



**Environmental and Social Impact Assessment (ESIA)**

**100 MW Kairouan Solar Power Project**  
Republic of Tunisia

**Project: Environmental and Social Impact Assessment for 100 MW Photovoltaic Plant in Kairouan Tunisia**

Version: Final Report

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## ACRONYMS & ABBREVIATIONS

AAO	Association les Amis des Oiseaux
AC	Alternating Current
AFI	Industrial Land Agency
AfDB	African Development Bank
AMEA	Africa – Middle – East - Asia
ANGED	National Waste Management Agency
ANME	National Agency for Energy Conservation
ANPE	National Environmental Protection Agency
APAL	Coastal Protection and Development Agency
APII	Agency for Promotion of Industry and Innovation
ARAP	Abbreviated Resettlement Action Plan
ARC	Anti-Reflective Coating
ASL	Above Sea Level
BNG	Banque Nationale de gènes
BPEH	Bureau de la Planification et des Equilibres Hydrauliques - Office of Planning and Hydraulic Balances
CITET	Centre international de technologie de l'environnement de Tunis
CLO	Community Liaison Officers
CONNECT	Confederation of Corporate Citizens of Tunisia
CPE	Consultation et Participation Eclairées
CRDA	Regional Commission for Agricultural Development
CSR	Corporate Social Responsibility
DC	Direct Current
DGEER	General Directorate of Energy and Renewable Energies
DGF	Directorate General of Forestry
EAM	Environmental Assessment & Management
E&S	Environmental and Social
EHS	Environment, Health, and Safety
EPC	Engineering, Procurement and Construction
ESHS MS	Environment, Social, Health and Safety Management System
ESIA	Environmental and Social Impact Assessment
ESAS	Environmental & Social Advisory Services
ESMP	Environmental and Social Management Plan
GDA	Agricultural Development Groups
GDP	Gross Domestic Product
GIIP	Good International Industry Practice
GWh	Gigawatt Hour
IBA	Important Birds and Biodiversity Area
ICP	Informed Consultation and Participation
IFC	International Finance Corporation
IFI	International Finance Institution
INP	National Heritage Institute
ISS	Integrated Safeguards System
IUCN	International Union for Conservation of Nature
kWh	Kilowatt Hour
ME	Ministry of the Environment
MW	Megawatt
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NTS	Non-Technical Summary
OHTL	Overhead Transmission Line
ONAS	National Sanitation Office

OS	Operational Safeguards
OTD	State Lands Office (Office des Terres Domaniales)
PPA	Power Purchase Agreement
PERC	Passivated Emitter and Rear Cell
PV	Photovoltaic
SONEDE	National Company of Exploitation and Distribution of Water
SOTULUB	Tunisian Company of Lubricants
STEG	Tunisian Company of Electricity and Gas
UGTT	Tunisian General Labor Union
UNFCCC	United Nations Framework Convention on Climate Change
URAP	Regional Union of Agriculture and Fisheries
UTICA	Tunisian Union of Industry, Commerce and Handicrafts
WWTP	Waste-Water Treatment Plant

## NON-TECHNICAL SUMMARY

### 1. Introduction

The consortium AMEA Power-TBEA (hereafter referred to as “the Developer”), was awarded in December 2019, an agreement for the development of a 100 Mega Watt (MW) Photovoltaic (PV) Solar Power Plant in the governorate of Kairouan, Tunisia (hereafter referred to as “the Project”).

AMEA Power is an Emirati company active in renewable energies. It acquires, develops, owns and operates thermal and renewable energy projects in Africa, the Middle East and Asia.

TBEA is an international company which offers its customers a range of services in the field of green energy and sustainable development. TBEA is present in a dozen countries around the world. With the opening of the solar market in Tunisia, TBEA has focused on the development and integration of solar solutions for the Tunisian and African market.

The Kairouan Project has two components:

- The solar plant (100MW), that will be built and operated by the Developer;
- The transmission line (8 km long – 225kV), that will be built and operated by the Tunisian Company of Electricity and Gas (Société Tunisienne de l’Electricité et du Gaz, STEG).

The Tunisian Company of Electricity and Gas is a public company under the supervision of the ministry of Industry, Energy and Mines which has a monopoly on the transport and distribution of electricity and gas. Its main mission is to cover the needs of the country in electrical energy in the best economic, technical and environmental conditions.

The developer who will seek financing for the project from international financial institutions (IFIs), including the International Finance Corporation (IFC) and the African Development Bank (AfDB), is expected to design and develop the project in accordance with international best practice, including the completion of an Environmental and Social Impact Assessment (ESIA) in accordance with the IFC Performance Standards (PS) on Environmental and Social Sustainability (2012) and the Operational Safeguards (OS) of the AfDB's Integrated Safeguard System (ISS)

it should be noted that the Project has been ranked as Category B according to the IFC PSs and as Category 2 according to the AfDB ISS.

For this purpose, Environmental Assessment and Management (EAM) has been commissioned by the consortium AMEA Power-TEBA to carry out the ESIA study for the Project in accordance with national requirements as well as IFC and AfDB requirements as identified above.

This document presents the ESIA study undertaken for the proposed 100 MW photovoltaic plant in Kairouan.

## **2. Project Context**

In 2014, Tunisia has adopted the “Energy Transition Policy” which aims for a 30% reduction of its primary energy consumption by 2030 and a 30% contribution of renewable energy in electricity production by the same period.

The Tunisian Solar Program "TSP" is the operational program to achieve the objective of the Energy Transition Policy in terms of introducing Renewable Energy in Tunisia. It aims at increasing electricity production of renewable energies from 3% in 2016 to 30% in 2030, This includes 10% from solar energy, more specifically 7% PV and 3% Concentrated Solar Thermal (CSP).

Under the Tunisian Solar Program (TSP), the Government of Tunisia, represented by its Ministry of Industry, Energy and Mining, selected the Developer for the development of the Project. A 20-year power purchase agreement (PPA) was signed by the Developer and the Tunisian Company of Electricity and Gas (STEG).

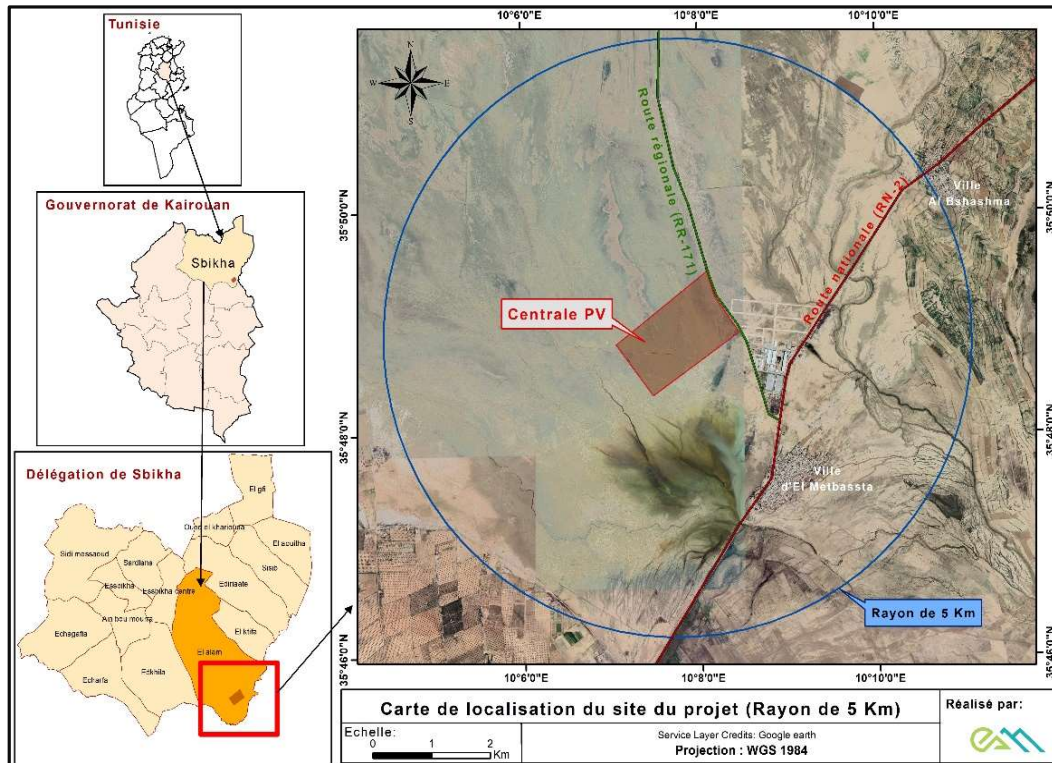
The Tunisian energy sector is facing strategic, economic, social, and environmental challenges. Energy sourcing, particularly in the power sector, relies heavily on natural gas (97% of total power generation), of which 50% is imported from Algeria, given the limited available national resources. Furthermore, electricity demand is increasing. As a consequence, the primary energy balance deficit has been aggravating for the past 15 years, reaching 50% in 2018.

## **3. Project Description**

### ***(i) Project Location***

- The Solar Project is located in the El Alem sector within the delegation of Sbikha in the Governorate of Kairouan. The closest community settlement to the Project Site is Metbasta, located around 2.2 km South of the Project Site.
- The solar plant will be constructed on a leased land that is currently part of the private domain of the Tunisian State with an area of 200 hectares. The area is reasonably flat,

well exposed, easily accessible, with sufficiently compacted ground and an elevation around 30 – 32 m above sea level. **Figure A** shows the project location map.



**Figure A** Project Location Map

- The solar plant is located approximately at 500 m from the Sbikha 1 industrial zone and at 100 m from the industrial zone Sbikha 2 (under construction) and in vicinity of agriculture parcels.

**(ii) Basic principle of photovoltaic power production**

PV is a method of generating electricity through solar energy. Solar cells convert the energy into electricity. Solar cells produce Direct Current (DC) electricity from sun light, which can be used for grid connected power generation. The electricity at the grid usually has a different form (Alternating Current, AC). Inverters are used to convert the DC current to AC current. Transformers are used to convert the output voltage from solar cells to a higher voltage that matches the grid it connects to.

**(iii) Project Components**

- The key component of the Project are the four blocks where each is composed of PV Power arrays (see **Figure B**). Each array is equipped with a mounting structure which

consists of a single axis horizontal tracker that carries the array and orients it towards the sun.



*Figure B* Typical Power Arrays Composed of PV Panels

- Each block will include a central inverter station that converts the produced electricity from DC to AC.
- The central inverter stations will be connected to the substation locations onsite by underground electrical cables. The substation then converts the produced voltage to an appropriate level for the connection to the National Grid.
- Building equipment for data, control, and voice communication systems for a proper operation and maintenance, as well as a warehouse for the storage of equipment and machinery and a car park will be needed.
- Besides, infrastructure elements like (i) internal road network to access the modules for operation and maintenance purposes; (ii) a security road around the perimeter of the Project Site for security patrolling; (iii) an access road from the highway to the Site; as well as (iv) onsite water reservoirs for potable purposes and cleaning are needed.
- Fencing around the entire facility and security along with remote cameras, automatic night lighting will be required to ensure safety from criminal activity and trespassing of unauthorized personnel.
- Besides, a monitoring system to track the plant equipment performance for operation and maintenance is needed.
- A separate ESIA for the overhead transmission line was prepared for this Associated Facility. Key components are expected to include transmission towers. Each transmission tower will consist of: (i) foundations to fix and bolt the tower to the ground; (ii) cross-arms to connect the conductors with the towers; and (iii) the

conductor to carry electrical energy from one tower to the next, as well as its connection with the High Voltage National Grid. The conductor will be a 225 kV line.

- The project requires human resources during both the construction and operation phases. These resources are as follows:
  - Around 450 job opportunities at peak during the construction phase for a duration of approximately 16 months. This will mainly include around 100 skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and 350 unskilled job opportunities (mainly laborers including security personnel); and
  - Around 45 job opportunities during the operation phase for a duration of 20 years. This will include around 10 skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and 35 unskilled job opportunities (such as security personnel, drivers, etc.).

***(iv) Project Phases***

The likely activities to take place during the Project development include three (3) distinct phases: (i) planning-construction, (ii) operation and (iii) decommissioning each of which is summarized below.

- Planning & Construction: This includes preparing the detailed design and layout of the Project, the transportation of Project components onsite, as well as Site preparation and construction activities for the installation of PV modules inverter stations, substation, internal access roads, office and warehouse, OHTL, etc. (e.g., Contractor mobilization, fencing, levelling and grading, transportation of project components, implementation of the hydro-infrastructure, etc.);
- Operation: this phase includes monitoring, maintenance, inventory management, elaborating administration warranties, storage of spare parts and safety equipment, ensuring site security, as well as the implementation and follow-up of the Environment, Social, Health and Safety (ESHS) plan;
- Decommissioning: after the operational time of 20 years, the Project is planned to be decommissioned. The decommissioning activities include the disconnection of the components, as well as the restoration of the Site and the internal road network and the removal of the fences.

