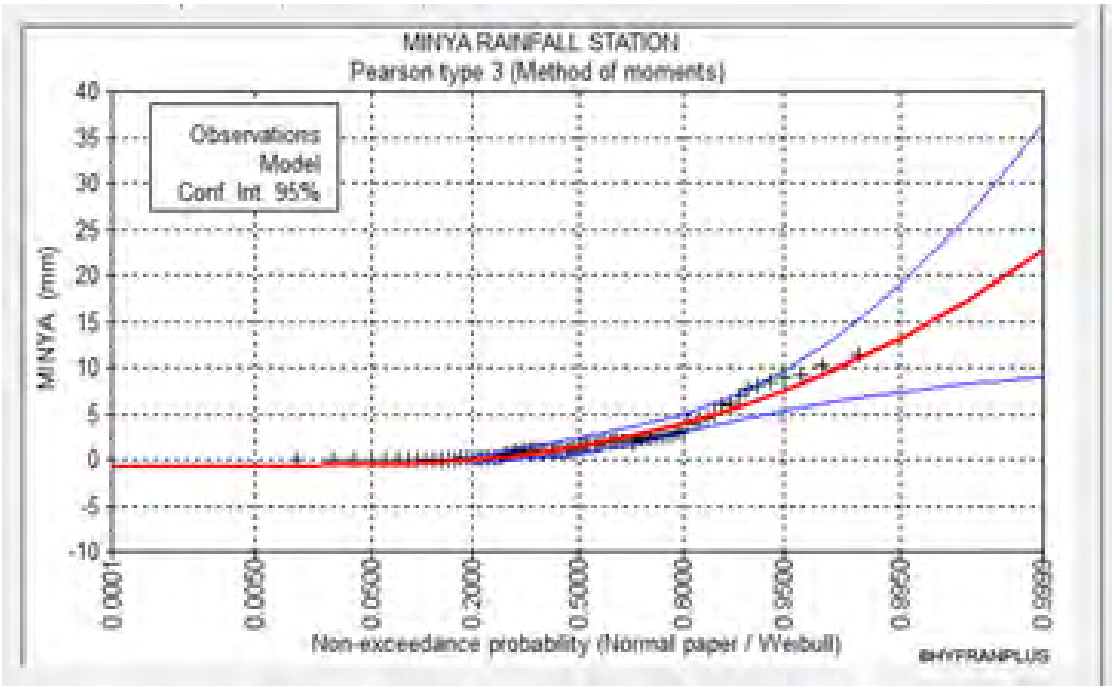

Figure 4-5: Pearson Type 3 distribution

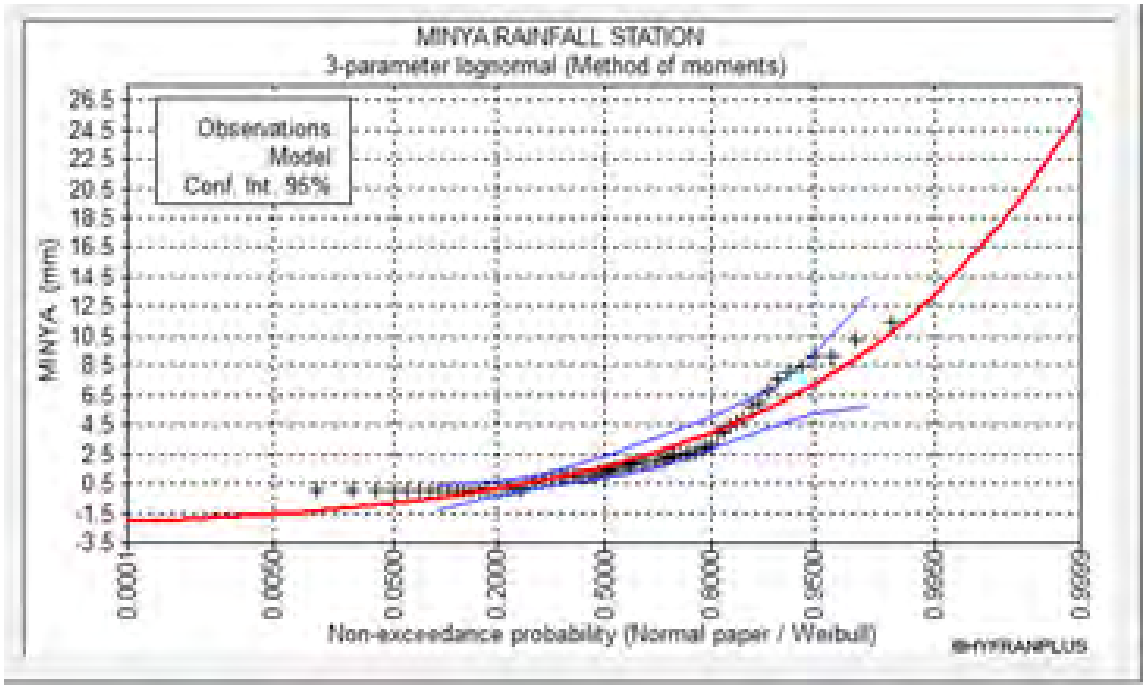

Figure 4-6 : 3 Parameter lognormal distribution

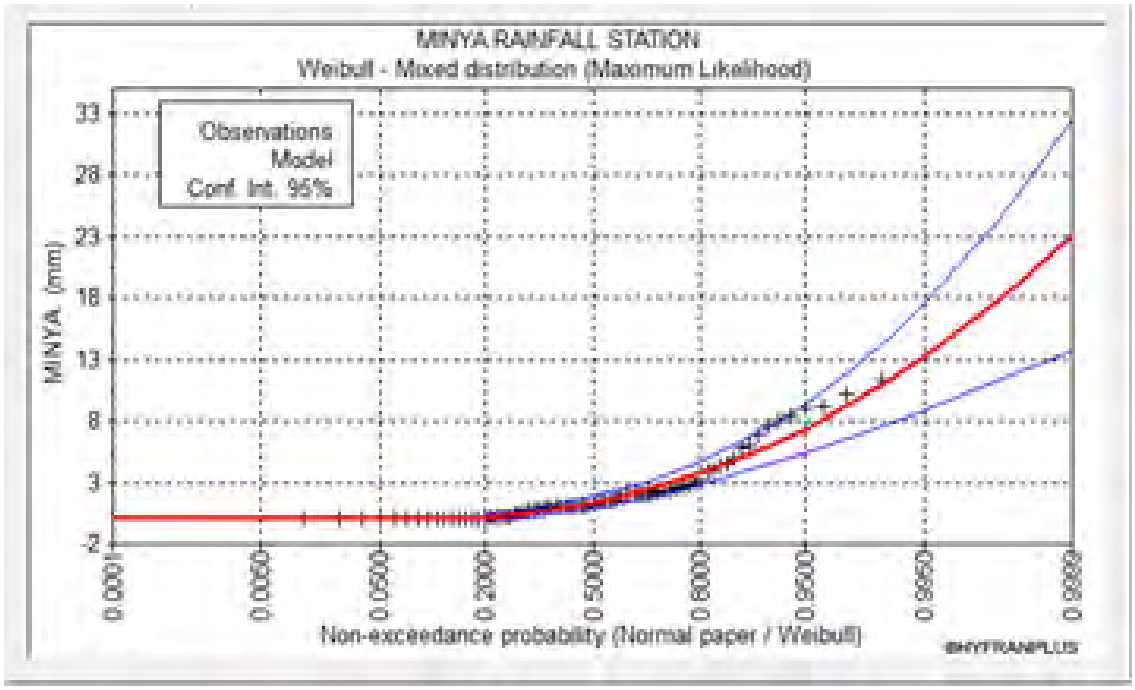

Figure 4-7 Weibull distribution

Table 4-1: Comparison Between Different Distributions Using Hyfran Plus Software with ignoring of zeros values.

Model	Rainfall Depth (mm)	P(Mi)	P(Mi | x)	BIC	AIC
Pearson type 3	11.491	16.67	95.84	336.177	329.069
Weibull - Mixed distribution	11.464	16.67	2.41	343.539	336.431
3-parameter lognormal	11.351	16.67	1.42	344.602	337.494
Gumbel	9.796	16.67	0.33	347.526	342.787
Normal	8.396	16.67	0	386.676	381.937

4.1.2 Rainfall Analysis Using HEC-SSP

- Bulletin 17 C was taken as a reference to analyses the station records.
- HEC-SSP software was used to apply the steps provided in the Bulletin 17 C and identify the low outliers and the required depths for each return period.
- Log Pearson III fitting was used to identify the Depths for each return period.
- This approach was adopted to address the presence of zero values, as more than 15% of the records consist of zeros. .

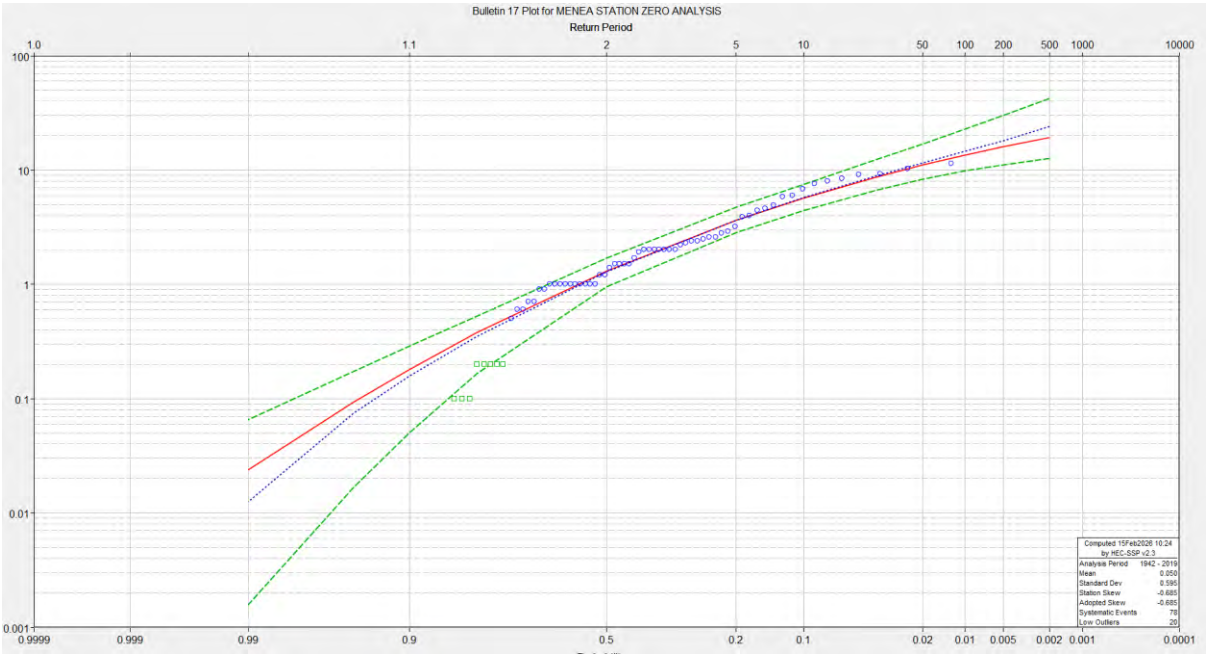

Figure 4-8: Log Pearson III fitting Curve for Minya Rainfall Station.

Table 4-4-2: Rainfall Statistical Analysis Results for Minya Rainfall Station.

Returned Periods.	Max 24 hrs. Rainfall Depth (mm)	Rainfall Depth with 20% climate impact (mm)
P 200 yr.	18.24	21.88
P 100 yr.	15.27	18.33
P 50 yr.	12.65	15.18
P 25 yr.	9.34	11.21
P 10 yr.	6.84	8.20
P 5 yr.	4.44	5.33

4.1.3 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. (Figure *4-9*)
2. Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths, to account for climate change impacts. (Figure *4-10*)

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 4-3: 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 4-4: Tabulated IDF Values for baseline Curves

Return Period	Duration (min.)								
	10	20	30	60	120	180	360	720	1440
100	27.58	19.23	15.25	10.02	6.43	4.49	2.41	1.29	0.69
50	21.91	15.28	12.12	7.96	5.11	3.57	1.92	1.02	0.55
20	16.81	11.72	9.30	6.11	3.92	2.74	1.47	0.79	0.42
10	10.77	7.51	5.96	3.91	2.51	1.75	0.94	0.50	0.27
5	6.80	4.74	3.76	2.47	1.58	1.11	0.60	0.32	0.17
2	3.59	2.50	1.99	1.30	0.84	0.58	0.31	0.17	0.09

Table 4-5: Tabulated IDF Values for Modified Curves with climate impact

Return Period	Duration (min.)								
	10	20	30	60	120	180	360	720	1440
100	30.37	21.18	16.80	11.03	7.08	4.95	2.66	1.42	0.76
50	25.16	17.55	13.92	9.14	5.86	4.10	2.20	1.18	0.63
20	18.59	12.96	10.28	6.75	4.33	3.03	1.63	0.87	0.47
10	13.60	9.48	7.52	4.94	3.17	2.22	1.19	0.64	0.34
5	8.84	6.16	4.89	3.21	2.06	1.44	0.77	0.41	0.22
2	4.31	3.00	2.38	1.56	1.00	0.70	0.38	0.20	0.11

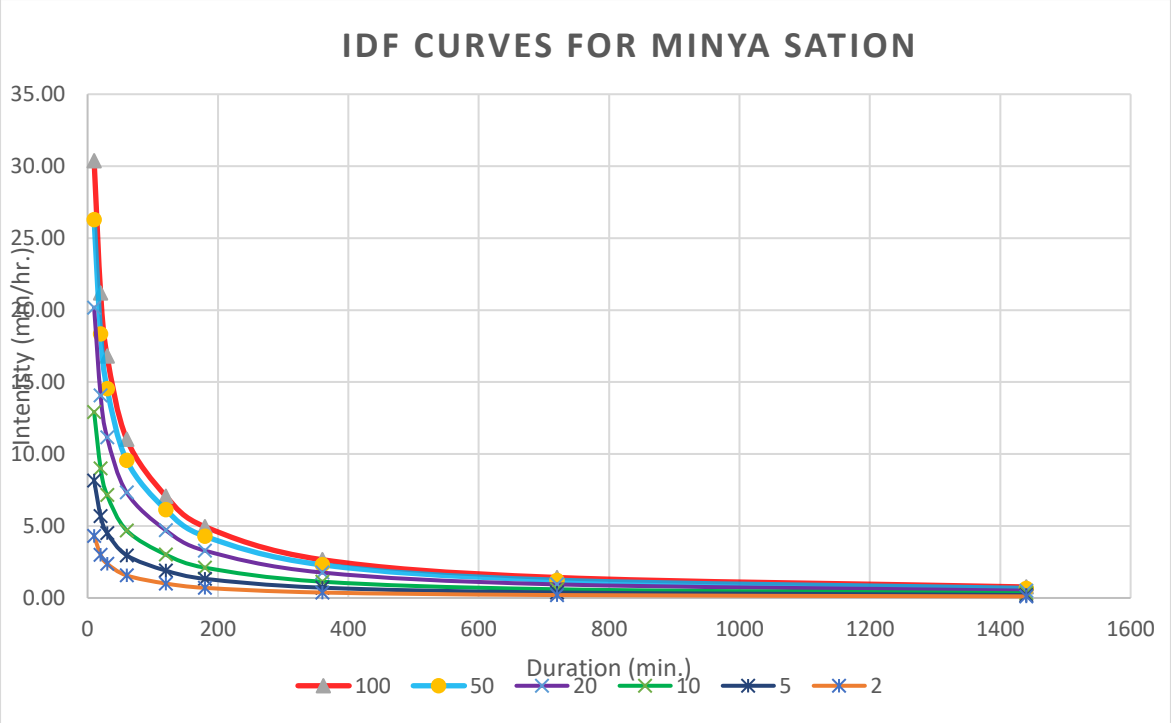

Figure 4-9: 1.Baseline IDF curves – derived using Bell ratios and historical rainfall data.

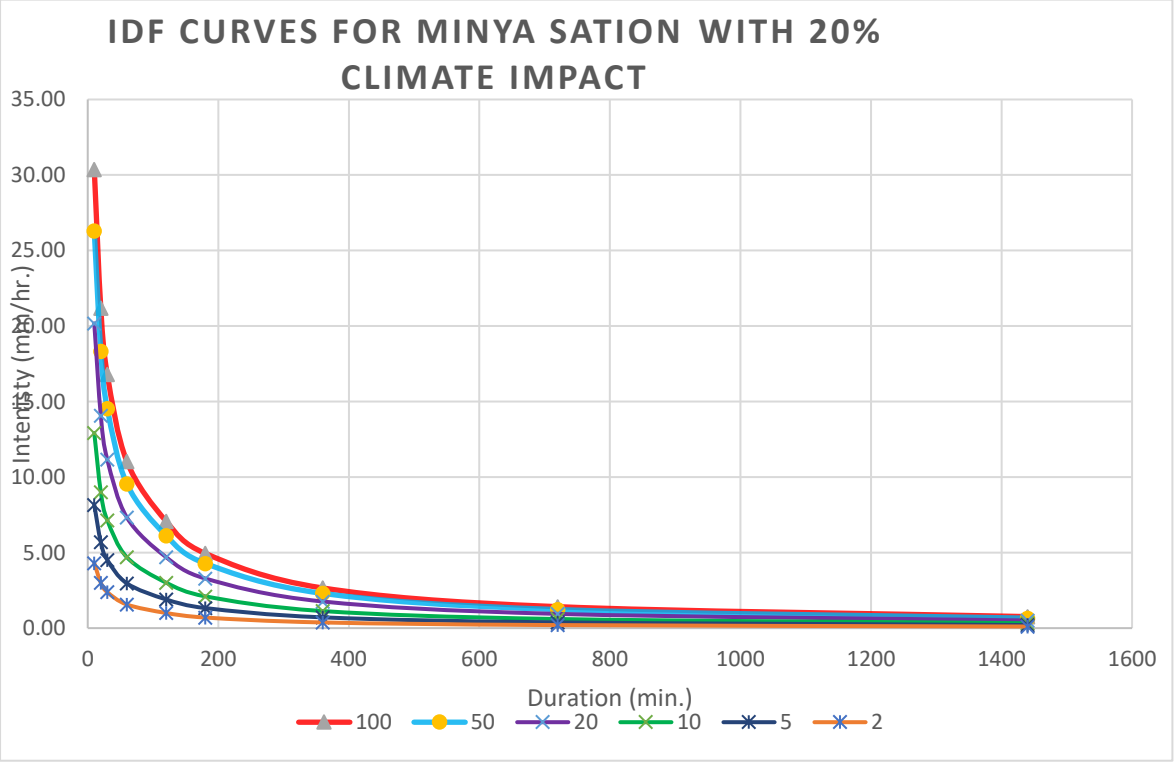

Figure 4-10:2.Climate-adjusted IDF curves – developed by applying a 20% increment to storm depths.

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. Figure *4-11* shows a general overview of the streams affecting the

whole project area and from which the effective watersheds will be determined, while Figure 4-12 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 *4-13* shows the main streams and the main watersheds affecting the study area verified using topographic maps, while Table 4-4 shows the morphological characteristics of the watersheds affecting the project boundaries.

Table 4-6: Morphological parameters of watersheds affecting the project boundary

WS Name	WS Area (km2)	LFP (m)	Tc	T_{Lag}
Subbasin-1	0.38	2051.01	52.22	31.33
Subbasin-2	0.41	2444.14	56.43	33.86
Subbasin-3	1.07	2865.42	68.60	41.16
Subbasin-4	3.79	7779.39	147.83	88.70
Subbasin-5	1.12	2706.34	62.37	37.42
Subbasin-6	8.08	8574.21	200.84	120.50

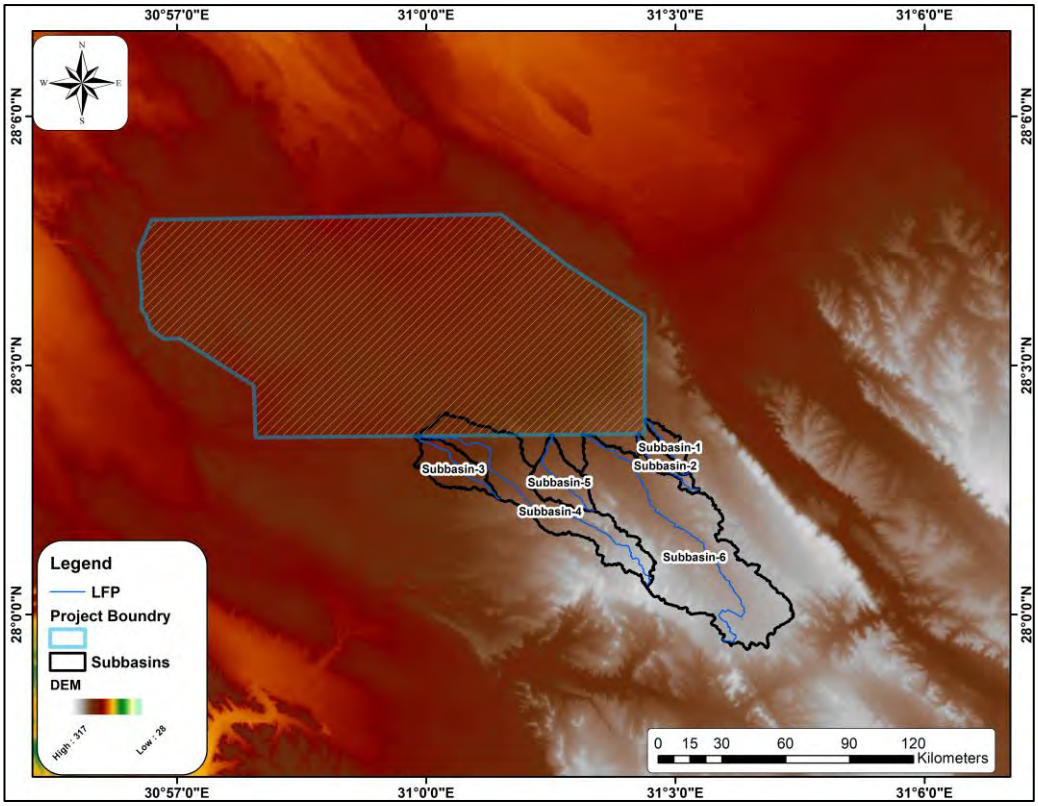

Figure 4-11: Streams and Watersheds affecting the study area draped over DEM.