The construction activities will start early 2023 for a duration of 16 months. Commercial operation of the Project is expected to commence in 2024 for a period of 20 years.

### **(v) Alternatives**

The Promoter was awarded in December 2019 an Agreement for the development of a 100 MW solar photovoltaic (PV) plant in the governorate of Kairouan on land owned by the State. Therefore, there are no specific siting alternatives that have been considered by the Promoter.

Nevertheless, some project design alternatives have been studied with the Promoter, mainly including the water drainage system with the construction of dykes to minimize the risk of flooding of the site and the use of dry cleaning to save about 3,000 m<sup>3</sup> of water per year.

## **4. Legal and institutional framework for the implementation of the project**

### ***(i) National legislative and regulatory framework***

#### **Environmental and Social Assessment:**

The Tunisian Government Decree 2016-1123 of August 24th, 2016, states that energy production from renewable energies requires the preparation of an Environmental Impact Study. However, based on Decree no. 2005-1991, dated 11 July 2005, only Power Generation Units with at least 300 MW capacity are subject to EIA studies. Therefore, the project for the construction of a 100 MW photovoltaic plant and a 225 kV overhead transmission line does not require the approval of the National Environmental Protection Agency (ANPE) and does not require an environmental permit for its implementation.

The institutional framework in Tunisia is constituted by the Ministry of industry, Energy and Mining, the National Agency for Energy Conservation (ANME) and the Tunisian Company of Electricity and Gas (STEG). Other institutions in charge of environmental and social issues are Ministry of the Environment (ANPE, ANGed, APAL, ONAS), Ministry of Agriculture (DGF, CRDA), Ministry of Culture (INP), Ministry of Social Affairs, Ministry of State Property and Land Affairs, and NGOs and Civil Society.

The legal framework established in Tunisia covers most aspects related to environmental protection, pollution control and improvement of the living environment. It includes preventive and incentive instruments (financial aid and tax incentives) as well as coercive measures against natural and legal persons committing pollution or environmental degradation offences.

#### **Biodiversity, natural resources, and ecosystem services:**

The main regulatory texts governing biodiversity, natural resources and ecosystem services are :

- The Forestry Code: constitutes the basic legal framework for the conservation of the

natural environment (forests, estuaries, rangelands, forest land, national parks and nature reserves, wildlife, and wild flora) and the management of national parks. It stipulates that work and development projects can only be undertaken in areas governed by the Forestry Code after authorisation from the Minister of Agriculture.

- Law 92-72 of August 03, 1992 Fixes the general provisions to the protection of the plants and to the organization of the sector of the pesticides to agricultural use
- Order of the Minister of Agriculture of July 19, 2006, fixing the list of the rare and threatened wild fauna and flora.

### **Protection of natural resources and prevention of pollution:**

The main regulatory texts relating to the protection of natural resources and the prevention of pollution are :

#### Liquid discharges

- Decree n° 85-56 of January 2, 1985: Relating to the regulation of discharges into the receiving environment
- Order of the Minister of Local Affairs and Environment and the Minister of Industry and Small and Medium Enterprises of March 26, 2018: fixing the limit values of effluent discharges into the receiving environment.

#### Atmospheric emissions

- Governmental decree n°2018-447 of 18 May 2018. Setting limit values and alert thresholds for ambient air quality.

#### Solid waste

- Law 96-41 of June 10, 1996, on waste and the control of its management and disposal.
- Decree 2005-2317 of 22 August 2005, creating a National Agency for Waste Management (ANGED).
- Decree 2005-3395 of December 26, 2005, sets the conditions and modalities for the collection of used accumulators and batteries.
- The Decree 2008-2565 of 07/07/2008, mending and supplementing Decree 2002-693 of 1 April 2002, sets the conditions and modalities for the recovery of used lubricating oils and oil filters and their management.

#### Management of waste and dangerous products

- The circular of the Ministry of Commerce of May 12, 1987, prohibiting the import into Tunisia of transformers and all other equipment or products containing PCBs.

- Law n° 96-41 of June 10, 1996, relating to waste and the control of its management and disposal.
- Law 97-37 of June 2, 1997, setting the rules organizing the transport of dangerous materials by road in order to avoid risks and damages likely to affect people, properties and the environment
- Decree 2000-2339, setting the list and classification of hazardous waste
- Decree 2005-3079 of November 29, 2005, establishing the list of hazardous materials that must be transported by road under the control and with the accompaniment of safety units.
- Decree of 23/03/2006: establishing a unit for the treatment of hazardous waste and reception, storage and transfer centers.
- Order of 17/01/2007: relating to the approval of the specifications setting the conditions and methods of exercise of the activities of collection, transport, storage, treatment, recycling and recovery of a not dangerous waste

#### Prevention of noise pollution

- Order of the President of the Municipality Mayor of Tunis of 22/08/2000 fixes the authorised noise limit values within the municipal perimeter of Tunis.
- Highway Code setting out the provisions relating to motor vehicles
- Decree 84-1556 of 29 December 1984, regulating industrial estates. Under the terms of Article 26 of this decree, the daytime noise level generated by a company must not exceed 50 decibels, measured at the front of the houses closest to the activity zone.
- Order of the Minister of Social Affairs and the Minister of Health of 29 March 2018 amending and supplementing the order of 10 January 1995 establishing the list of occupational diseases.

#### Protection of agricultural land

- Law 83-87 on the protection of agricultural land aims to protect agricultural land from urbanization and sets out the terms and authorizations required for the change of the status of agricultural land.
- Law No. 2019-47 of 29 May 2019, on improving the investment climate.
- According to Article 11 bis, the realisation of electricity production projects from renewable energies does not require the change of vocation of agricultural land.
- Law 95-70 of July 17, 1995 on the conservation of water and soil.

- Law 2001-119 of 6 December 2001: prohibiting the felling and uprooting of olive trees, unless authorised by the territorially competent governor, within two months of the date of submission of the request.

#### **Protection of cultural resources**

- The National Heritage Code (Law 94-35 of 24 February 1994)

#### **(ii) International conventions and agreements**

In addition, Tunisia has ratified more than 60 international conventions and agreements concerning environmental protection. It has developed information systems as part of the implementation of the three RIO conventions to facilitate reporting to various organizations, including: (i) the information system developed as part of the implementation of the Convention on Biological Diversity; and (ii) the information system on the Clean Development Mechanism.

#### **(iii) International Standards**

The project will solicit funding from International Financial Institutions (IFIs), which will include primarily the International Finance Corporation (IFC) and the African Development Bank (AfDB). As such, the ESIA is based on the IFC's Performance Standards (PS) for environmental and social sustainability (2012) and the AfDB's Integrated Safeguard System (ISS),

#### **(iv) Roles and responsibilities of the actors in the implementation of the ESMP**

The Project Management Unit is set up by the promoter and will be responsible for monitoring the implementation of the ESMP, the PARA and the preparation of periodic reports for the donors (IFC and AfDB).

The PMU should have within it an environmental safeguard specialist, a social safeguard specialist and a community liaison officer.

The Promoter has defined roles and responsibilities for the environmental and social management of the human resources involved in the implementation of the project, including contractors and other persons working on behalf of the company, in all phases of the project implementation (see E&S team organization chart).

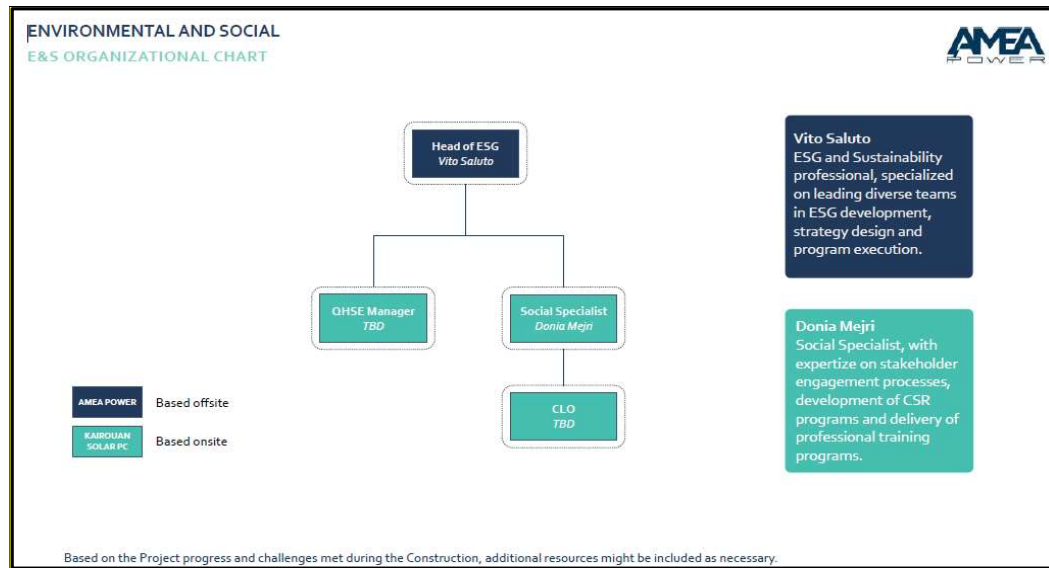


Figure C Organizational chart of the E&S team

The responsibility for the implementation of the Environmental and Social Management Plan (ESMP) will be organized and chaired by the Project Promoter who will be accountable to the Donors even if some measures are delegated to the EPC contractor during the construction phase and by the Project operator during the operation phase reinforced by the Promoter's E&S team.

The implementation and monitoring of environmental and social measures will be done in accordance with the ESMP, which is the project's reference for environmental and social safeguards. They will be relayed by the monitoring and control missions of the works acting as external control.

Periodic monitoring will be carried out by the Promoter's E&S safeguards specialists and the Regional Environmental Directorate or ANPE (if applicable) as external control.

The inspection and monitoring must include the following elements :

- Daily HSE inspection and monitoring of the site and preparation of a daily observation report indicating corrective actions on observed safety deficiencies, unsafe acts and conditions.
- Weekly site inspections to be carried out using the weekly site inspection checklist template, based on the ESMP and ESMS requirements.
- HSE audits to be conducted monthly during the construction phase and quarterly during the operation phase.

A general description of the entities responsible for the implementation of the ESMP and their respective roles and responsibilities is given in the following table:

**Table 1 - General description of the entities responsible for the implementation of the ESMP**

Entity	Responsibilities
<b>Project Manager</b>	<ul style="list-style-type: none"> <li>• He is the person who organizes and conducts the various phases of the project, for which he assumes full management responsibility.</li> <li>• The project manager is involved in both the upstream and downstream phases of the project, i.e. from the development to the evaluation of the results of the managed project. He is often in meetings and is always up to date with the latest trends in his field.</li> <li>• His main tasks consist of organizing and leading the project from start to finish, supervising the various phases, from the drafting of functional and technical specifications to the user acceptance test or even the launch of the project, as well as following up with the client.</li> <li>• As part of this monitoring, he will be required to check the quality of the work carried out by the project team and to ensure that deadlines and costs are met. He communicates a report to his hierarchy as well as to the client. His objective is to complete the project on time, within budget and to meet expectations.</li> <li>• He is responsible for ensuring the implementation of the ESMP and ARAP, all other E&amp;S instruments prepared for the project, commitments in the loan agreement, national regulations and ensuring that contractors and sub-contractors do the same.</li> </ul>
<b>Site Manager</b>	<ul style="list-style-type: none"> <li>• The site manager is responsible for the reception, supervision, and maintenance of a site. With his teams, which he coordinates, he organizes technical interventions. He may also provide technical advice to the management in order to propose the implementation of modifications that he deems necessary.</li> </ul>
<b>Social Specialist</b>	<ul style="list-style-type: none"> <li>• The Social Specialist will lead and coordinate the planning, development, and implementation of social policies for projects initiated by the Promoter (AMEA Power) and the assessment and effective management of social risks related to project activities. This includes reviewing social safeguard frameworks and plans in collaboration with relevant government agencies and local beneficiary groups, processing compensation, monitoring ESMP and PARA implementation, and monitoring the project's compliance with safeguard policies throughout the project duration.</li> <li>• The Social Specialist will ensure compliance with the project's social risk and impact assessment in collaboration with the Environmental Specialist, in accordance with the requirements of the relevant donor policies (AfDB and IFC) and national or, failing that, international texts, and in particular the implementation of the ESMP and RAP, all other E&amp;S instruments prepared in the framework of this project, the commitments in the loan agreement, national regulations and ensure that contractors and sub-contractors do the same thing It is responsible for :             <ul style="list-style-type: none"> <li>• Monitor and audit social compliance throughout the project.</li> <li>• Analyze, monitor and manage the expected and unexpected social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects).</li> <li>• Carry out labor accommodation inspections and social audits.</li> <li>• Ensure proper implementation of grievance mechanisms at project level.</li> <li>• Engage, as appropriate, with civil society organizations and non-governmental organizations on social issues.</li> </ul> </li> </ul>