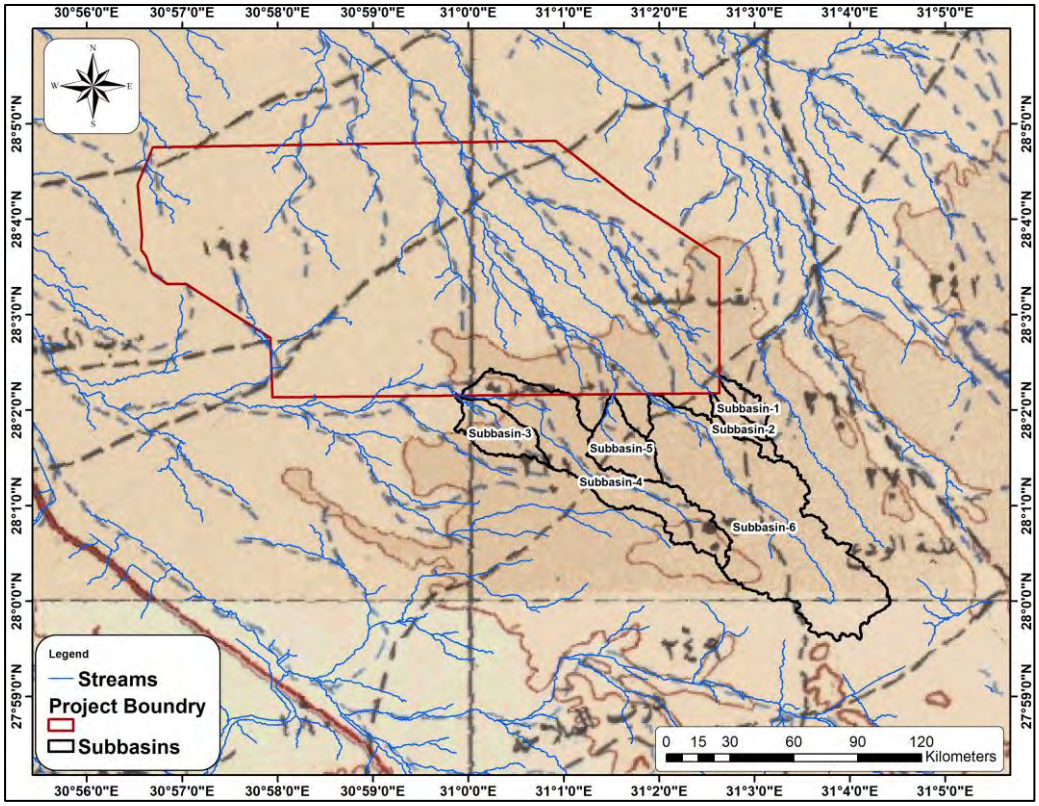

Figure 4-12: Streams and Watersheds affecting the study area draped over a satellite image.

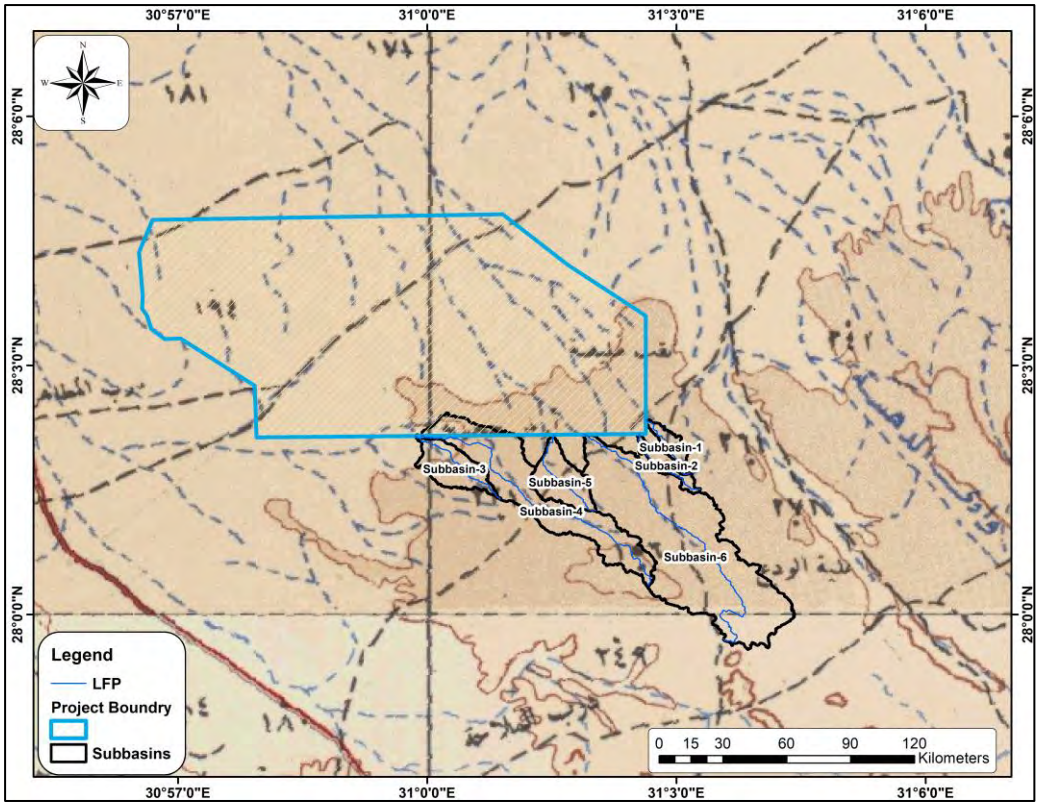

Figure 4-13: Main watersheds and Streams affecting the study area draped over topographic maps.

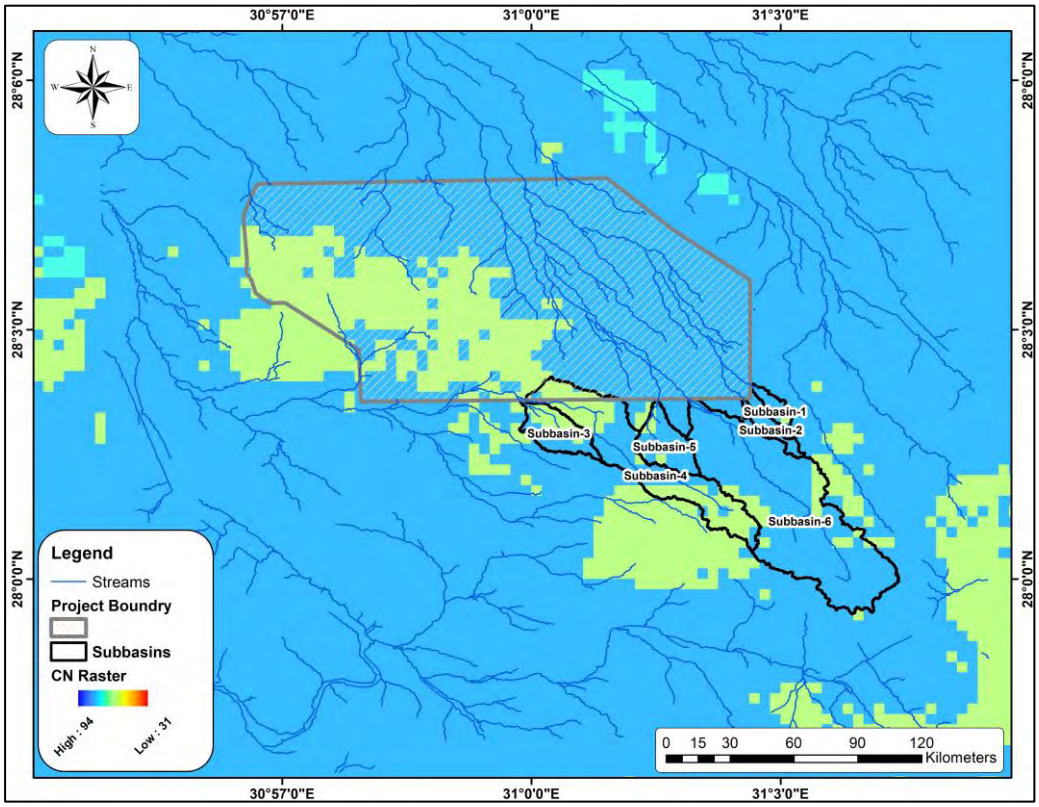

Figure 4-14: Main watersheds affecting the study area draped over the CN grid.

4.3 HYDROLOGICAL ANALYSIS

Hydrological studies represent the foundation for the selection of Flood protection works. Meteorological, morphological, geological and by considering design storms and their distribution are considered as the input to the hydrological study, the maximum flow and flow hydrograph is the main output of the hydrological study, which is used in the hydraulic design of flood protection works.

4.3.1 Design Storm

While we maintain the validity of the official rainfall magnitudes, we recognize the "flashy" nature of desert storms (Convective Storms) in Middle Egypt. To ensure a resilient hydraulic design and to account for high-intensity, short-duration events that may lead to flash floods. As a conservative engineering measure, we will adopt a **6-hour storm duration** instead of the standard 24-hour distribution.

Storm duration 6 hours has been adopted SCS Storm Type II has been used extensively worldwide, providing logical and safe maximum discharge values, as it relies on concentrating the bulk of precipitation in a short time. **Figure** *4-15* shows the Distribution of a storm in an SCS Storm type II method for 24 hours which has been scaled over 6 hours.

Time	Cumulative Fraction	Cumulative Precipitation	Incremental Precipitation
(hours)	P/P24	P(t/n)	(in)
0	0.000	0.00	0.00
1	0.010	0.10	0.10
2	0.020	0.20	0.10
3	0.032	0.32	0.12
4	0.043	0.43	0.12
5	0.059	0.58	0.15
6	0.072	0.72	0.15
7	0.089	0.89	0.17
8	0.115	1.15	0.26
9	0.148	1.48	0.33
10	0.189	1.89	0.41
11	0.250	2.50	0.61
12	0.500	5.01	2.50
13	0.751	7.52	2.51
14	0.811	8.12	0.60
15	0.849	8.49	0.38
16	0.886	8.87	0.38
17	0.904	9.05	0.18
18	0.922	9.22	0.18
19	0.939	9.40	0.18
20	0.957	9.58	0.18
21	0.968	9.69	0.11
22	0.979	9.79	0.11
23	0.989	9.90	0.11
24	1.000	10.01	0.11

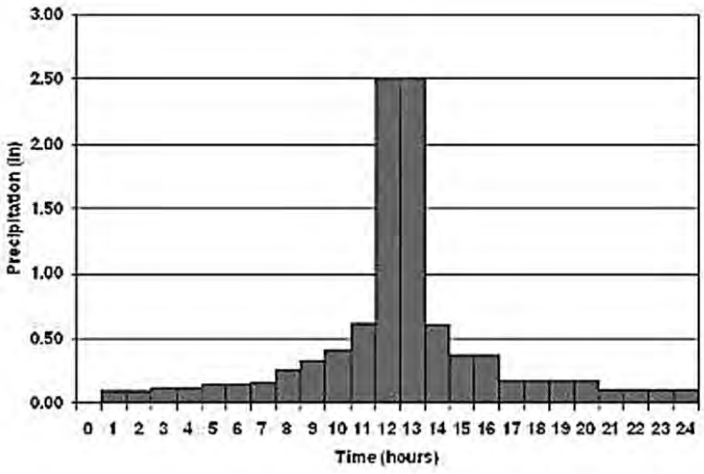

Figure 4-15: Distribution of SCS type II storm for 24 hours.

To calculate the maximum discharge of the flood the SCS Method was used for watersheds with areas greater than or equal to 100 hectares to avoid the high discharges resulting from the use of the Rational method for the large watersheds, so don't lead to large the flood protection works than necessary.