Entity	Responsibilities
	<ul style="list-style-type: none"> <li>• Support and implement social development (CSR) activities and sustainable development initiatives in line with company and project specific strategies.</li> <li>• With the Environmental Specialist, prepare and submit quarterly monitoring reports on the implementation of ESMP, PARA and other E&amp;S instruments to the AfDB.</li> <li>• With the Environmental Specialist, coordinate the preparation of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>Environmental specialist</b>	<ul style="list-style-type: none"> <li>• The Environmental Specialist will lead and coordinate the planning, development and implementation of environmental policies for projects initiated by the Promoter (AMEA Power) and the assessment and effective management of environmental risks associated with project activities.</li> <li>• The Environmental Specialist will ensure compliance with the environmental risk and impact assessment, in accordance with the requirements of the relevant donor policies (AfDB and IFC) and national or, failing that, international instruments, including the implementation of the ESMP and the RAP, all other E&amp;S instruments prepared under this project, commitments in the loan agreement, national regulations and ensure that contractors and sub-contractors do the same.</li> <li>• With the Social Specialist, prepare and submit quarterly monitoring reports on the implementation of the ESMP, ARAP and other E&amp;S instruments to the AfDB.</li> <li>• With the Social Specialist, coordinate the preparation of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>Community Liaison Officer (CLO)</b>	<ul style="list-style-type: none"> <li>• For PARA, the Community Liaison Officer ensures continuous communication and outreach with local communities to provide updates on the project and its progress through information channels such as public consultation, direct contact with the community via the CLO or the Promoter's local representative.</li> <li>• Assist in publicizing the grievance mechanism, and facilitate the registration, investigation and resolution of grievances.</li> <li>• Provide ongoing assistance in the implementation of the PARA</li> <li>• Report on the progress of the implementation of the PARA</li> <li>• Provide any other assistance that may be required for the successful implementation of the project where relevant and appropriate.</li> <li>• Together with the E&amp;S specialists, contribute to the preparation of the quarterly monitoring reports on the implementation of the ESMP, PARA and other E&amp;S instruments to the AfDB.</li> <li>• With the E&amp;S specialists, contribute to the supervision of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>QHSE Manager</b>	<ul style="list-style-type: none"> <li>• Monitor and audit QHSE compliance throughout the site.</li> <li>• Carry out on-site HSE inspections and audits.</li> <li>• Identify hazards, carry out risk assessments and ensure that subsequent corrective actions are implemented</li> </ul>

Entity	Responsibilities
<b>Contractor EPC</b>	<ul style="list-style-type: none"> <li>• The EPC Contractor will be required to assign a suitably qualified full-time Site HSE Manager and a Social Specialist, both of whom will be responsible for the following</li> <li>• Overall responsibility for the development and implementation of the EPC contractors' HSSE management system requirements</li> <li>• Ensures the availability of resources to properly implement HSSE plans and requirements</li> <li>• Provide HSSE reporting requirements, where applicable</li> <li>• Provide HSSE training requirements, if applicable Undertake HSSE inspection and monitoring requirements, if applicable</li> <li>• Organise and participate in HSSE meetings</li> <li>• HSSE incident reporting</li> <li>• Ensure that all subcontractors appoint sufficient HSE officers for the overall implementation of HSSE plans and requirements, where applicable.</li> <li>• The HSE Manager should be assisted by 2-3 (depending on the construction schedule) full-time, suitably qualified HSE Officers on site.</li> <li>• Prior to the commencement of any site work, for each of the key site HSSE personnel as indicated above, the EPC Contractor shall submit the following to the Developer for approval:                         <ul style="list-style-type: none"> <li>• Curriculum Vitae (CV)</li> <li>• Certificate of Competence</li> <li>• Letter of appointment</li> </ul> </li> <li>• The Developer will review the submitted documents and may interview the candidates to determine their suitability for the intended roles.</li> </ul>
<b>The Service Providers</b>	<ul style="list-style-type: none"> <li>• Responsible for taking into account environmental, social, health and safety and gender mainstreaming aspects in the design and implementation of their services in accordance with ISS and PS requirements.</li> </ul>
<b>The NGOs</b>	<ul style="list-style-type: none"> <li>• Environmental, social and development NGOs should play a role in raising awareness among affected people and local communities</li> </ul>

## 5. Environmental, Ecology and Social Baseline

### *(i) Physical environment*

The Project Site is located in the North-East of the governorate of Kairouan, in central-eastern Tunisia, which is part of the eastern termination of the central Atlas, falling within the natural domain of the low steppes that links the Sahel and the high steppes of Tunisia. The Solar Plant will be constructed on 200 ha leased land belonging to the private domain of the Tunisian State.

The Project site is a large and a flat area - hence the name - with no particular geomorphology. It is an area of saline depression, with a general gentle slope to the south and east. On a larger scale, the project area is mainly surrounded by the mountain range to the west and north and the eastern plains of the Governorate at an altitude of 100m. The general appearance of the landscape is illustrated below.



**Figure C** General Topography and Landscape of the Project Site

- The Project Site is located within recent alluvium compositions which include substratum dating from the Quaternary period, covered by deep heavy soil. The type of soil within the Site causes a limited deep development of plant roots, making it unsuitable for agricultural activities. The project site is neither a wetland nor a Sabkha.
- The project area is part of the Sisseb-El Alem basin which is affected by anomalies close to the eastern and northern trend. The distance to the main anomalies is however sufficiently large. Thus, from this point of view, no seismic risk is to be expected.

- The germination of plants at the Site is strongly limited by the clay-silt texture with a layer of hardpan formed on the surface.
- The hydrographic network of the Site consists of three temporary streams with endorheic flow towards Sebkhet Kelbia:
  - Wadi Boushkima, 15 km long, crosses the Project Site from north to south;
  - Wadi Dalloussi, 17 km long, is located further west of Wadi Boushkima;
  - Wadi Boughal, 15 km long, intercepts the Boushkima and Dalloussi wadis and flows into Sebkhet Kelbia.
- During the first quarter of 2021, important agricultural and hydraulic projects were carried out upstream of the Power Plant Site. Considering the area affected (400 ha) and the dikes built, these changes will significantly modify the flow regime within the project area.
- The Project Area is part of the Sisseb-El Alem plain north of the Kairouan Plain. The groundwater resources of this plain consist of the phreatic groundwater and the deep groundwater of Sisseb – El Alem.
- The Kairouan region belongs to the upper arid bioclimatic stage with a temperate winter.
- Average annual temperatures in the study area are around 21.1°C with variations of 7 to 9°C depending on the season.
- The monthly average GHI (Global Solar Radiation) between 2010 and 2019 ranges from 76.5 kWh/m<sup>2</sup> for the month of December to 229.3 kWh/m<sup>2</sup> in July, with an annual average of 1,793 kWh/m<sup>2</sup> per year.
- The average annual rainfall recorded in the study area over the last few years (2010 - 2019) is 298.7 mm.
- Relative humidity in the study area varies from 43% to 64% (2010-2019).
- The prevailing winds are from the North and Southwest sectors.

***(ii) Biological Environment***

- To evaluate the biological baseline, field surveys were performed on September 4th, 2020, and April 9th, 2021. For this, a biologist, a bird expert, and an insect specialist analyzed the prevalent species as well as their status of conservation, evaluated their habitats, and identified any other areas of special significance as well as any relevant environmental features.
- None of the main plant species identified within the Project Site and its surroundings are considered rare or endangered and all the species are considered common to their

habitats.

- The results of a desktop research revealed three wetlands of national and international importance for the reception and conservation of birds within a radius of 10 km from the site, namely: plains of Kairouan (5.4 km distance), Sebkheth Kelbia (5 km distance) and Metbasta (1 km distance).
- The project site is of hydro-halomorphic character and is, due to the proximity of the road linking Sbikha to Kairouan, grazing, the activity of the Metbasta Industrial Zone, etc., an unsuitable biotope for diversified wildlife.
- Most of the animal species identified in the literature review are of minor concern, except for the Greek tortoise, the Southern Grey Shrike, as well as the species *Gomphus lucasii*, which are classified as vulnerable species according to the IUCN (International Union for Conservation of Nature) are on the red list of endangered species.
- There are no protected natural areas in the Power Plant Site. The Jbel Zaghdoud National Park and Sebkheth Kelbia Nature Reserve are in the extended study area about 30 km and, respectively, 5 km away from the Site.

***(iii) Socio-Economic Conditions***

- According to the INS estimate, the population of the Sbikha delegation was 74,464 inhabitants in 2018.
- The rate of unemployment in Sbikha is lower than the average of the governorate but higher than the national average. Females are significantly more affected by unemployment than males. It affects mainly the youth, especially young women. Graduates also face a high unemployment rate, in particular young female graduates.
- The main sectors of the local economy are agriculture, construction and public works, and education, health, and administrative services.
- The Governorate of Kairouan is ranked as the third poorest governorate in Tunisia. It is characterized by subsistence agriculture, a dominant rural environment, a weakness of basic infrastructure, a high unemployment rate, a high illiteracy rate, a very low level of education of the population, a significant rural exodus and a high school drop-out rate. The delegation of Sbikha is ranked second nationally in terms of school dropout.

***(iv) Land Use***

- The land allocated for the development project is in the private domain of the State. A land lease agreement was signed on 22 June 2021 between the Government and the Developer.
- No agricultural activities have been observed on the site of the solar power plant, except for extensive pastoralism which concerns the whole area. The livestock observed is mainly composed of sheep and goats, but the presence of dromedary faeces in the neighbourhood of the solar power plant site (Metbasta grazing area) indicates the potential presence of camels.
- Apart from a strip of annual vegetation along the Sbikha-Kairouan road, which is only of pastoral interest for short periods of the year, the rest of the vegetation is dominated by woody species of little interest to livestock.
- Consultations showed other minor land uses, including hunting and timber collection. However, these activities are generally undertaken on open land, including the wider project site area.
- Based on the community consultations, no specific objections or concerns were raised regarding land use and pastoral activities specifically on the solar plant site.

***(v) Archeology and Cultural Heritage***

- Based on literature review, as well as an onsite survey, no archaeological or heritage site were identified, except for the ancient French colonial farm located at 6 km northwest of the Project Site at the El-Alem agricultural estate. It is most likely a farm which belonged to the “Société des Fermes Françaises de Tunisie”. Such findings are considered not important and common and do not affect the Project development.
- Some findings like African sigillata ceramics, ceramic sherds, or traces of walls and scattered fragments of a colonial construction were identified on the Site but are considered not important and common.

***(vi) Infrastructure and Utilities***

- A Site visit, as well as a desktop review, were performed to review the infrastructure and utility elements onsite, especially regarding water supply, wastewater, solid waste, hazardous waste facilities, and road networks.
- The key infrastructure in vicinity to the Project Site includes a road (20 m distance to the boundary of the Site), a STEG 30 kV OHTL and a gas pipeline (south of the site).

- There are six wastewater treatment plants in the Governorate of Kairouan, the closest one to the Project Site is Kairouan (10 km southeast). The Sbikha plant, which is located 15 km north-east of the power station, is equipped with a tertiary urban wastewater treatment plant with a nominal capacity of 1,200 m<sup>3</sup>/day. Currently, it treats 700 m<sup>3</sup>/day of domestic wastewater.
- Solid Municipal Waste generated by the Project will be disposed to El Baten controlled landfill for household and construction waste.
- Hazardous and special waste is managed by companies authorized by the Ministry of the Environment (ME) (the list of companies authorized for hazardous waste management is available on the ANGED website). If necessary, an area will be designated for the temporary storage of hazardous waste on site.
- The Project Area is located west of the national road RN2. The road traffic on the RN2 and the RR-171 is respectively estimated at 10,886 and 2,964 vehicles per day, including heavy goods vehicles (DGPC, 2017).

## 6. Environmental and Social Impact

Such a solar energy project will have important and crucial positive impacts on the environment and the economy at the strategic and national level, given the current challenges facing the energy sector in Tunisia, which have serious implications for Tunisia's energy security. These positive impacts which are important to highlight, consider and take into account can be translated as follows

- Contribute to sustainable development by demonstrating the Tunisian government's commitment to its energy strategy and to achieving the targets set for renewable energy sources.
- Increase energy autonomy by relying on an indigenous, inexhaustible and largely import-independent energy resource. The solar power plant's electricity production is estimated at 230 GWh per year, which will meet the annual electricity needs of over 43,000 local households.
- Reduce the consumption of natural gas used in thermal power plants for electricity generation and reduce greenhouse gas emissions and air pollutants - the project is expected to offset more than 117,000 metric tons of CO<sub>2</sub> per year;
- Improved socio-economic conditions by providing employment and service opportunities.

With the exception of risks to community health and safety - road transport, the Project will not result in major adverse environmental and social impacts.

The ESIA considers that these impacts are generally minor in nature, benign and controllable and can be adequately mitigated as detailed below.

Potential impacts mainly concern the following receptors:

- ✓ Dust generation and noise resulting from construction activities.
- ✓ For the area as a whole (PV plant and OHTL) and the surrounding classified site (IBA/Ramsar) and given the environmental impact, whilst impacts on reptiles and invertebrates are considered extremely unlikely, potential impacts on bird communities need to be considered in more detail:
- ✓ Given the possible presence in the project area of one endangered species (White-headed Duck: *Oxyura leucocephala*) and two vulnerable species (Marbled Teal: *Marmaronetta angustirostris* and Greater Scaup: *Aythya marila*), an assessment of the potential impact of the project on these species is required: *Aythya marila*, a multi-season (spring and autumn) monitoring programme for these species during the construction period is recommended and in case of confirmation of their presence in the project area (PV plant and high voltage overhead power line, a critical habitat analysis will be conducted in accordance with IFC Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources and AfDB Operational Safeguard SO3.
- ✓ Watercourses and wadi systems could lead to potential risks of local flooding, particularly during the rainy season and during flash floods, which in turn could affect project components (leading to damage and destruction of equipment and machinery on site) and could also have impacts on the health and safety of workers on site. A flood protection system is considered in the design of the project according to the flood protection study conducted in June 2022.
- ✓ The influx of workers, trespassing, security personnel, increased traffic and transportation, and occupational health and safety have been considered in establishing a series of organizational, operational and preventive emergency measures, adapted to the circumstances of such situations, which in turn will ensure the health and safety of workers, the community and property on the specific Project site;
- ✓ The risk of labor law violations within the supply chain has been considered by taking all necessary precautions and complying with donor (IFC and AfDB) policies and standards;

- ✓ The project land is used by occasional herders who visit the project site during certain periods of the year with livestock, mainly sheep, goats and camels. The main impact on land use could be the reduction in the area grazed by the herders. Ten (10) herders from Dalloussi and ten (10) herders from Metbasta are identified as using the project site for grazing. The size of the livestock of the identified herders varies from 30 to 400 heads. The number of PAPs is 20 herders. The socio-economic household surveys identified 64 dependents of PAPs who may be dependent on the herders' livestock. This required the preparation and implementation of an Abbreviated Resettlement Action Plan (ARAP). The ARAP cost for the solar power plant is estimated at 450,000 DT (140,000 USD) including the cost of preparing the Community Development Plan which is estimated at 50,000 DT (15,000 USD).
- ✓ Employment and labor management with consideration of gender and vulnerability. Also taking into account the community development plan.
- ✓ Impacts on infrastructure and utilities mainly (i) water resources estimated at 5,500 m<sup>3</sup> during the construction phase and about 115 m<sup>3</sup>/year during the operation phase considering a dry cleaning method (the use of dry cleaning saves about 3,000 m<sup>3</sup>/year), (ii) wastes and discharges, it is to be noted that the management of hazardous wastes (if any) should take into account the availability of the Jeradou centre.
- ✓ the change in drainage flow, water and soil quality, solid waste generation and disposal. The tables below provide a summary of the impacts identified during the construction, operation and decommissioning phases:

**Table2.** - Summary of Impacts during the Construction phase of the solar plant

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct	Long term	Irreversible	Low	low	Minor	Not Significant
Soil and Water Resources	Direct	Short term	Reversible	Low	Low	Not significant	-
Flood risk	Direct	Long term	Reversible	Medium	Low to medium	Moderate	Minor
Air quality	Direct	Short term	Reversible	Low	Medium	Minor	Not Significant
Noise	Direct	Short term	Reversible	Low	Medium	Minor	Not Significant
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Long term	Reversible & Irreversible	High	Medium	Moderate	Minor
Fauna	Direct & indirect	Long term	Reversible & Irreversible	High	Medium	Moderate	Minor
<b>Impacts on social environment</b>							
Land use	Direct	Long term	Irreversible	Low	Low	Not significant	-
Archaeology and cultural heritage	Direct	Short term	Irreversible	Low	Medium	Minor	Not Significant
Trespassing of Unauthorized Personnel	Direct	Short term	Irreversible	High	Low	Minor	Not Significant
Worker Influx	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
Security Personnel	Direct	Short term	Irreversible	Medium	Low	Minor	Not Significant
Occupational Health and Safety	Direct	Short term	Irreversible	High	Low	Minor	Not Significant
Labor violations within supply chain	Direct	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Community health and safety risks - road transport	Direct	Short term	Irreversible	High	High	Major	Minor
National, Local and Regional Economy	Direct & Indirect	Short term	Reversible	Medium	Medium	Minor	-
Employment and management of the workforce	Direct	Short term	Reversible	High	Medium	Moderate	-
Community Development	Direct	Long term	Irreversible	High	Medium	Moderate	-
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Short term	Reversible	Medium	Low	Minor	Not Significant
Waste utilities	Direct	Short term	Reversible & Irreversible	Low	Low	Not significant	-

**Table 3. - Summary of Impacts during the Operation phase of the solar plant**

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct & indirect	Long term	Irreversible	Low	Medium	Minor	Not Significant
Flood Risk	Direct & indirect	Long term	Reversible	Medium	High	Moderate	-
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Long term	Reversible & Irreversible	Medium	Medium	Minor	Not Significant
Fauna	Direct & indirect	Long term	Reversible & Irreversible	Medium	Medium	Minor	Not Significant
<b>Impacts on social environment</b>							
Security Personnel	Direct	Long term	Irreversible	Medium	Low	Minor	Not Significant
Occupational Health and Safety	Direct	Long term	Irreversible	High	Low	Minor	Minor
Labor violations within supply chain	Direct	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Local and Regional Economy	Direct & Indirect	Long term	Reversible	Medium	Low	Minor	-
Local Employment	Direct & Indirect	Long term	Reversible	Medium	Low	Minor	-
Community Development	Direct	Long term	Irreversible	High	Medium	Moderate	-
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Long term	Reversible	Medium	Low	Minor	Not Significant
Waste Management	Direct	Long term	Reversible & Irreversible	Low	Low	Not significant	-

**Table 4. - Summary of Impacts during the Decommissioning phase of the solar plant**

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct	Short term	Reversible	Low	High	Minor	Minor
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Fauna	Direct & indirect	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
<b>Impacts on social environment</b>							
Occupational Health and Safety	Direct	Short term	Irreversible	High	Low	Minor	Minor
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Short term	Reversible	Medium	Low	Minor	Not Significant
Waste utilities	Direct	Short term	Reversible & Irreversible	Low	Low	Not significant	-

## 7. Public consultation

Several consultations were conducted during this phase of ESIA. The key consultations were as follows:

- Main regional and local government entities: Kairouan Governorate, the deputies of Kairouan Governorate at the Assembly of People's Representatives (ARP), the Regional Development Directorate (DDR), the Tunisian Electricity and Gas Company (STEG), the Agency for the Promotion of Industry and Innovation (APII), the Tunisian Union of Agriculture and Fishing (UTAP), the Municipality of Sbikha, the Regional Directorate of State Domains and Land Affairs (DRDEAF), the Regional Commission for Agricultural Development (CRDA).
  - o A public consultation was held on 27/10/2020 to present the Project.
  - o A disclosure meeting was held on 03/03/2022 to present the different results of the ESIA.
- Consultations with local entities, National Agency for Waste Management (ANGed), National Agency for Environmental Protection (ANPE), Tunisian Electricity and Gas Company (STEG), National Water Exploitation And Distribution Company (SONEDE), National Sanitation Office (ONAS), and the Regional Commission for Agricultural Development (CRDA), undertaken during the environmental and social due diligence phase in August and September 2021
- Affected community: land users, representatives of educational and health institutions, including vulnerable groups. A series of consultation was held on October 19, 2020 in five sectors:
  - El Alem sector: 13 men and one woman
  - Sector El Dalloussi: 10 men and 2 women
  - Bir Jdid sector: 7 men
  - Sector El Bechechma: 10 men and 3 women
  - Metbasta Sector: group of men
  - A second round of meetings was conducted with focus groups from the community of Metbasta:
    - Men's group (15 people), consulted on February 04, 2022.
    - Group of young active and non-active graduates (8 people), consulted on February 04, 2022.
    - Women's group (8 people) accessed 06 February 2022.
- NGO and industrial in proximity area.

In general, the main conclusions and observations of the consultation process were as follows  
**Positive expectations from the project:** it was conferred that most people saw the project as a positive development for the communities specifically in terms of employment and contracting opportunities, better infrastructure, and electricity supply.

#### **Restriction on access to the land**

The solar power plant will be built on 200 hectares of land owned by the Tunisian state. This may result in a potential loss of grazing livelihoods.

A total of 7 livestock farmers were met and interviewed in relation to the solar project and the associated HV overhead transmission line. These consultations were conducted in October 2020, 04 February and 20 August 2022.

However, as a result of the land user consultation, it appears that grazing activity is not limited to the project area; it is also undertaken in other sufficient surrounding areas with similar biological characteristics.

### **8. Abbreviated Resettlement Action Plan (ARAP)**

The results of the CRDA survey (May 2022) showed that the number of herders potentially using the solar power plant site and a section of the LEAHT is limited to 20 (10 herders from Dallousi and 10 herders from Metbasta).

The number of PAPs is 20 herders. The socio-economic household surveys identified 64 dependents of the PAPs who may be dependent on the livestock of the herders.

The ARAP cost for the solar plant is estimated at 450,000 DT (140,000 USD) including the cost of preparing the Community Development Plan which is estimated at 50,000 DT (15,000 USD).

The total number of People affected by the Solar Power Plant and the OHTL is 42 PAPs. The overall cost of the ARAP is estimated at **900,000 DT or about 280,000 USD**.

### **9. Grievance Mechanism (GM) at project level**

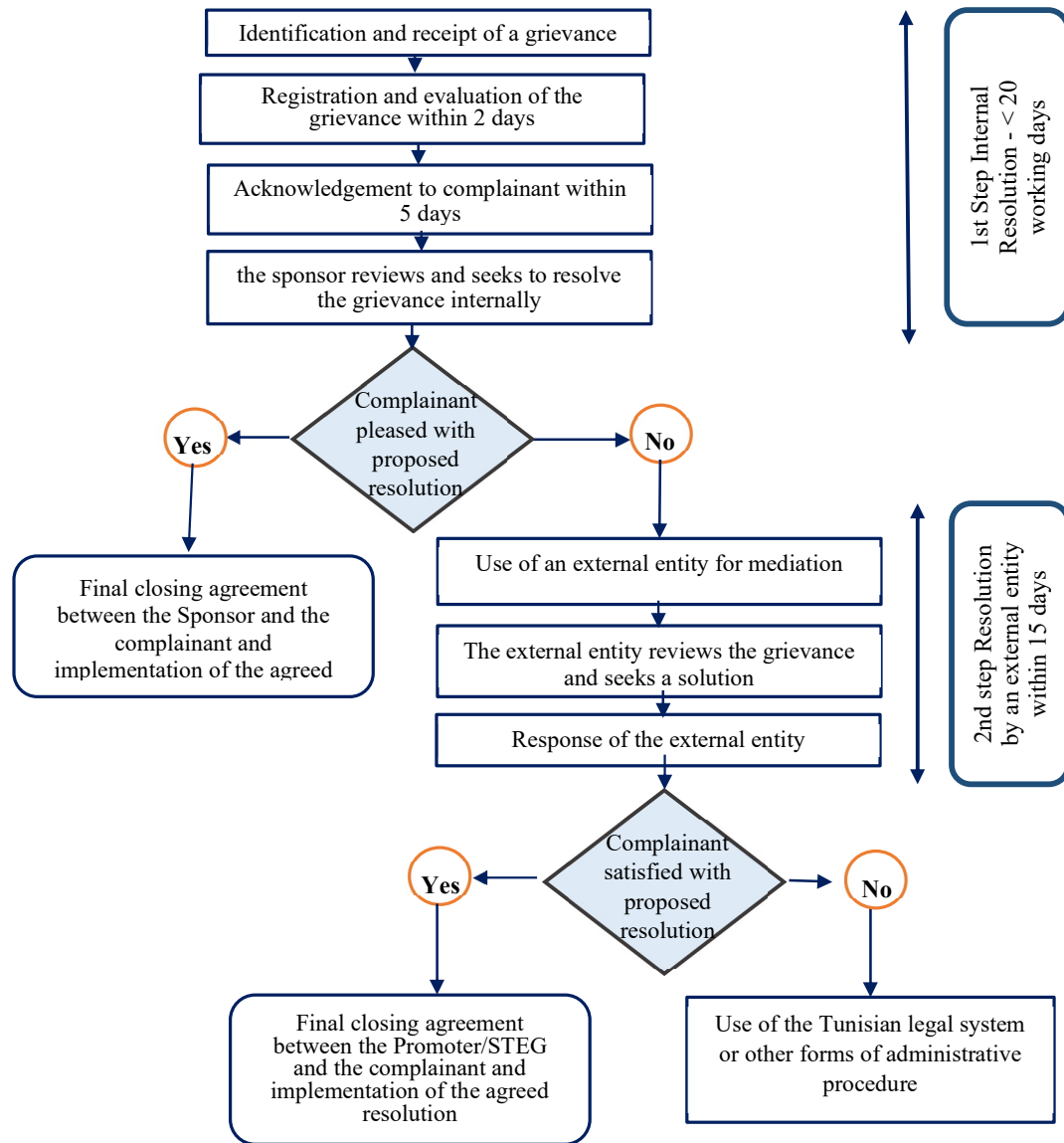
The grievance mechanism aims to resolve problems quickly, using a procedure that is understandable and transparent, culturally appropriate and easily accessible, at no cost and without reprisals to the grieving party. The mechanism has been designed in such a way as not to impede access to future judicial or administrative proceedings and to guarantee the confidentiality of the person or group that has filed the grievance.