The HEC-HMS program will be used to calculate the peak discharge from drainage basins larger than 0.8 km², based on a 100-year return period with an additional 20% climate change allowance. The analysis will apply a 24-hour design storm using the SCS Type II distribution, which is considered most suitable for dry regions. For watersheds smaller than 0.8 km², the Rational Method (implemented via Excel) will be used to estimate the peak discharge for the 100-year return period. **Table 4-3** presents the results of the hydrological analysis.

In the absence of a universally agreed-upon multiplier, planning and vulnerability assessments often use predetermined scenarios to test the resilience of infrastructure. A

±10% and ± 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 ±10% and ± 20% alongside temperature changes. This demonstrates that a ± 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.
Following a visual inspection of the watersheds affecting the study area—using satellite imagery, landform maps, topographic maps, and land cover data—the runoff curve number (CN) was determined by calculating a weighted average, interpolated from Figure 4-14. The figures Figure 4-16, Figure 4-17, Figure 4-18, and Figure 4-19below show the generated hydrographs for each catchment corresponding to the 100-year return period.

Table 4-7: Results of hydrological study for catchments affecting the project boundary

WS Name	WS Area (km2)	Calculation Method	CN	C	Q(m^3/sec)
Subbasin-1	0.38	Rational Method	-	0.42	0.89
Subbasin-2	0.41	Rational Method	-	0.42	0.96
Subbasin-3	1.07	SCS	81.88	-	0.03
Subbasin-4	3.79	SCS	80.91	-	0.06
Subbasin-5	1.12	SCS	85.25	-	0.11
Subbasin-6	8.08	SCS	85.00	-	0.38

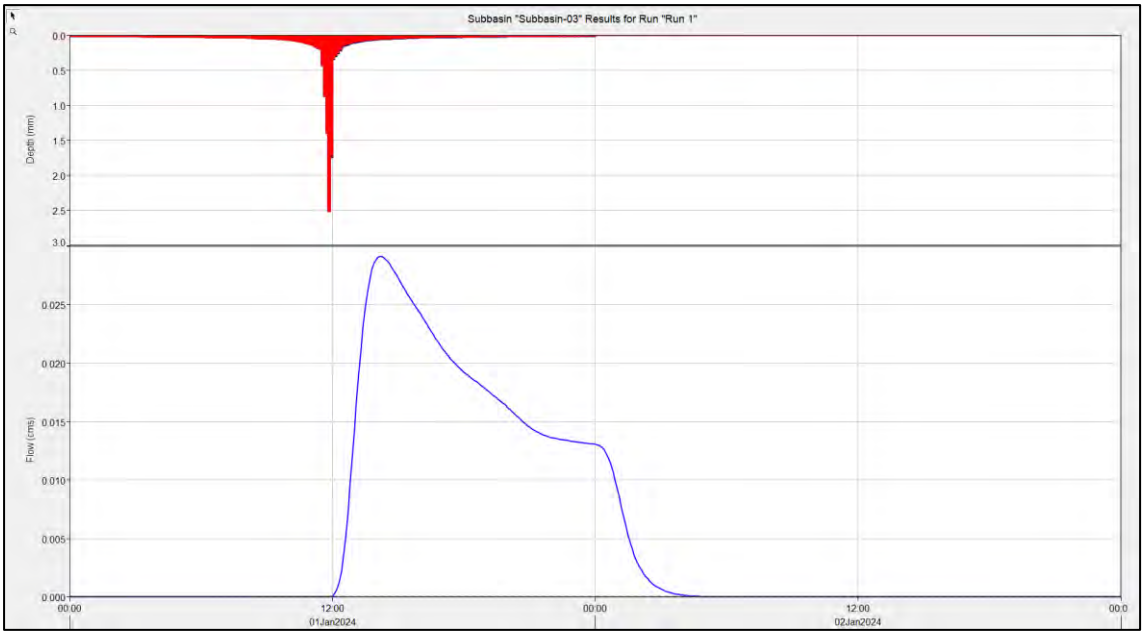

Figure 4-16 Hydrograph for Subbasin-03.

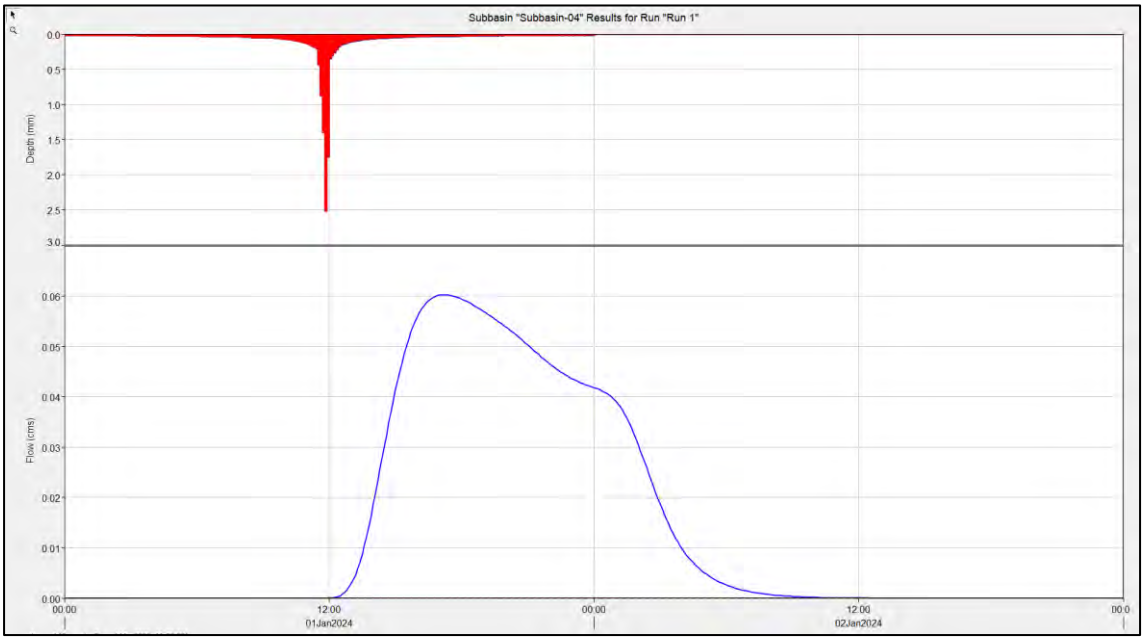

Figure 4-17Hydrograph for Subbasin-04.

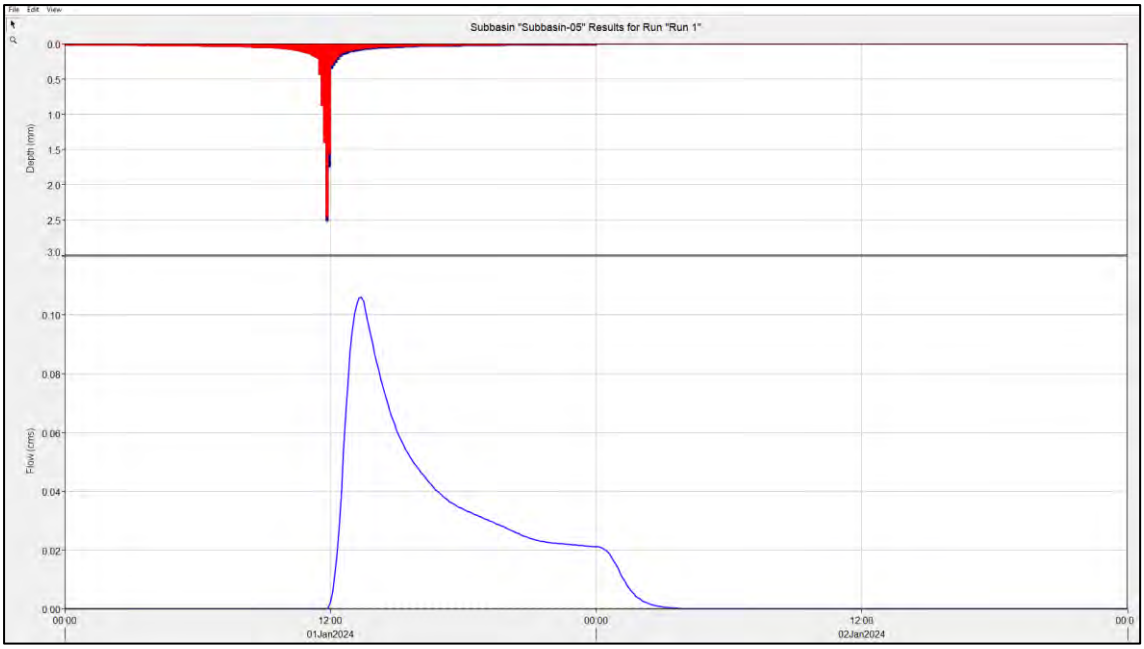

Figure 4-18: Hydrograph for Subbasin -05.

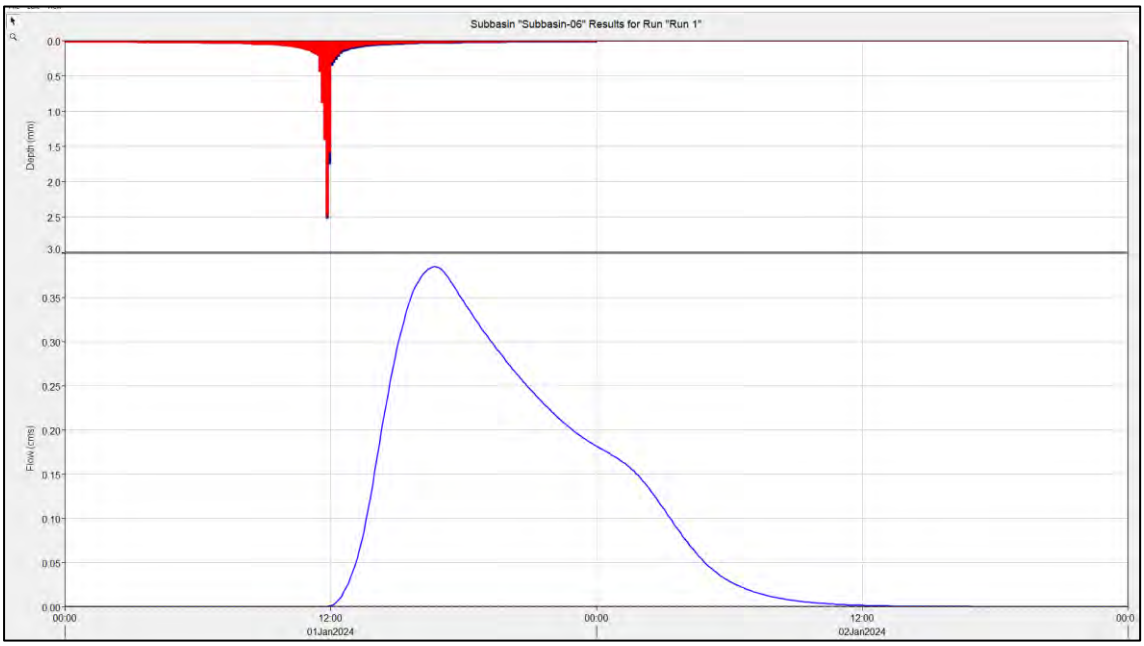

Figure 4-19: Hydrograph for Subbasin-06.

4.3.2 HYDRAULIC ANALYSIS

HEC-RAS 2D 6.3 software was used to build up a complete 2D hydrodynamic model to perform the flood inundation analysis required to identify the inundated locations which are subjected to the risk of flood hazards using the discharge hydrographs produced from the hydrological analysis.