Any group/individual can submit a grievance/complaint to the Promoter/STEG. All complaints will be considered and acknowledged as an opportunity for improvement or a recommendation. The cost of the GMP is estimated at 15,000 DT (approximately 5,000 USD)

A complaint can be submitted in one of the following ways :

- Governorate of Kairouan
  - o Address: Avenue de l'Environnement 3100, Kairouan, Tunisia
  - o Phone: (+216) 77 226 777 / Fax: (+216) 77 228 450
  - o E-mail Address: [gouv.gouvkairouan@planet.tn](mailto:gouv.gouvkairouan@planet.tn)
- Municipality of Sbikha
  - o Address: Rue 18 Janvier 1952 Sbikha, Kairouan, Tunisia
  - o Phone: (+216) 77 365 517 / Fax: (+216) 77 365 517
  - o E-mail Address: [contact@commune-sbikha.gov.tn](mailto:contact@commune-sbikha.gov.tn)
- By sending a message through the social manager hired by the Developer to liaise with complaints and all social issues:  
Donia MEJRI: email: [Donia.Mejri@ameapower.com](mailto:Donia.Mejri@ameapower.com);

In case of conflict, amicable resolution through mediation following the methods stipulated below is the preferred method:



Grievance Mechanism Procedure

**10. Environmental and Social Management Plan (ESMP)**

A detailed Environmental and Social Management Plan (ESMP) has been prepared for each phase of the project (construction, operation, decommissioning), including the appropriate identification of :

- Identified management measures that aim to eliminate and/or reduce potential impact to acceptable levels. Management measures include mitigation actions, additional requirements, further studies;
- Monitoring actions to ensure that the identified mitigation measures are implemented - monitoring actions include inspections, review of reports/plans, reports, etc;
- The frequency of implementation of monitoring actions, which may be continuous

throughout the construction/operation period (depending on the identified mitigation measure, this may be daily, weekly or monthly), or punctual - when a certain problem occurs;

- The parameters and location of monitoring actions, as identified and applicable
- The entity responsible for implementing the identified mitigation measures and monitoring actions.
- The entity responsible for implementing the identified mitigation and monitoring actions (EPC contractor, project operator);
- The cost associated with each identified action.

**Table 5 - ESMP for the Planning and construction phase**

Designation	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (TND)
General		Prepare and submit a site ESMP or ESMP-E to the donors (IFC/AfDB) for validation before the installation of sites and the start of any work.	Additional requirements	Submitting a plan	Once, before construction commences	EPC Contractor	20,000
		HSE Manual (in agreement with the Sponsor) to include: (i) HSE policy; (ii) human resources policy and procedures; (iii) organizational structure and HSE responsibilities; (iv) HSE training, monitoring and reporting plan	Additional requirements	Submitting a plan	Once, before construction commences	EPC Contractor	20,000
		Undertake in writing to scrupulously respect this commitment and submit to the donors (IFC/AfDB) a description of the procedures it will put in place to achieve this in collaboration with the EPC Contractor	Additional requirements	Submitting a plan	Once, before construction commences	Developer	-
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the construction site is left in an orderly state at the end of each work day, (ii) proper handling of waste streams, (iii) ensure all areas are fully restored after they have been used for construction works, (v) ensure that all artificial lights adopt a down-lighting strategy so that artificial lights will not escape outside the project site.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
Land Use	The project will reduce grazing lands available for pastoralists	Undertake consultations with such land users prior to commencement of any construction activities to inform them about the project schedule, construction of the boundary fence, construction activities to be undertaken, expected impacts, and emphasize that grazing can be undertaken in surrounding areas Prepare and implement the Abbreviated Resettlement Action Plan (including compensation measures).	Additional Requirement	Submission of plan	Once, before construction commences	Developer	-
	Risk of soil and groundwater contamination during the	Ensure spill kits are available at specific locations on site including the refueling area.	Mitigation	Inspection	Continuous	EPC Contractor	10,000

<b>Geology, Hydrology and Hydrogeology</b>	various construction activities from leaks and spills from the use of construction machinery, and from refueling activities, as well as discharge of wastewater from the worker accommodation camp. In addition, the use of construction machinery will degrade soils and modify local drainage flows through a combination of compaction, physical disturbance, creating trenches along tire tracks, and from excavations and stockpiling material. This could result in the turbidity of nearby surface water receptors.	The base camp and construction site shall be located at more than 100 meters from the closest stream to reduce risk of direct pollution from sanitation facility, the few hazardous materials storage, and the concrete area.	Mitigation	Inspection	Continuous	EPC Contractor	-
		A dedicated refueling area will be used and fitted with an impermeable surface, boundary sumps to catch any localized spills before they are able to escape into the environment. This area will also be protected from rainwater.	Mitigation	Inspection	Continuous	EPC Contractor	10,000
		Prohibit off-road driving of construction machinery	Mitigation	Inspection	Continuous	EPC Contractor	-
		Ensure regular maintenance of machinery, to decrease the risk of accidental pollution.	Mitigation	Inspection	Continuous	EPC Contractor	15,000
		The first 20-30 cm of soil should be excavated and stored for later reuse to preserve the arable layer during excavation works. This soil will be stored apart on a dedicated area, in 1-2 m high, non-compacted windrows to maintain the quality of the soil. Arable soil will be reused for the restoration and rehabilitation.	Mitigation	Inspection	Continuous	EPC Contractor	50,000
		Risk of local flood hazards especially during rainy seasons and flash flood events due to the presence of three wadi systems	Undertake a flood risk assessment that should identify engineering measures will be identified to eliminate such risks and which are to be implemented as part of the detailed design. It is recommended to perform a climate change risk assessment over the project area and implement flood scenario to predict and quantify future flood risk changes. Projected flood hazard (extent and water level rise) in addition to potential affected areas can be modeled under current and for future these scenarios.	Additional Study	Submit Flood Risk Assessment	Once before construction commences	EPC Contractor
<b>Biodiversity</b>	Construction activities to include land clearing, circulation of construction vehicles, construction of	Undertake an additional species inventory during the wet season to verify the absence of protected flora that might present around Boushkima water course and temporary stream in the south.	Additional Study	Submit Species Inventory	Once, before construction commences	EPC Contractor	10,000

roads could disturb existing habitats (flora, fauna, avifauna) and any species which might be present within the Project site.	Undertake an additional species inventory during the wet season to detect birds and amphibians in order to avoid sensitive areas or species, propose additional mitigation measures and to better understand fauna circulation on site and usage of Boushkima water course and wet area by local fauna (amphibians, birds, and mammals). Prepare a Critical Habitat Assessment Study (CHA).	Additional Study	Submit Species Inventory	Once, before construction commences	EPC Contractor	10,000
	Carry out clearing works and earthworks during the dry period (July - September) in order to limit the impact on biodiversity (bird nesting period extending from mid-March to mid-July) and manage flooding risk as much as possible.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	In order, not to introduce invasive plant species during the works, it is recommended to clean the machines before their arrival on the site. Quality controls of materials brought to the site will also be carried out.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	Mark out and fence of the construction activities.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
	Plan site preparation and construction to cause the least impacts to vegetation ground cover & cause the least disruption to topsoil.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Make gaps designed into fencing to allow fauna to pass.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	Select wildlife-friendly design for infrastructures, e.g., elevated fencing to allow small mammals movements, properly designed drainage channels to avoid animals being trapped inside.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Plan infrastructures layout avoiding natural habitat features as much as possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Limit vehicle movements to only be on designated paved/unpaved roads to reduce impacts to surrounding natural vegetation.	Mitigation	Inspection	Continuous	EPC Contractor	-

	Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Ensure appropriate management of pollution risks to prevent any impact of wildlife and in particular batrachian.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	Hire an ecologist to monitor environmental measures during the construction phase for clearing and earthwork	Mitigation	Inspection	Continuous	EPC Contractor	30,000
	Restoration and revegetation (ecological restoration) of temporary use areas and lay down areas and areas distributed during construction of the PV Array as soon as reasonably practicable after construction activities are complete. Restoration method design will be done by a competent specialist;	Mitigation	Inspection	Continuous	EPC Contractor	30,000
	Restoration of the natural habitats that will be disturbed during the development of the PV array to meet the NNL aim;	Mitigation	Inspection	Continuous	EPC Contractor	50,000
	The natural habitat temporary pond area for <i>Gomphus lucasii</i> will be protected as far as possible. The sensitivity of this area will be communicated to all workers on site. No vehicle activity will be permitted in this area. Restoration of vegetation will occur immediately, should vegetation be damaged in this area;	Mitigation	Inspection	Continuous	EPC Contractor	-
	It is recommended that eco-design features are incorporated to provide temporary wetlands within the boundary ditches as habitat for <i>Gomphus lucasii</i> .	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	The dike will be constructed to replicate a natural stream channel, allowing for areas of ponding and with banks of varying gradients.	Mitigation	Inspection	Continuous	EPC Contractor	10,000

<b>Archaeology</b>	Construction activities could damage/disturb potential archaeological remains, as well as potential archaeological remains which could be buried in the ground (if any).	Implement chance find procedures for potential unearthing of any archaeological sites during construction. This includes that construction activities be halted, and the area fenced, while immediately notifying the National Heritage Institute and follow the applicable procedures. No additional work will be allowed before the Institute assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found.	Mitigation	Inspection/ report Submission to National Heritage Institute	Upon Occurrence	EPC Contractor	5,000
<b>Infrastructure and Utilities</b>	Water requirements – water requirements of the Project could entail constraints on existing users.	Prepare a water management plan	Additional Requirement	Submit proof for coordination with authorities	Once, before construction commences	EPC Contractor	2,000
		Document water consumption of the Project		Submit monthly report	Continuous	EPC Contractor	2,000
		Minimization by abatement controls, involving acting for water conservation and wastewater management measures (e.g., water recycling facility).	Mitigation	Inspection	Each quarter	EPC Contractor	15,000
	Waste utilities – it is important to ensure that existing utilities would be able to handle the amount solid waste, wastewater, and hazardous waste	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.	Additional Requirement	Submit proof of coordination with authorities	Once, before construction commences	EPC Contractor	2,000
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if any.	Additional Requirement	Submit proof of coordination with authorities	Once, before construction commences	EPC Contractor	50,000
Final disposal will be checked for compliance with IFC/AfDB and GIIP standards.		Mitigation	Inspection	Continuous	EPC Contractor	5,000	
	Develop a waste management plan which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal. and provide measures for the temporary management of hazardous	Additional Study	Submit Waste Management Plan	Once, before construction commences	EPC Contractor	10,000	

		waste during the temporary closure of the Jeradou centre.					
		Provide adequate sanitary facilities, i.e. toilets and showers for the construction workforce;	Mitigation	Inspection	Each quarter	EPC Contractor	Included in project cost
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Sbikha, or other location.	Mitigation	Inspection	Each quarter	EPC Contractor	5,000
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the final destination of waste. A detailed register will be held to record and document all waste streams.	Mitigation	Review chain of custody records/register to ensure consistency	Each quarter	Project Operator	2,000
<b>Air Quality and Noise</b>	Construction activities will likely result in an increased level of dust and particulate matter emissions which in turn will directly impact ambient air quality.	Minimize the storage of spoil and other of fine material.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Apply basic dust control and suppression measures which could include regular watering of roads, and proper planning of dust causing activities.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Regular inspection and covering of stockpiles and excavated material if this material cannot be readily used elsewhere.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Proper covering of trucks transporting aggregates and fine materials.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Adhering to a speed limit of 15-20km/h for trucks on the construction site.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit the idling of vehicles so that fuel usage and air emissions are minimized to the greatest extent possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit solid waste burning on site.	Mitigation	Inspection	Continuous	EPC Contractor	-