The HEC-RAS software is a powerful tool for performing 2D simulations of water behavior across various terrains. It incorporates Direct precipitation – rainfall applied over the model domain, which then moves across the terrain, following natural drainage paths and accounting for elevation changes as well as potential outflows beyond the domain boundaries. Using the results of these simulations, optimal protection and mitigation solutions for the study area can be developed.

For this study, a 2D hydrodynamic model was developed using the available terrain data for the study area.

The DEM was processed within HEC-RAS Mapper, where an appropriate mesh size in Cartesian coordinates was defined. To account for spatial variability, landcover and Curve Number (CN) data were incorporated into the model, allowing differentiation of soil infiltration characteristics and Manning's roughness coefficients between wadis and floodplains.

The HEC-RAS model incorporated land cover characteristics using a Manning's roughness coefficient of 0.035. Curve Number (CN) values were derived from the GCN 250 m raster dataset, as presented in the table titled "Results of Hydrological Study for Catchments Affecting the Project Boundary." The computational grid was defined with a cell size of 20 m to ensure adequate spatial resolution of flow behavior. Rainfall inputs for both the 100-year and 200-year return period simulations were applied with a uniform storm duration of 6 hours for each model run.

The results of the 100-year and 200-year return period simulation show the distribution of water depth, velocity, and hazard within and around the study area are shown in Figure 4-20 , Figure 4-22 and Figure 4-24 for 100-year storm and Figure 4-21, Figure 4-23,and Figure 4-25 for 200-year storm event. These results confirm that there is no extreme risk from surrounding streams bypassing the site. The simulations also provide a reliable representation of the floodwater flow paths and validate the proposed mitigation measures.

4.3.3 Results analysis and discussion

The hydrological and hydraulic modeling results provide a comprehensive understanding of the flood behavior within the Minya solar farm area. Both HEC-HMS and HEC-RAS models were utilized to assess runoff generation and flood propagation, respectively. The comparison between the two models highlights the influence of local terrain features, particularly the presence of natural depressions, on the resulting flood discharges and flow patterns.

The HEC-HMS rainfall–runoff model was applied at the sub-basin scale to estimate peak discharges for different return periods. The model assumes idealized overland flow with limited consideration of local storage or depression effects within the catchments.

Consequently, the simulated peak discharges from HEC-HMS are relatively high, especially for the upper sub-catchments where micro-topographic storage plays a significant role in attenuating flows.

In contrast, the hydrodynamic model (HEC-RAS 2D) integrates the actual terrain characteristics derived from the processed DEM, which explicitly represents local depressions, flow constrictions, and minor undulations. These features act as natural

To quantify this difference, the most critical sub-basins selected based on their relative size and peak discharge magnitude—were compared.

, HEC-HMS consistently predicts higher peak discharges than HEC-RAS, emphasizing the role of topographic storage in moderating the flood hydrographs.

The HEC-RAS hydrodynamic model was further used to simulate flood depths and velocities for various return periods at the project boundary.

For return periods (5, 10, 25,50 years), no significant surface flow reaches the project boundary, confirming that the upstream catchments have limited runoff potential under typical storm conditions.

For the extreme 200-year return period, the maximum simulated water depth and velocity within the project boundary reach approximately 2.3 m and 4.5 m/s, respectively, while for the 100-year event, the maximum depth and velocity are approximately 2.1 m and 3.1 m/s. Despite these peak values, they occur only in very limited and localized areas, typically associated with topographic depressions and regions of relatively steeper slopes.

The spatial distribution of water depths across the site indicates generally shallow conditions. Depth values range from 0 up to approximately 2.3 m for the majority of the area, with most values clustered below 0.2 m. The mean depth is approximately 0.038 m, with a standard deviation of 0.052 m, reflecting minimal variation and confirming that shallow water accumulation dominates across the site. Localized deeper areas are rare and do not represent widespread conditions.

Similarly, the velocity distribution indicates that flow across the site is generally slow-moving. Although maximum velocities can reach up to 4.5 m/s in isolated locations, the majority of values are concentrated near zero. The mean velocity is approximately 0.042 m/s, with a standard deviation of 0.093 m/s, indicating that higher-velocity flows (greater than 1.5 m/s) are uncommon and confined to limited, localized areas such as steeper slopes or channelized flow paths.

A flood hazard map was developed using depth and velocity raster data to evaluate site safety. The results indicate that the overall flood hazard classification is low, as most of the site experiences shallow depths and low velocities. The HEC-RAS model results further support this conclusion, showing no significant continuous flow across the site. This is primarily due to the presence of localized depressions and the relatively low storm rainfall depth, as discussed in the rainfall analysis. Overall, the hydraulic behavior confirms that flood impacts are minimal and do not pose a significant hazard to the project area, except in very limited and localized areas as illustrated in the hazard figures.