		Develop a regular fit-to-work inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant emissions, before being allowed to be deployed/used on site.	Mitigation	Inspection	Continuous	EPC Contractor	2,000
		Optimization of the itineraries to reduce the number of vehicles for the transport of personnel and materials.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Inform the nearby industrial plant about the start date of construction works and the potential generation of air and dust emissions. This shall include details of the Project's grievance mechanism.	Additional Study	Stakeholder Engagement Plan	Continuous	EPC Contractor	-
		assessment of the initial air quality status	Recommendation	Inspection	Once before construction	EPC Contractor	5,000
	Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers and compressors and other activities.	Only well-maintained equipment should be operated on-site to avoid the generation of unnecessary sources of noise.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Adhering to a speed limit of 15-20km/h for trucks on the construction site.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit the idling of vehicles to the greatest extent possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Optimization of the itineraries to reduce the number of vehicles for the transport of personnel and materials.	Mitigation	Inspection	Continuous	EPC Contractor	-
		No work shall be carried out at night to avoid important disturbance for the surroundings communities. Equipment generating high noise levels (pile driving, blasting, hydraulic hammer, earthwork and grading) will only be used between 8AM and 6PM.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Inform the nearby industrial plant about the start date of construction works and the potential impacts on Noise. This shall include details of the Project's grievance mechanism.	Additional Study	Stakeholder Engagement Plan	Continuous	EPC Contractor	-
<b>Socio-economic</b>	The Project will positively influence the regional and national economy during	It is recommended that the EPC Contractor adopt and implement a Local Content Policy that seeks to procure goods and services from SMEs based in	Recommendation	Submission of Policy	Once, before construction commences	EPC Contractor (under	15,000

	construction from the direct procurement and supply of materials and services from companies based in the governorate of Kairouan and elsewhere in Tunisia.	Kairouan to enhance the economic impacts that will result from the Project development on the Governorate level. The Plan should be developed under the supervision of the Developer.				supervision of the Developer)	
	The Project is expected to provide job opportunities for local communities. This could contribute to enhancing the living environment for its inhabitants and bring social economic prosperity to the local community including vulnerable groups such as women.	It is recommended that the EPC Contractor adopt and implement a Construction Local Employment Plan for working with the local community members during the construction phase. The plan must aim to support the local community stating its aims and objectives and should acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program. The plan must be developed under supervision of the Developer.	Recommendation	Submission of Plan	Once, before construction commences	EPC Contractor (under supervision of the Developer)	15,000
	The project will provide a range of benefits for local communities in the vicinity of the Project.	The project company will develop and implement a voluntary Community Development Plan (CDP).	Recommendation	Submission of Plan	Once, before construction commences	Developer	30,000
<b>Occupational Health and Safety</b>	There will be some generic risks to workers health and safety form working on construction sites, as it increases the risk of injury or death due to accidents.	Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	15,000
		An HSE management and performance report on the ongoing work at the project site shall be submitted monthly and quarterly. Each report shall be submitted by the 5th of the month following the end of the relevant quarter and shall contain the following data in accordance with the project's corporate HSE monitoring and reporting procedures: Summary of accidents/incidents during the past month; Summary of daily and cumulative work hours; Lost time due to accidents/incidents; First aid data; Near misses/hazardous conditions reported; Emergency drills conducted; Number of training hours, including	Additional requirements	Inspection	Each month and each quarter	EPC Contractor	15,000

		toolbox training; Safety audit and meeting information; Waste collected and disposed of; Water consumption; Electricity consumption; Fuel consumption; Environmental monitoring data					
		Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency. The gas pipeline shall be considered in the Emergency Preparedness and Response Plan in coordination with STEG and relevant authorities.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	15,000
<b>Potential labor violations within supply chain of photovoltaic solar panels (Child labor / forced labor / modern slavery)</b>	The use of a supply chain introduces the potential for labour violations to occur. (Child labor / forced labor / modern slavery in the solar photovoltaic supply chain).	Take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the construction of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) that categorically prohibit and ban (i) child labor or abusive employment of vulnerable persons and (ii) the practice of forced labor, human trafficking, and modern slavery. Use the AfDB's Risk Self-Assessment Form	Additional Study	Inspection	Before construction phase Continuous	Developer / EPC contractor	15,000
<b>Community Health and Safety</b>	Trespassing of unauthorized personnel into the Project site could result in potential risk from several hazards.	Install a fence around the project boundary to restrict public access to the site.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
		Security guards will be used to prevent unauthorized access.	Mitigation	Inspection	Continuous	EPC Contractor	50,000
		Ensure fences have warning signs (in Arabic and English) to deter people from entering the site.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
	Influx of Project workers could result in certain community health, safety, and security impacts such as risk diseases, inappropriate	Prepare and implement a worker accommodation plan in accordance with the applicable content of the IFC/EBRD publication entitled: "Workers' accommodation: processes and standards - A guidance note (2010).	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000

Code of Conduct, increase in social vices, etc.	prepare a worker accommodation plan, which should provide details of the accommodation needs of the workforce, including location, facilities, transport needs, etc	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	5,000
	Prepare and implement a worker influx plan.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	5,000
Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events.	Prepare security management plan which must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000
The use of transport vehicles could introduce significant community health and safety risks	Prepare and implement a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000
Training and awareness						50,000
<b>Cost of the ESMP construction phase in Tunisian Dinars</b>						<b>785,000</b>
<b>Cost of construction phase ESMP equivalent in dollars</b>						<b>245,000</b>

**Table 6.** Environmental and Social Management Plan (ESMP) for the operational phase

Designation	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (TND)
Biodiversity	Disturbance of existing habitats (flora, fauna, avifauna) which might be present within the Project site. In addition, other impacts could be from improper management of the site (e.g. the use of pesticides).	Implement and undertake a bird mortality program during the operation phase that includes a bird fatality search survey. Use of the increasing fragmentation of polarizing surfaces within PV panels by a white grid to reduce their attractiveness to polarotactic insects.	Additional Requirement	Submission of annual bird mortality monitoring report	Three years of operation at least (to be revised after)	Project Operator	85,000
		Utilization of increasing fragmentation of the polarizing surfaces of the PV panels with a white grid to reduce their attractiveness to polarotactic insects. Implementing and undertaking an insect monitoring program, particularly for <i>Gonphus luscasii</i> , will be implemented during the operational phase, including an invertebrate survey to ensure that mitigation measures have been successfully implemented.	Additional Requirement	Submission of annual report	Once, before operation commences	Project Operator	5,000
Infrastructure and Utilities	Water requirements – water requirements of the Project could entail constraints on existing users.	Preparation of the water management plan taking into account the implementation of a dry cleaning method	Additional Requirement	Submit proof for coordination with authorities	Once, before operation commences	Project Operator	15,000
		Document water consumption of the Project.	Additional Requirement	Submit monthly report	Continuous	Project Operator	5,000
	Waste utilities – it is important to ensure that existing utilities would be able to handle the amount solid waste, wastewater, and hazardous waste.	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.	Additional Requirement	Submit proof of coordination with authorities	Once, before operation commences	Project Operator	-
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website).	Additional Requirement	Submit proof of coordination with authorities	Once, before operation commences	Project Operator	-

		Provide a temporary area for hazardous waste storage, if necessary.					
		Final disposal will be checked for compliance with IFC/AfDB and GIIP standards. Provide for the temporary management of hazardous waste during the temporary closure of the Jeradou facility.	Mitigation	Inspection	Continuous	Project Operator	15,000
		Develop a waste management plan which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal.	Additional Study	Submit Waste Management Plan	Once, before operation commences	Project Operator	50,000
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Sbukha, or other location.	Mitigation	Inspection	Continuous	Project Operator	-
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the final destination of waste.	Mitigation	Review chain of custody records to ensure consistency	Continuous	Project Operator	15,000
Socio-economic	The Project will positively influence the regional and national economy during operation from the direct procurement and supply of materials and services from companies based in the governorate of Kairouan and elsewhere in Tunisia.	It is recommended that the Operator adopt and implement a Local Content Policy that seeks to procure goods and services from SMEs based in Kairouan to enhance the economic impacts that will result from the Project development on the Governorate level. The Plan should be developed under the supervision of the Developer.	Recommendation	Submission of Policy	Once, before operation commences	Project Operator (under supervision of the Developer)	Included in operation cost
	The Project is expected to provide job opportunities for local communities. This could contribute to	It is recommended that the Operator adopt and implement an Operation Local Employment Plan for working with the local community members during the operation phase. The plan must aim to support the local community stating its aims and objectives and should	Recommendation	Submission of Plan	Once, before operation commences	Project Operator (under supervision of the Developer)	Included in operation cost

	enhancing the living environment for its inhabitants and bring social economic prosperity to the local community including vulnerable groups such as women.	acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program. The plan must be developed under supervision of the Developer.					
	The project will provide a range of benefits for local communities in the vicinity of the Project.	The project company will develop and implement a voluntary Community Development Plan (CDP).	Recommendation	Submission of Plan	Once, before operation commences	Developer	10,000
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on operational sites, as it increases the risk to injury or death due to accidents.	Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Additional Study	Submission of Plan	Once, before operation commences	Project Operator	15,000
		Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency.	Additional Study	Submission of Emergency Preparedness and Response Plan	Once, before operation commences	Project Operator	15,000
<b>Potential labor violations within supply chain of photovoltaic solar panels (Child labor / forced labor / modern slavery)</b>	The use of a supply chain introduces the potential for labour violations to occur. (Child labor / forced labor / modern slavery in the solar photovoltaic supply chain).	Take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the construction of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) that categorically prohibit and ban (i) child labor or abusive employment of vulnerable persons and (ii) the practice of forced labor, human trafficking, and modern slavery. Use the AfDB's Risk Self-Assessment Form	Additional Study	Inspection	Before construction phase	Project Operator	Not required
Community Health and Safety	Inappropriate management of security issues and incidents by security personnel	Prepare security management plan which must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues.	Additional Study	Submission of Security Management Plan	Once, before operation commences	Project Operator	15,000

	towards communities	local						
<b>Cost of the ESMP exploitation phase in Tunisian Dinars</b>								<b>250,000</b>
<b>Cost of the ESMP operational phase equivalent in dollars</b>								<b>77,500</b>

**Table 7 - Environmental and Social Management Plan (ESMP) for the decommissioning phase**

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
<b>Landscape and Visual</b>	Visual and landscape impacts due to presence of elements typical of a decommissioning site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the site is left in an orderly state at the end of each workday, (ii) proper handling of waste streams, (iii) ensure all areas are fully restored after they have been used for decommissioning works, (v) ensure that all artificial lights adopt a downlighting strategy so that artificial lights will not escape outside the project site	Mitigation	Inspection	Continuous	Project Operator	50,000
		Submit a decommissioning plan that identifies the following: (i) dismantlement methodology and activities for each project component; (ii) disposal methodology for each project component (taking into account measures identified under infrastructure and utilities below); (iii) site rehabilitation plan that should aim to restore the area similar to pre-construction characteristics including identification any landscaping measures as applicable; (iv) monitoring activities to be undertaken e; (iv) roles and responsibilities.	Additional study	Submission of Plan	Once, before decommissioning commences	Project Operator	50,000
<b>Biodiversity</b>	Decommissioning activities to include dismantling and removal of security perimeter fencing, buildings and access tracks, electrical infrastructure and solar panel arrays and their	Reviewing the monitoring dataset accumulated over the project lifecycle and undertaking field surveys, if needed, to confirm the sensitive species for consideration during decommissioning.	Mitigation	Inspection	Once, before decommissioning commences	Project Operator	20,000
		Establish a schedule of work that will consider the seasonal nature of the project climate. In this sense, it is recommended to carry out decommissioning work during the dry season (July to September) to limit as much as possible the impacts on fauna as birds nesting period extends from mid-					

Environmenta l Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
	associated structural components could disturb existing habitats (flora, fauna, avifauna) and any species which might be present within the Project site.	March to mid-July and to avoid managing water during earthworks.			Continuous		
		Limit vehicle movements to only be on designated paved/unpaved roads and maintain a speed of vehicles to 15-20 km/h to surrounding natural vegetation.					
		Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.					
		Minimising habitat disturbance during infrastructure removal.					
		Minimising noise impacts on fauna associated with infrastructure removal procedures;					
		Ensure appropriate management of pollution risks to prevent any impact of wildlife and in particular batrachian.					
		Ensuring good practice for reuse, recycling, or disposal of decommissioned components.					
		Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading, etc.					
		Development of Framework Decommissioning Plan including all disposal options and relevant costs. End-of-life solar plant infrastructure components including solar panels and aluminium and copper cables will need to be recycled or otherwise disposed of responsibly.					
		Restoration of the site to its original state as far as feasible. In addition, internal road network will be restored, and gates and fences will be removed. Restoration measures following good environmental	Additional Study	Submit Framework Decommissioning Plan	Once, before decommissioning commences	Inclus dans les coûts de démantèlement	