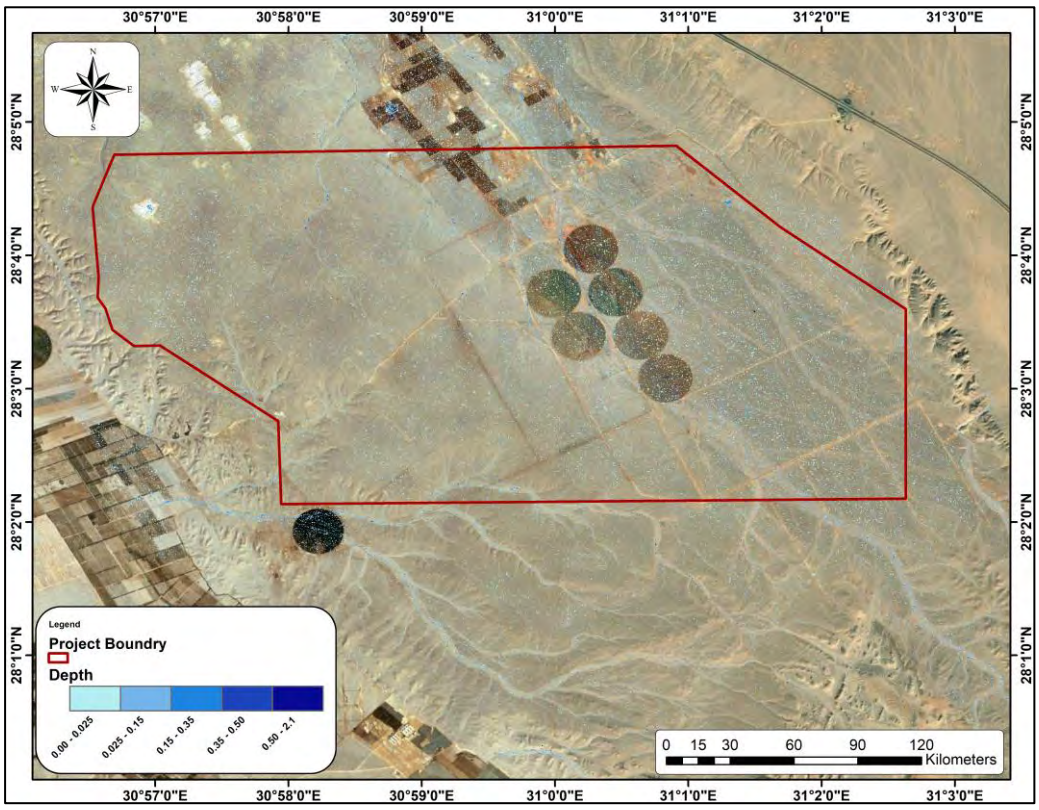

Figure 4-20: Water Depth in 100-year flood storm

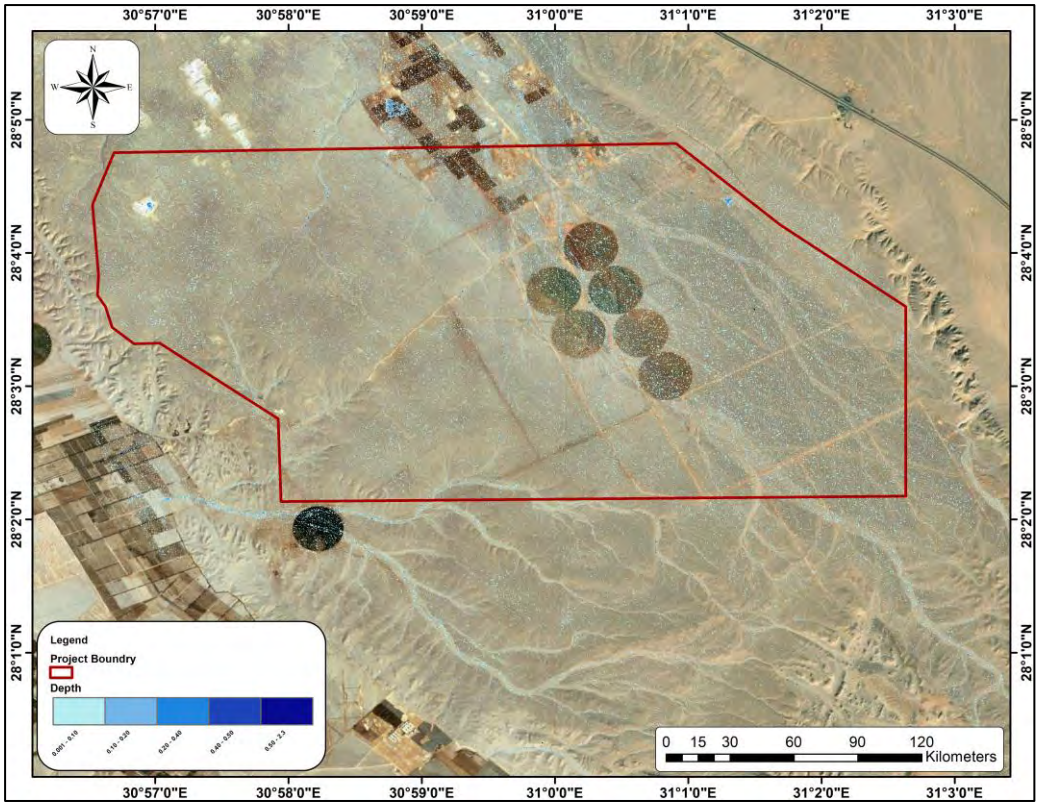

Figure 4-21: Water Depth in 200-year flood storm

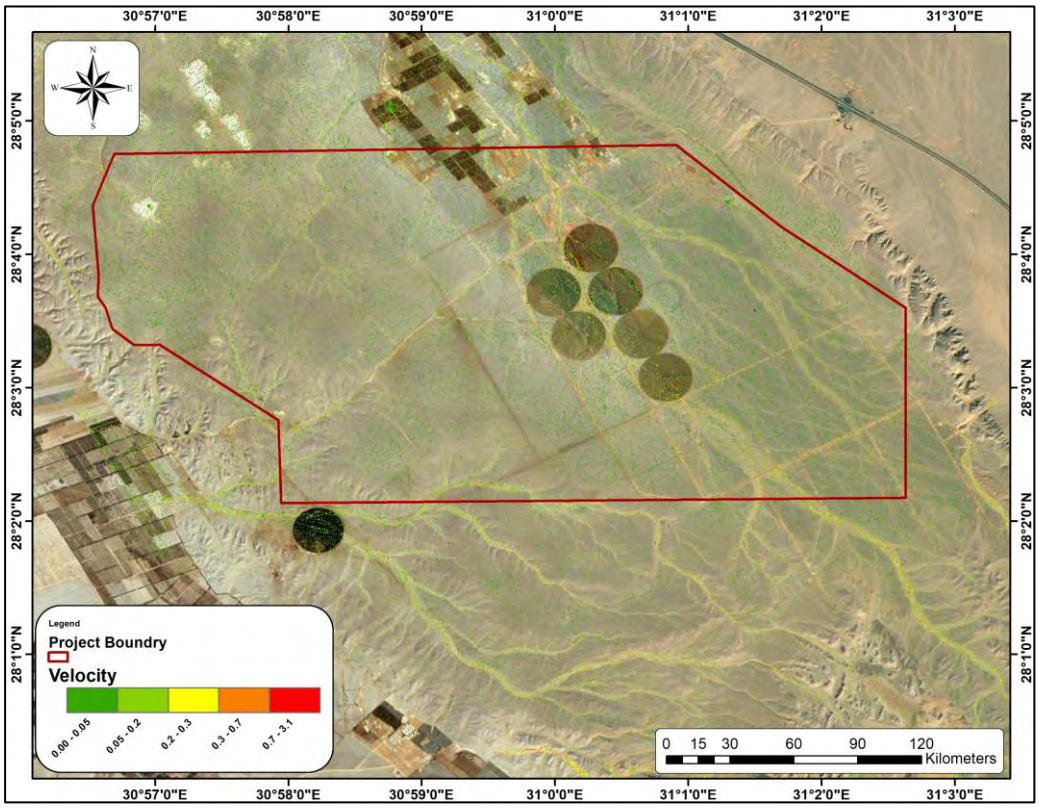

Figure 4-22: Water Velocity in 100 year flood storm

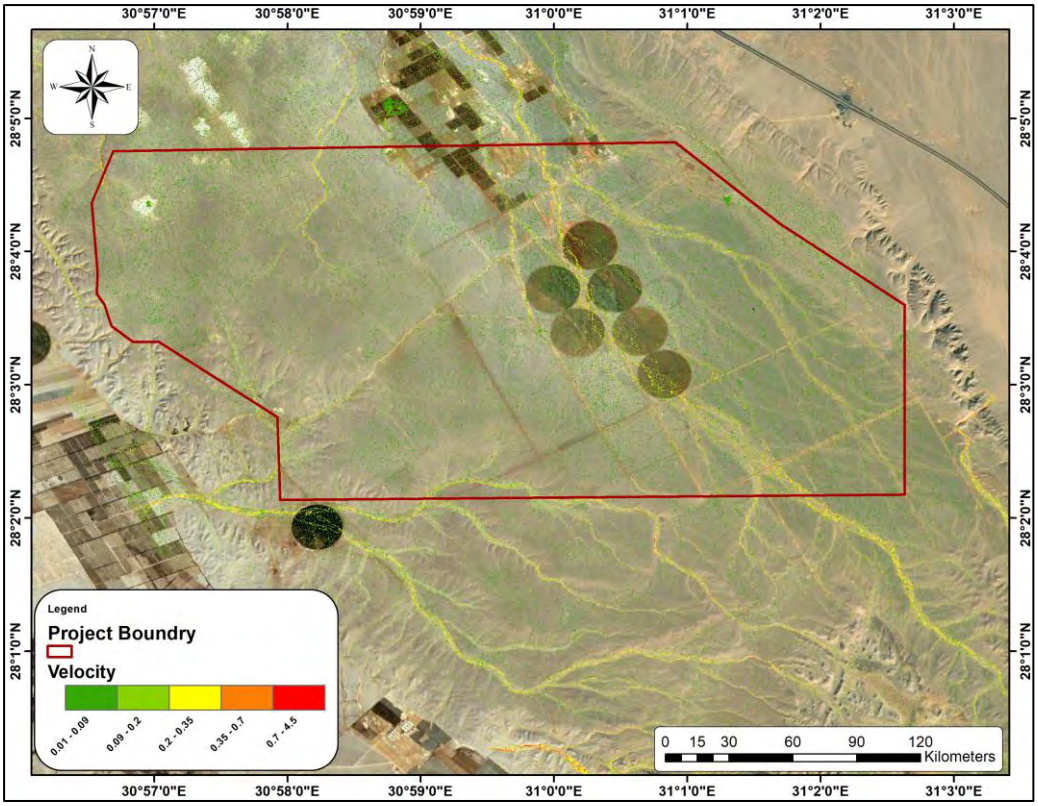

Figure 4-23:Water Velocity in 200 year flood storm

4.4 HAZARD ASSESSMENT

The guidelines produced by the Department for Environment, Food & Rural Affairs (DEFRA) entitled 'Flood and Coastal Defense Assessment Guidelines' have been used to conclude hazard maps according to the following equation:

$$HR = d \times (v + 0.5) + DF$$

Where.

(v): Velocity of flow water (m/sec)

(d): Depth of flow water (m)

(DF): A factor that expresses the percentage of suspended solids in stream water, determined from the Table 5-1

Table 4-8:Guidance on the factor (DF) for various flood depths, velocities and prevailing land uses

Depth (m)	Bushes	Forests	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0	0.5	1
d<0.75 &/or v<2	0.5	1	1

DEFRA FD2321/TR1 does not provide a specific class for all land uses; therefore, the debris factor (DF) has been adapted by analogy to the predominant land cover in the study area. Open desert and cultivated floodplain are treated as Pasture/Arable (open terrain with limited debris potential), while palm groves and shelterbelts correspond to Woodland. Built-up areas, storage yards, and bridge or culvert buffers are assigned Urban values. Wadi

corridors and crossings are considered high-debris pathways, with DF values reaching 1.0 when depths exceed 0.75 m or velocities exceed 2 m/s. This approach captures the characteristic debris sources in Minya —such as cobbles and boulders in wadis, agricultural residues on the floodplain, and movable objects in urban and industrial areas—while remaining consistent with the DEFRA hazard rating framework. Accordingly, the debris factors for the study area land uses are summarized in *Table 4-9*.

Table 4-9: DF factor for the study area

Depth / Velocity Band	Open Desert / Cultivated Floodplain (Pasture/Arable equivalent)	Palm Groves / Orchards (Woodland equivalent)	Wadi Channels / Gullies (High-debris corridors)	Urban / Villages / Roads / Yards (Urban equivalent)
0 – 0.25 m	0.0	0.0	0.0	0.0
0.25 – 0.75 m	0.0	0.5	0.5	1.0
d > 0.75 m and/or v > 2 m/s	0.5	1.0	1.0	1.0

Table 4-10:hazard rating values (HR) classification according to DEFRA guidelines

Hazard Rating (HR)	Category	Description
< 0.75	Low Hazard	Caution – generally safe for people, minimal impact on structures
0.75 – 1.25	Moderate Hazard	Dangerous for some (children, elderly), risk to light structures
1.25 – 2.0	Significant Hazard	Dangerous for most people, potential for asset damage
> 2.0	Extreme Hazard	Dangerous for all, major risk to safety and infrastructure

For Solar Project context, the hazards category translates into:

- Low: Panel foundations remain stable, minor nuisance flooding to access roads.
- Moderate: Some access disruption, potential minor scour at cable trenches.
- Significant: Risks to substation platforms, scour around panel foundations and access tracks.
- Extreme: Threat to structural stability of panel foundations, substations, and buried power cables.

This classification was used to produce hazard maps for 200 years return period event and to guide the selection of suitable locations for Solar panel, ensuring avoidance of high-risk zones and supporting the project's sustainability objectives.