Environmenta l Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
		practices should be the focus during this phase.					
		Given that at this stage there is a great deal of uncertainty at the decommissioning phase of the Project (with regards as to whom is the responsible party, prospects on waste disposal facilities in Tunisia, etc.), it is recommended that before any decommissioning activities take place a Disposal Plan for the PV Panels is prepared. The plan should consider the following options and compare the costs/benefits of each: (i) it is recommended that the Plan first opt for disposing the panels at the end of their lifetime as part of international recycling programs for PV Panels (such as PV CYCLE's recycling program); and (ii) if the above could not be achieved, as a last option the plan must investigate the disposal of the Panels at existing waste facilities in Tunisia through coordination with ME.	Mitigation	Inspection	Continuous		Inclus dans les coûts de démantèlement
<b>Infrastructure &amp; Utilities</b>	Waste utilities – it is important to ensure that existing utilities would be able to handle the amount solid waste, wastewater, and hazardous waste	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use	Additional study	Submission of Plan	Once, before decommissioning commences	Project Operator	30,000
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if necessary.	Additional Requirement	Submit proof of coordination with authorities	Once, before decommissioning commences	Project Operator	10,000
		Develop a waste management plan which includes measures to avoid, minimize, re-	Additional Requirement	Submit proof of coordination with authorities	Once, before decommissioning commences	Project Operator	-

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
		use and recycle waste before it is sent for treatment/disposal.					
		Final disposal will be checked for compliance with IFC/AfDB and GIIP standards.	Additional Study	Submit Waste Management Plan	Once, before decommissioning commences	Project Operator	Inclus dans les coûts de démantèlement
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Kairouan, or other location.	Mitigation	Inspection	Continuous	Project Operator	-
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the destination of waste.	Mitigation	Inspection	Continuous	Project Operator	50,000
		Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Mitigation	Review chain of custody records to ensure consistency	Continuous	Project Operator	20,000
<b>Occupational Health and Safety</b>	There will be some generic risks to workers health and safety from working on decommissioning site, as it increases the risk to injury or death due to accidents.	Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency	Additional Study	Submission of Plan	Once, before decommissioning commences	Project Operator	15,000
			Additional Study	Submission of Emergency Preparedness and Response Plan	Once, before decommissioning commences	Project Operator	10,000
<b>Cost of the ESMP dismantling phase in Tunisian Dinars</b>							<b>260,000</b>
<b>Total Cost - ESMP Decommissioning Phase in dollars</b>							<b>78,000</b>

**Table 8 : Global cost of the ESMP of the solar Project (solar plant and the OHTL)**

Cost of mitigation measures	Cost in Tunisian Dinars	Cost in US Dollars
Cost of the ESMP Construction phase of the Solar Power Plant	<b>785000</b>	<b>261667</b>
Cost of the ESMP Operation phase of the Solar Power Plant	<b>250000</b>	<b>83333</b>
Cost of the ESMP Dismantling phase of the Solar Power Plant	<b>255000</b>	<b>85000</b>
Cost of the ESMP Construction phase of the OHT	<b>635000</b>	<b>211667</b>
Cost of the ESMP Operation phase of the OHTL	<b>195000</b>	<b>65000</b>
Cost of the ESMP OHTL decommissioning phase	<b>255000</b>	<b>85000</b>
Cost of the Stakeholder Engagement Plan	<b>60000</b>	<b>20000</b>
Grievance Mechanism	<b>30000</b>	<b>10000</b>
Cost of Abbreviated Resettlement Action Plan for the solar power plant	<b>450000</b>	<b>150000</b>
Cost of OHTL's Abbreviated Resettlement Action Plan (ARAP)	<b>450000</b>	<b>150000</b>
Cost of the Community Development Plan (To be negotiated and determined before starting)	<b>To be determined</b>	<b>To be determined</b>
Cost of hiring an environmental safeguards specialist	<b>30000</b>	<b>10000</b>
Cost of hiring a social safeguards specialist	<b>30000</b>	<b>10000</b>
Cost of hiring a community liaison officer	<b>40000</b>	<b>13333</b>
Cost of (03) Annual E&S Compliance Audits (2023 and 2024 and 6 after completion)	<b>60000</b>	<b>20000</b>
<b>TOTAL COST OF THE ESMP</b>	<b>3,525,000</b>	<b>1,175,000</b>

## RESUMÉ NON-TECHNIQUE

### 1. Introduction

Le consortium AMEA Power-TBEA (ci-après dénommé « le Promoteur »), s'est vu attribuer en décembre 2019, un Accord pour le développement d'une centrale solaire photovoltaïque (PV) de 100 Méga Watt (MW) dans le gouvernorat de Kairouan, en Tunisie (ci-après dénommé "le Projet").

AMEA Power est une société émiratie active dans les énergies renouvelables. Elle acquiert, développe, possède et exploite des projets d'énergie thermique et renouvelable en Afrique, au Moyen-Orient et en Asie.

TBEA est une entreprise internationale basée en Chine qui offre à ses clients une gamme de services dans le domaine des énergies vertes et du développement durable. TBEA est présente dans une douzaine de pays à travers le monde. Avec l'ouverture du marché solaire en Tunisie, TBEA s'est concentrée sur le développement et l'intégration de solutions solaires pour le marché tunisien et africain.

Le Projet de Kairouan comporte deux volets :

- La centrale solaire (100MW), qui sera construite et exploitée par le Promoteur ;
- La Ligne Electrique Aérienne à Haute Tension de transport (8 km de long – 225kV), qui sera construite et exploitée par la Société Tunisienne de l'Electricité et du Gaz (*STEG*).

La Société Tunisienne de l'Electricité et du Gaz est une entreprise publique sous tutelle du ministère de l'Industrie, de l'Energie et des Mines qui a le monopole du transport et de la distribution de l'électricité et du gaz. Sa mission principale est de couvrir les besoins du pays en énergie électrique dans les meilleures conditions économiques, techniques et environnementales.

Le développeur qui cherchera à obtenir un financement pour le projet auprès d'institutions financières internationales (IFI), notamment la Société financière internationale (SFI) et la Banque africaine de développement (BAD) est enclin à concevoir et à développer le projet conformément aux meilleures pratiques internationales, ce qui inclut la réalisation d'une évaluation de l'impact environnemental et social (EIES) conformément aux Normes de Performance (NP) de la SFI sur la durabilité environnementale et sociale (2012) et des Sauvegardes Opérationnelles (OS) du Système de Sauvegarde Intégré (SSI) de la BAD.

Il est à noter que le Projet a été classé dans la catégorie B selon les NP de la SFI et dans la catégorie 2 selon le SSI de la BAD.

À cette fin, Environmental Assessment and Management (EAM) été désigné par le consortium AMEA Power-TBEA pour réaliser l'étude EIES pour le projet conformément aux exigences nationales ainsi qu'aux exigences de la SFI et de la BAD telles qu'identifiées ci-dessus.

Ce document présente l'EIES entreprise pour le projet de la centrale photovoltaïque de 100 MW de Kairouan.

## 2. Contexte du projet

En 2014, la Tunisie a adopté la « Politique de transition énergétique » qui vise une réduction de 30% de sa consommation d'énergie primaire d'ici 2030 et une contribution de 30% des énergies renouvelables dans la production d'électricité d'ici la même période.

Le Plan Solaire Tunisien (PST) est le programme opérationnel devant permettre d'atteindre l'objectif de la Politique de Transition Énergétique en termes d'introduction des Énergies Renouvelables en Tunisie. Il vise à augmenter la production d'électricité d'énergies renouvelables de 3% en 2016 à 30% en 2030. Cela comprend 10% d'énergie solaire, plus précisément 7% PV et 3% Solaire Thermique à concentration (CSP).

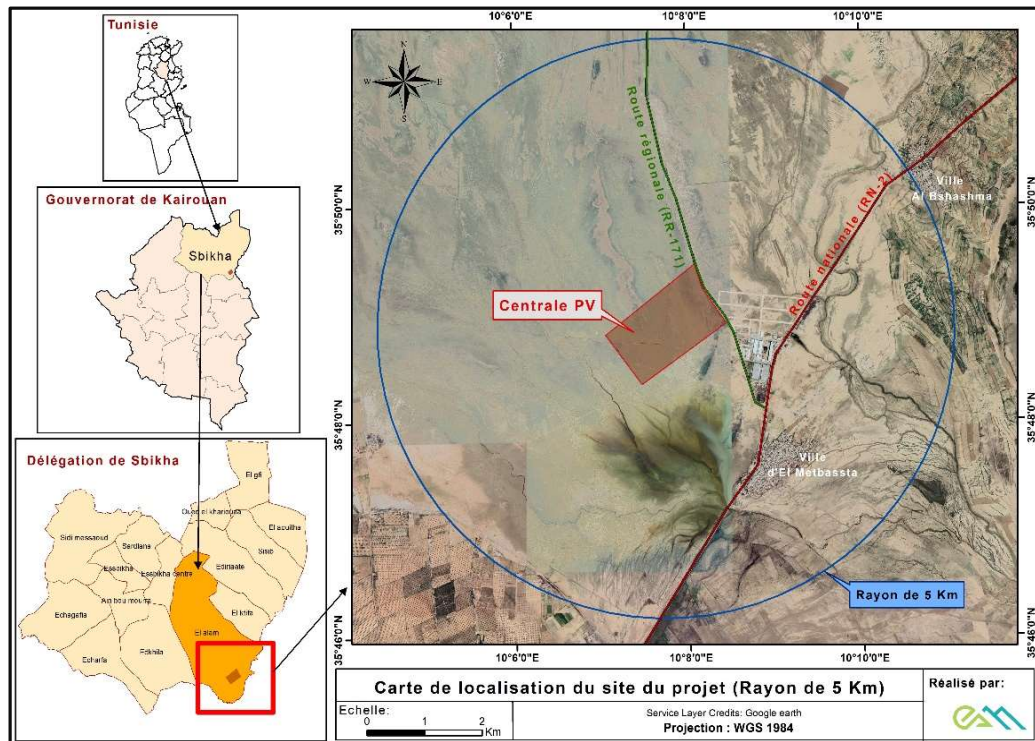
Dans le cadre du Plan solaire tunisien (PST), le Gouvernement Tunisien, représenté par son ministère de l'Industrie, de l'Énergie et des Mines, a sélectionné le Promoteur pour le développement du Projet. Un contrat d'Achat d'Electricité (CAE) de 20 ans a été signé par le Promoteur et la Société Tunisienne de l'Electricité et du Gaz (*STEG*).

Le secteur énergétique Tunisien fait face à des défis multiples : stratégiques, économiques, sociaux et environnementaux. Ainsi, l'approvisionnement énergétique, notamment pour le secteur de l'électricité, dépend essentiellement du gaz naturel (97% de l'énergie électrique produite), dont plus de la moitié provient de l'Algérie, compte tenu des ressources nationales limitées. De ce fait, le déficit de la balance d'énergie primaire n'a cessé de s'aggraver depuis une quinzaine d'années, atteignant les 50% en 2018.

## 3. Description du projet

### *(i) Localisation géographique*

- Le Projet Solaire est situé dans le secteur El Alem relevant de la délégation de Sbikha dans le Gouvernorat de Kairouan. Le village le plus proche du site du projet est Metbasta, situé à environ 2,2 km au sud du site du Projet.
- La centrale solaire sera construite sur un terrain relevant du domaine privé de l'Etat Tunisien, d'une superficie de 200 hectares. La zone est raisonnablement plate, bien exposée, facilement accessible, avec un sol suffisamment compacté et une altitude d'environ 30 à 32 m au-dessus du niveau de la mer. **La figure A** montre la carte de localisation du projet.



**Figure A** Carte de localisation du projet

- La centrale solaire est située à environ 500 m de la zone industrielle Sbikha 1 et à 100 m de la zone industrielle Sbikha 2 (en construction) et à proximité des parcelles agricoles.

**(ii) Principe de la génération de l'énergie photovoltaïque**

Le Photovoltaïque (PV) est une méthode de production d'électricité grâce à l'énergie solaire. Les cellules solaires convertissent l'énergie solaire en électricité. Les cellules solaires produisent de l'électricité à courant continu (CC) à partir de la lumière du soleil, qui peut être utilisée pour la production d'électricité connectée au réseau. L'électricité sur le réseau est généralement sous forme différente (courant alternatif (CA)). Les onduleurs sont utilisés pour convertir le courant continu en courant alternatif. Les transformateurs sont utilisés pour convertir la tension de sortie des cellules solaires à une tension plus élevée qui correspond au réseau.