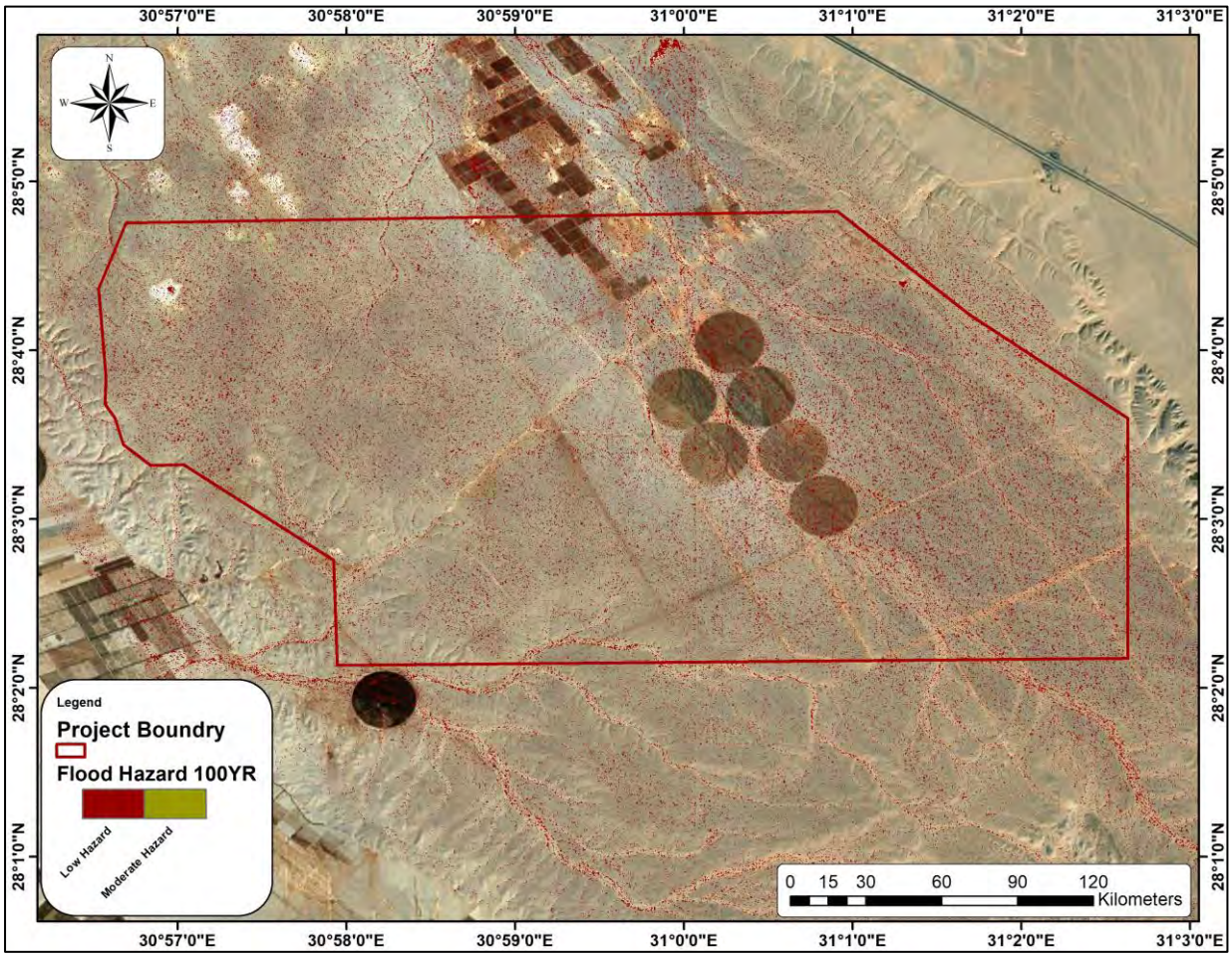

Figure 4-24: Flood Hazard in 100 Years Flood Storm

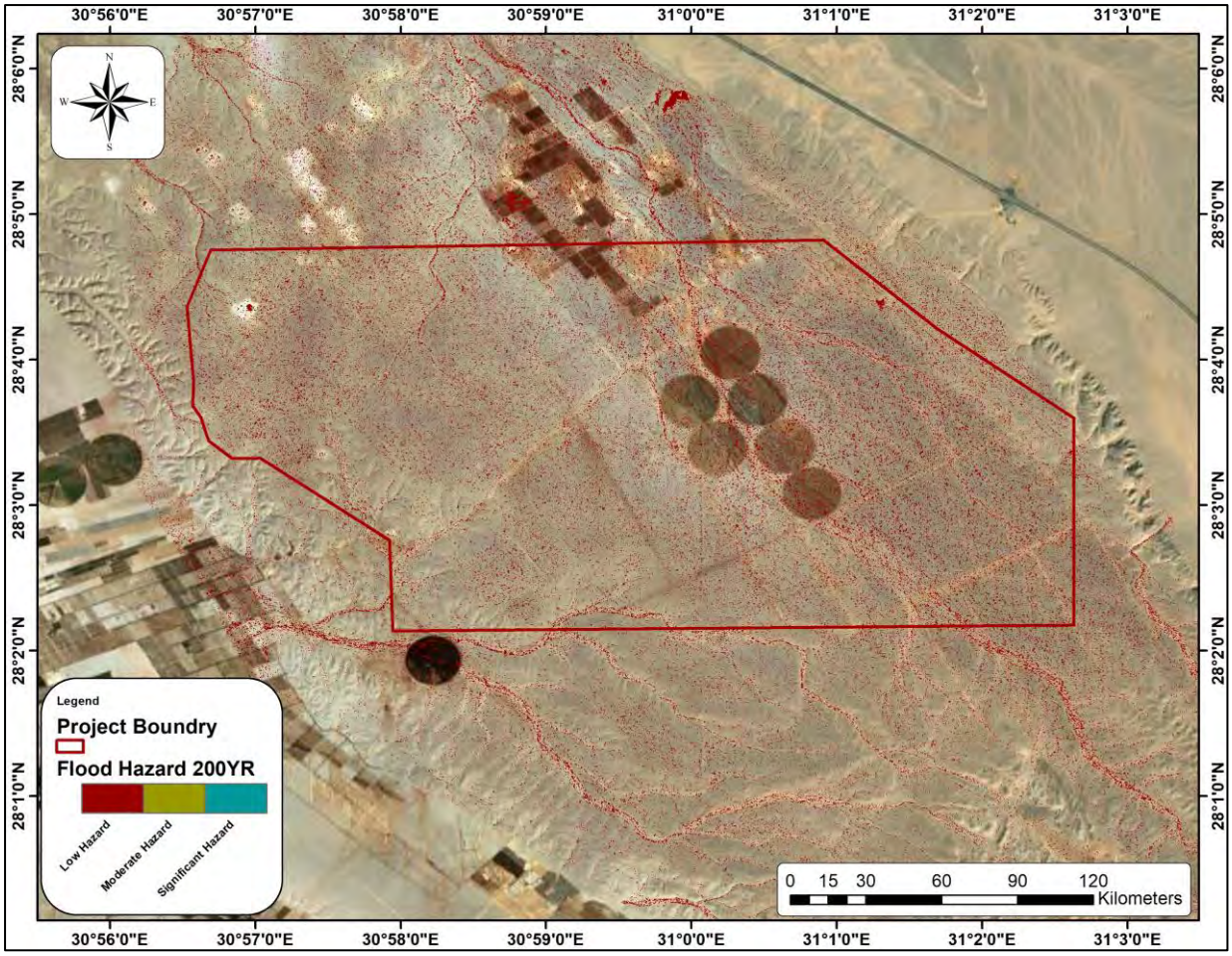

Figure 4-25:Flood Hazard in 200 Years Flood Storm.

As illustrated in the figure, the flood hazard at the site is classified as low. The analysis indicates minimal risk of significant flooding, due to the low storm depths, the presence of natural depressions, and limited flow velocities.

4.5 SCOUR CALCULATION

Scour depth is one of the most critical parameters in assessing erosion hazards around hydraulic and structural works. It refers to the vertical lowering of the bed level caused by flowing water removing soil or sediment. In risk assessments, scour depth is often expressed relative to the foundation depth of a structure, since this ratio directly indicates the potential for structural instability. Shallow scour may pose limited concern, but when scour depth approaches or exceeds the embedment depth of foundations, the risk of structural compromise rises significantly. For solar projects, this parameter is particularly important for panel foundations, substations, and buried cable crossings, where excessive scour could undermine stability, expose utilities, or lead to costly failures. By categorizing risk levels according to relative scour depth, engineers can evaluate where protective measures such as riprap armoring, bed stabilization, or deeper foundation design are necessary.

For solar installations, scour risk is mainly associated with erosion of soil around panel foundations, substations, access roads, and buried cable routes. The risk is governed by::

- Hydraulic conditions (flow depth, velocity, turbulence, shear stress).
- Soil properties (cohesive vs. non-cohesive, grain size, erodibility).
- Foundation design (shallow vs. deep, armoring).
- Channel geometry (culverts, crossings, drainage features).

Several studies (Chow 1959; Melville & Coleman 2000; Lagasse et al. 2001 – HEC-18, and HEC 20; Breusers & Raudkivi 1991) classify scour based on flow velocity relative to critical velocity, scour depth relative to foundation depth, or shear stress relative to critical shear stress.

Scour depths were calculated based on HEC 20 equations as illustrated in section 3.5 by assuming the following parameters:

$\gamma \rightarrow$ Specific weight of Water $= 62.4\ lb/ft^3$

$\gamma_s \rightarrow$ Specific weight of sediment $= 2.65 * 62.4 = 165.36\ lb/ft^3$

$k_s \rightarrow$ Dimensionless coefficient often referred to as the Shields parameter =0.05 for sand according to Hydraulic Engineering Circular (HEC) no. 20

$n \rightarrow$ Manning roughness coefficient =0.04 as scour area at culvert alignment consists of sand and gravel

$y_a \rightarrow$ Thickness of the armor layer, ft (=$2D_C$)

$P_c \rightarrow$ Percent of material coarser than the critical particle size (D_C) = 20%

Table 4-11:Scour Depth-Based Risk

Scour Risk	Relative Scour Depth (y_s / Df)	Description
Low	< 0.25	Scour shallow compared to foundation embedment.
Moderate	0.25 – 0.5	Scour depth may expose parts of shallow foundations or cable trenches.
High	0.5 – 1.0	Scour depth approaches foundation depth; structural risk possible.
Critical	> 1.0	Scour exceeds foundation embedment; severe failure risk.

The scour risk was mapped in Figure *4-26* by considering the typical foundation depth (Df) = 0.5 m .

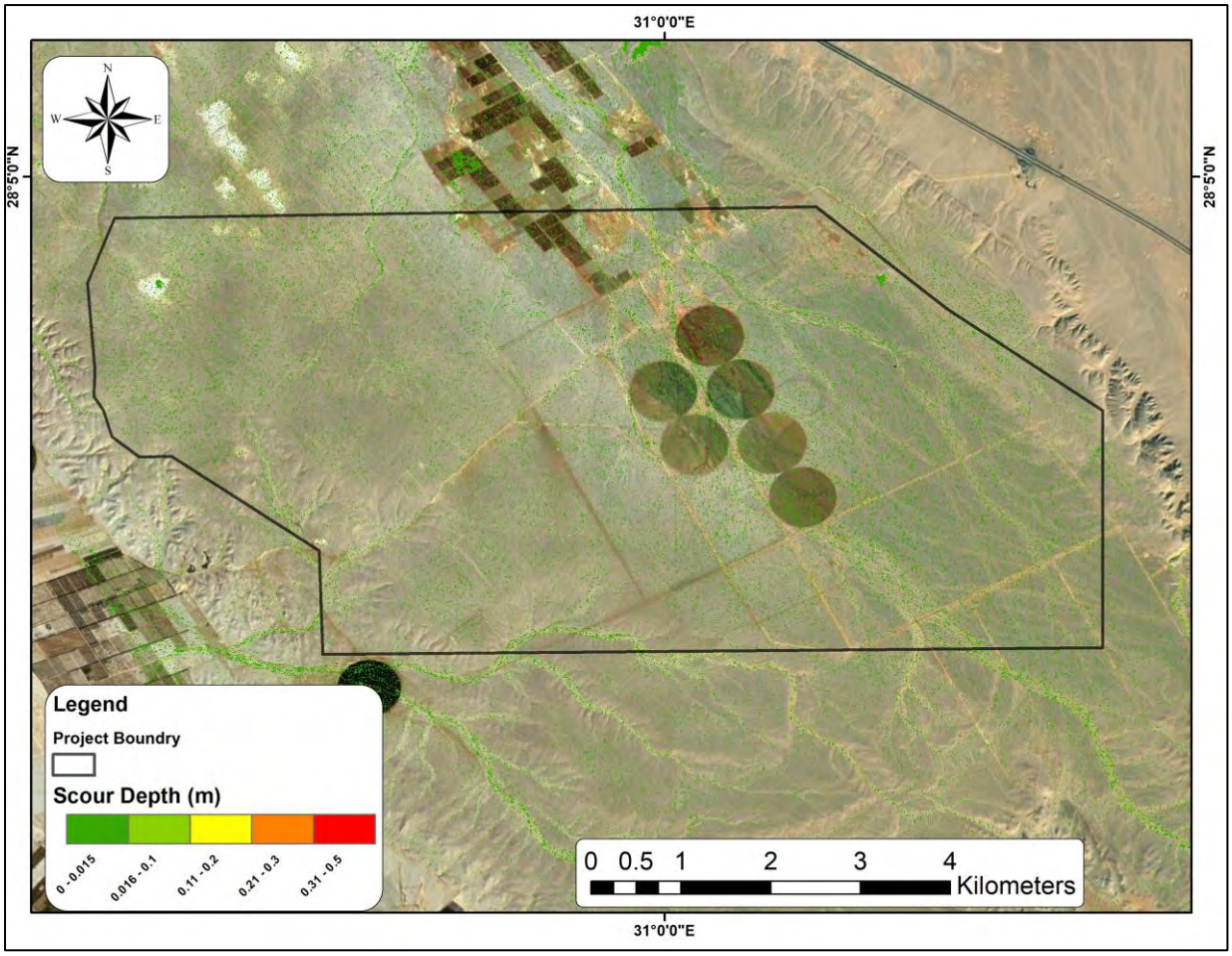

Figure 4-26: Scour Depth 100-year.

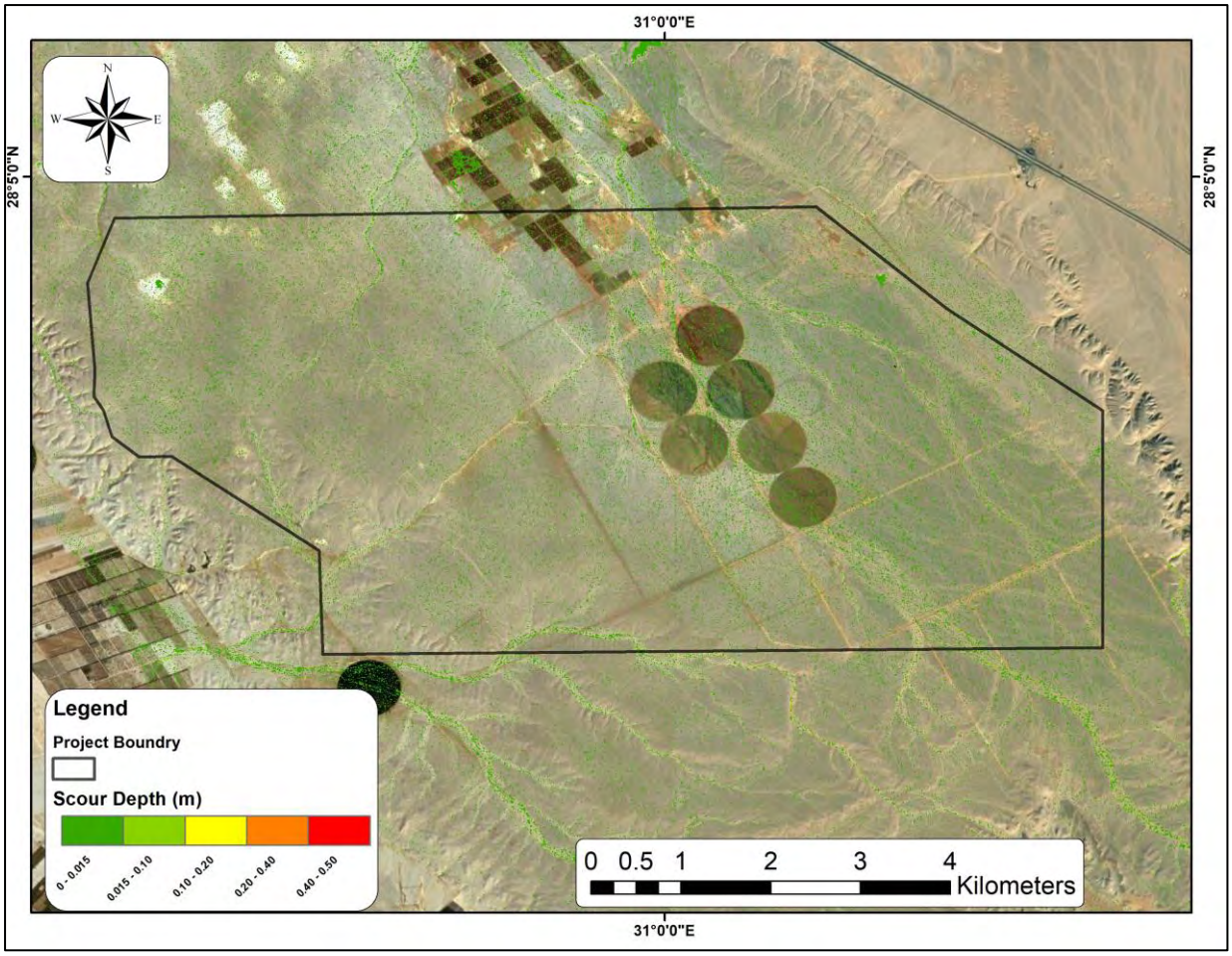

Figure 4-27:Scour Depth 200-year.

5 Recommendations

- Official EMA dataset has been adopted as the basis for Rainfall frequency analysis.
- As a conservative engineering measure, we will adopt a 6-hour storm duration instead of the standard 24-hour distribution.
- Based on the hydrological analysis conducted for the Minya Solar Power Station, the results indicate that the calculated flood water peak discharges are relatively low under the 100-year and 200-year return periods s, including the 20% climate change allowance. This is primarily attributed to the high infiltration capacity of the prevailing soils and the relatively limited design storm depths recorded at Minya Station.
- The incorporation of a 20% increase in rainfall intensity provides a conservative safety margin.
- The computed runoff depths and corresponding peak discharges demonstrate that the site is exposed to low flood hazards under the adopted design conditions.
- The flood hazard at the project site is classified as low. Solar panels and critical infrastructure can be safely installed in the proposed locations, minimizing flood risk.
- Foundation designs should account for the mapped scour risk, with typical foundation depths (Df) ≥ 0.5 m to prevent erosion-related instability.
- The hydrological assessment demonstrates that the proposed solar power station in Minya is not exposed to significant flood risk. HEC-HMS and HEC-RAS simulations indicate limited runoff from upstream catchments, and localized depressions further reduce potential flooding.
- Flood hazard mapping confirms the site is safe, with low hazard classification.
- Appropriate foundation depths and minor internal drainage interventions will mitigate localized scour and runoff issues, ensuring the resilience and sustainability of the solar infrastructure even under extreme storm events.

Annex 5: Stakeholders scoping meetings PV&BESS-East Minya

Stakeholders Scoping meetings

Topic	Discussions
6/1/2026: EEAA	
EEAA- Central EIA department	A meeting took place with the head of energy projects at the central EIA department of EEAA during which the categorization of the PV project and its different related projects including the PV and BESS in NREA East Menya concession, the consumer substation in Menya, the standalone BESS projects in Abou Qir and Nagaa Hammadi was discussed. It has been advised that the projects are to be catgeorised as Scoped B, that do not require organizing public disclosure meetings. As per the national environmental law, EEAA is to issue its opinion on the ESIA within 30 days from receipt of the ESIA for review.
15/2/2026: Informal agricultural operators at the Energy Valley site	
Farms operators at the site	During the site visit, a number of agricultural farms operators met while dismantling their infrastructure to evacuate the lands. Discussions indicated that they have been informally using land since 2023, despite it having been allocated for NREA since 2016. The agriculture operators indicated that since January 2025, the Menya governorate has been notifying and warning farmers to evacuate the lands, while some farmers claimed that no warnings took place by the governorate before undertaking the evacuation campaigns. As indicated by the interviewed farmers, the majority of farmers came from other governorates mostly from Gharbeia governorate. The farmers advised that they had submitted applications to the governorate regarding acquiring the lands area for agricultural activities. As they received no feedback to their applications, they assumed that the applications were accepted and moved forward with their projects. They have also applied to the Egyptian Electricity Transmission company and got connected to the electricity grid and they pay monthly electricity bills. This provided support to their assumption.
16/2/2026: General Agency of the Public Property Protection	
Head of the General Agency of the Public Property Protection – Menya governorate	Dr. Mohamed Shoeib, the Head of the General Agency of the Public Property Protection who advised that agency undertakes regular evacuation campaigns to acquire back public lands from illegal transgression. The evacuation campaign for the NREA concession took place as part of the 28th campaign undertaken within the Menya governorate. As indicated by Dr. Shoeib, in light of the amendments of Law 144/2017 with Law 168/2025, for some cases where the land transgression does not conflict with other planned uses of the area, legal reconciliation can take place. Since this is not the case for the NREA concession, no reconciliation or compensation has been considered

Topic	Discussions	
16/3/2026 Menya City Councils		
Attendees – Deputy Head of Menya City Council – Head of environmental department –Menya city	• Issues discussed included the following: – The project's water demand and the capacities of existing water treatment companies within Menya and Abo Qurkas cities. The head of Menya city council indicated that the project needs to apply to the Menya water company indicating the required water demand. He advised that the water company will be able to secure the required water demand. – The Menya city waste management capacity: The head of Menya council environmental department advised that a solid waste landfill is currently under development at Toukh El Kheil area. Another waste dumpsites exist in Balansoura in Abo Qurkas and Mallawi. – The workforce required: It was advised that job advertisements, labour qualifications of and receipt of workers applications can be done through the Menya governorate labour office. – Workers accommodation: it was advised that accommodation within the closest villages is not a preferred option mainly because housing in the villages are mostly family homes and do not offer renting for foreigners from outside the village. In this respect, accommodation would be recommended to take place within Menya of Abo Qurkas urban areas where renting is available – The wastewater of the town of Meny is treated in the Talla Wastewater treatment plant which has a capacity of 53,600 m3/day and could accommodate the wastewater generated by the project in its peak construction period. .	
Chairman of Menya Water and Wastewater company	– The total water design capacities of the water treatment plants in Menya and Abo Qurkas are 313,240 and 106,320 m3/day respectively. – The Markaz of Menya has a total of 15 water treatment plants. Their capabilities vary from 2000 to over 100,000 m3/.day of which only 5 have capacities of more than 20,000 m3/day – On the other hand, Markaz Abo Qukas has only 2 treatment plants of capacities of 4,320 and 102,000 m3 /day. – Discussions focused on the ability of the nearest water treatment plants to meet the project water demand. Eng. Yehia advised that the daily water needs, about 500m3/day, cannot be met through one of the nearby water treatment plants. – In this respect, the project needs to coordinate with the water company in advance to enable planning the supply from different water treatment plants within the governorate. – There are two options to acquire water, namely this could be through direct contract with the water company for water supply. In this case, water could be provided from the plants in which capacity permits, and the water company would use its own trucks. Alternatively, the project could contract a private company using its own trucks to acquire water from points specified by the water company.	

Topic	Discussions	
– Head of EEAA Menya RBO – Head of environmental department- Menya governorate	Discussions included the following topics: – The catagorisation of the project where it was indicated that project is categorised as Scoped B project according to the national EIA system. – Accommodation of workers: Eng. Eftat advised that accommodation can be provided within Menya urban centres. In addition, considering workers camps on site, similar to the practice of the agricultural projects in the area, will reduce the costs of extensive transportation given the significant distances between the site and the Menya city centres. – Transportation: it was indicated that the new Sammalout and Mallawi axes can be used for transportation of imported PV modules and BESS components whether from Sokhna or Safaga ports. – Labour: It was advised that unskilled labour are available in Menya governorate, while highly skilled technical and specialised labour will need to be sought from outside the governorate.	
NGOs	A meeting took place with various NGOs working in different community support areas. Discussions included the following issues: – Labour: the project may attract skilled construction workers in the governorate, thus potentially adversely affecting other construction activities. However, it was clarified that the temporary nature of construction activities is not expected to have significant impact on the other construction activities – Capacity building: an issue was raised regarding the potential provision of capacity building to the technical school students to qualify them to work for the project. It was clarified that due to the relatively limited project construction time frame, provision of capacity building can be provided within the scope of the project CSR plans. – Workers code of conduct is emphasized where accommodation of workers would take place within urban communities to control for potential frictions with the community including GBV. – Role of NGOs: attendees indicated that NGOs may play a role in providing awareness to the communities with regard to the project and information about the skills needed by the project. They can also play a role with regards to potential areas of community supporting the project 's CSR plans. Moreover, NGOs can support the project through monitoring many issues including e.g. workers' conduct or impact on rental costs Agreement with the project on issues to monitor could be discussed in due time NGOs can also contribute to training personnel on general skills such as first aid. Employment of physically or mentally disabled individuals: Although a 5 % share of employment is required by law, this is not expected to apply to individual projects especially in the construction phase but rather on the total employment of the contractors. During operation, more permanent jobs could be available depending on the specific conditions of individuals.	

Topic	Discussions	
17/3/206- New Menya Urban Authority		
Deputy Head of New Menya Urban Authority	Discussions included the following topics: – Water treatment capacity: it was indicated that the design capacity of new Menya city is about 95,000m3/day to be operated in two phases of 45,000 and 50,000 m3/day. The current production of the first phase is 36,000m3/day – It was advised the construction activities within the new Menya city are still on going and have not yet reached its maximum capacity. Accordingly, the current excess capacity makes it easy to supply the water needs of the project. Wastewater treatment capacity is also available – It was also indicated that large number of the existing buildings are not yet occupied, thus providing sufficient workers accommodation. However, it was recommended to avoid concentrating large number of workers (especially unskilled workers), in one neighbourhood to avoid potential disturbances to the communities. – Potential adverse impacts of the project may include increasing the cost of construction labour. However, due to the temporary nature of the construction activities, such impacts would not be significant. – Waste management: there are two waste dumpsites for solid and construction wastes. – Regarding medical services, there is only one specialized hospital, Cardiothoracic Hospital, within new Menya city. Plans for construction of a Central Hospital are underway expected to be established in 2027. In addition, a number of small health units exist that can provide first aid services.	