**(iii) Composantes du projet**

- Les éléments clés du projet sont les panneaux photovoltaïques (voir la figure B). Chaque rangée est équipée d'une structure de montage qui se compose d'un suiveur horizontal à axe unique qui supporte le panneau PV et l'oriente vers le soleil.



**Figure B** Exemple d'une rangée de panneaux PV

- Chaque bloc comprendra une station d'onduleur centrale qui convertit l'électricité produite du courant continu (CC) au courant alternatif (CA).
- Les stations centrales d'onduleurs seront reliées par des câbles électriques souterrains aux emplacements des sous-stations sur le site. La sous-station convertit ensuite la tension produite en une tension appropriée pour la connexion au réseau national.
- L'infrastructure du bâtiment comprendra principalement des bureaux pour le travail quotidien normal lié aux opérations, un bâtiment de contrôle comprenant un système de données, de contrôle et de communication vocale pour le bon fonctionnement et la maintenance du site ainsi qu'un entrepôt/atelier pour le stockage des équipements et des machines et pour la maintenance et le stationnement des voitures.
- En plus, des éléments d'infrastructure tels que (i) un réseau routier interne pour faciliter l'accès aux modules à des fins d'exploitation et de maintenance et (ii) une route de sécurité autour du périmètre du site du Projet pour les patrouilles de sécurité ; et (iii) une route d'accès au site.
- Des clôtures autour de l'ensemble de l'installation ainsi que des caméras à distance, un éclairage nocturne automatique seront nécessaires pour assurer la sécurité contre l'intrusion de personnel non autorisé.
- Un système de surveillance pour suivre les performances de l'équipement de la centrale pour l'exploitation et la maintenance.
- Une EIES pour la ligne électrique aérienne à haute tension (LEAHT) séparée a été préparée pour cette installation associée. Les composants clés devraient inclure des tours de transmission. Chaque tour de transmission sera composée : (i) des fondations en béton armé pour que la tour soit fixée et boulonnée au sol ; (ii) des traverses qui relient les conducteurs aux tours ; et (iii) le conducteur est la ligne utilisée pour transporter l'énergie

électrique d'une tour à l'autre jusqu'à sa connexion avec le réseau national haute tension. Le conducteur sera une ligne de 225 kV.

- Le projet requiert des moyens humains aussi bien pendant la phase de construction que la phase d'exploitation. Ces ressources sont comme suit :
  - Environ 450 emplois en période de pointe pendant la phase de construction pour une durée d'environ 16 mois. Il s'agit principalement d'une centaine (~100) d'emplois qualifiés (ingénieurs, techniciens, consultants, géomètres, etc.) et de 350 emplois non qualifiés (principalement des ouvriers, mais aussi un certain nombre de membres du personnel de sécurité) ;
  - Environ 45 emplois pendant la phase d'exploitation pour une durée de 20 ans. Cela comprendra une dizaine (~10) d'emplois qualifiés (ingénieurs, techniciens, employés administratifs, etc.) et 35 emplois non qualifiés (personnel de sécurité, chauffeurs, etc.).

#### ***(iv) Phases du projet***

Les activités susceptibles d'avoir lieu pendant le développement du Projet comprennent trois (3) phases distinctes : (i) la planification-construction, (ii) l'exploitation et (iii) le démantèlement, chacune étant résumée ci-dessous.

- Planification et construction : cela comprend la préparation de la conception détaillée et de l'aménagement du Projet, le transport des composants du projet sur le site, ainsi que les activités de préparation et de construction du site pour l'installation de modules photovoltaïques, les stations d'onduleur, la sous-station, les routes d'accès internes, le bureau et l'entrepôt, la ligne de transmission, etc. (mobilisation des contractants, clôture, nivellement, transport des composantes du projet, infrastructure hydraulique);
- Exploitation : cette phase comprend la surveillance, la maintenance, la gestion des stocks, l'élaboration des garanties administratives, le stockage des pièces de rechange et des équipements de sécurité, la sécurisation du chantier, ainsi que la mise en place et le suivi du plan l'Environnement, Social, Hygiène et Sécurité (ESHS) ;
- Démantèlement : après la durée d'exploitation de 20 ans, la centrale solaire sera cédée à la *STEG*. Les activités de démantèlement comprennent la déconnexion des différents composants du Projet en vue d'une élimination finale. Le site sera restauré dans son état initial ou réutilisé. L'abandon du site comprend entre autres, la restauration du réseau routier interne et l'enlèvement des barrières et des clôtures.

La phase de construction devrait commencer en janvier 2023 et durera environ 16 mois.

L'exploitation commerciale du projet devrait commencer en 2024.

**(v) Les alternatives**

Le Promoteur s'est vu attribuer en décembre 2019 un Accord pour le développement d'une centrale solaire photovoltaïque (PV) de 100 MW dans le gouvernorat de Kairouan sur un terrain qui appartient à l'État. Par conséquent, il n'y a pas d'alternatives spécifiques au choix du site qui ont été considérées par le Promoteur.

Néanmoins, certaines alternatives de conception du projet ont été étudiées avec le Promoteur, comprenant principalement le système de drainage des eaux avec la construction des digues pour minimiser les risques d'inondation du site et l'utilisation du nettoyage à sec permettant d'économiser environ 3 000 m<sup>3</sup> d'eau par an.

**4. Cadre légal et institutionnel de mise en œuvre du projet**

**(i) Cadre législatif et réglementaire national**

**Évaluation environnementale et sociale :**

Le décret gouvernemental n°2016-1123 du 24 août 2016 indique que la production d'énergie à partir d'énergies renouvelables nécessite la préparation d'une étude d'impact sur l'environnement.

Cependant, sur la base du décret no. 2005-1991 du 11 juillet 2005 relatif à l'étude d'impact sur l'environnement (EIE) et définissant les catégories d'unités soumises à l'étude de l'impact sur l'environnement et les catégories d'unités soumises aux cahiers des charges, seules les unités de production d'électricité d'une capacité d'au moins 300 MW sont soumises à une EIE. Par conséquent, le projet de construction d'une centrale photovoltaïque de 100 MW et d'une ligne électrique aérienne de 225 kV ne requiert pas l'avis de l'Agence Nationale de Protection de l'Environnement (ANPE) et ne nécessite pas de permis environnemental pour sa réalisation.

Le cadre institutionnel en Tunisie est constitué par le ministère de l'industrie, de l'énergie et des mines, l'Agence nationale pour la maîtrise de l'énergie (ANME) et la Société Tunisienne de l'Electricité et du Gaz (STEG). Les autres institutions en charge des questions environnementales et sociales sont : Le ministère de l'environnement et les agences sous tutelle (ANPE, ANGED, ONAS), le ministère de l'agriculture (DGF, CRDA), le ministère de la culture (INP), le ministère des affaires sociales, le ministère des domaines de l'état et des affaires foncières, et les ONG et la société civile.

Le cadre juridique établi en Tunisie couvre la plupart des aspects liés à la protection de l'environnement, à la lutte contre la pollution et à l'amélioration du cadre de vie. Il comprend des instruments préventifs et incitatifs (aides financières et incitations fiscales) ainsi que des

mesures coercitives à l'encontre des personnes physiques et morales qui commettent des infractions de pollution ou de dégradation de l'environnement.

### **Biodiversité, ressources naturelles et services Écosystémiques :**

Les principaux textes réglementaires qui régissent la biodiversité, les ressources naturelles et les services Écosystémiques sont :

- Le code forestier : constitue le cadre juridique de base en matière de conservation du milieu naturel (forêts, nappes alfatières, terrains de parcours, terres à vocation forestière, parcs nationaux et réserves naturelles, à la faune et à la flore sauvage) et de gestion des parcs nationaux.
- Loi 92-72 du 03 Août 1992 Fixe les dispositions générales à la protection des végétaux et à l'organisation du secteur des pesticides à usage agricole
- Arrêté du ministre de l'Agriculture du 19 Juillet 2006, fixant la liste de la faune et de la flore sauvages rares et menacées.

### **Protection des ressources naturelles et Prévention de la pollution :**

Les principaux textes réglementaires relatifs à la protection des ressources naturelles et la prévention de la pollution sont :

#### *Rejets liquides*

- Code des Eaux contient diverses dispositions qui régissent, sauvegardent et valorisent le domaine public hydraulique
- Décret n° 85-56 des 2 Janvier 1985 : Relatif à la réglementation des rejets dans le milieu récepteur
- Arrêté du ministre des affaires locales et de l'environnement et du ministre de l'industrie et des petites et moyennes entreprises du 26 Mars 2018 : Fixant les valeurs limites des rejets d'effluents dans le milieu récepteur.

#### *Émissions atmosphériques*

- Décret gouvernemental n°2018-447 du 18 Mai 2018. Fixant les valeurs limites et les seuils d'alerte de la qualité de l'air ambiant.

#### *Déchets solides*

- La Loi 96-41 du 10 juin 1996, relative aux déchets et au contrôle de leur gestion et de leur élimination :
- Décret 2005-2317 du 22 août 2005, portant création d'une Agence Nationale de Gestion des Déchets (ANGED).
- Le décret 2005-3395 des 26 décembre 2005, fixe les conditions et les modalités de collecte des accumulateurs et piles usagées.

- Le Décret 2008-2565 du 07/07/2008, modifiant et complétant Décret 2002-693 du 1er avril 2002, fixe les conditions et aux modalités de reprise des huiles lubrifiantes et des filtres à huile usagés et leur gestion.

#### *Gestion de déchets et produits dangereux*

- La circulaire du ministère du commerce du 12 mai 1987 interdisant l'importation en Tunisie de transformateurs et tous autres appareillages ou produits à base de PCBs.
- Loi n° 96-41 du 10 Juin 1996 Relative aux déchets et au contrôle de leur gestion et de leur élimination.
- La Loi 97-37 du 2 Juin 1997, fixant les règles organisant le transport par route des matières dangereuses afin d'éviter les risques et les dommages susceptibles d'atteindre les personnes, les biens et l'environnement
- Décret 2000-2339, fixant La liste et la classification des déchets dangereux
- Le décret 2005-3079 du 29 novembre 2005, fixant la liste des matières dangereuses qui sont transportées par route obligatoirement sous le contrôle et avec l'accompagnement des unités de sécurité.
- Arrêté du 23/03/2006 : portant création d'une unité de traitement des déchets dangereux et de centres de réception, de stockage et de transfert.
- Arrêté du 17/01/2007 : relatif à l'approbation des cahiers des charges fixant les conditions et les modalités d'exercice des activités de collecte, de transport, de stockage, de traitement, de recyclage et de valorisation des déchets non dangereux

#### *Prévention des nuisances sonores*

- Arrêté du président de la municipalité Maire de Tunis du 22/08/2000 interdisant le bruit susceptible de perturber la tranquillité du citoyen entre 10 h du soir et 8h du matin pendant toute l'année et de 13h à 17 h l'été.
- Code de la Route fixant les dispositions relatives aux véhicules à moteur
- Décret 84-1556 du 29 décembre 1984, portant réglementation des lotissements industriels. Aux termes de l'article 26 de ce décret, le niveau de bruit de jour généré par une entreprise ne devra pas dépasser 50 décibels, mesurés au droit de la façade des habitations les plus proches de la zone d'activité.
- Arrêté du ministre des affaires sociales et du ministre de la santé du 29 Mars 2018 modifiant et complétant l'arrêté du 10 Janvier 1995 fixant la liste des maladies professionnelles.

### *La protection des terres agricoles*

- La Loi 83-87 relative à la protection des terres agricoles a pour objectif de protéger les terres agricoles contre l'urbanisation et fixe les modalités et autorisations requises pour le changement du statut des terres agricoles.
- Loi 95-70 du 17 juillet 1995 relative à la conservation des eaux et du sol.
- La loi 2001-119 du 06 Décembre 2001 : portant interdiction de l'abattage et l'arrachage des oliviers, sauf autorisation délivrée par le gouverneur territorialement compétent, dans un délai de deux mois à partir de la date du dépôt de la demande.

### **Protection des ressources culturelles**

- Le Code du patrimoine (Loi 94-35 du 24 Février 1994)

#### ***(ii) Conventions et accords internationaux***

En plus, la Tunisie a ratifié plus de 60 conventions et accords internationaux concernant la protection de l'environnement. Elle a développé des systèmes d'information dans le cadre de la mise en œuvre des trois conventions RIO afin de faciliter les rapports à diverses organisations, notamment (i) le système d'information développé dans le cadre de la mise en œuvre de la Convention sur la diversité biologique ; et (ii) le système d'information sur le mécanisme de développement propre.

#### ***(iii) Standards Internationaux***

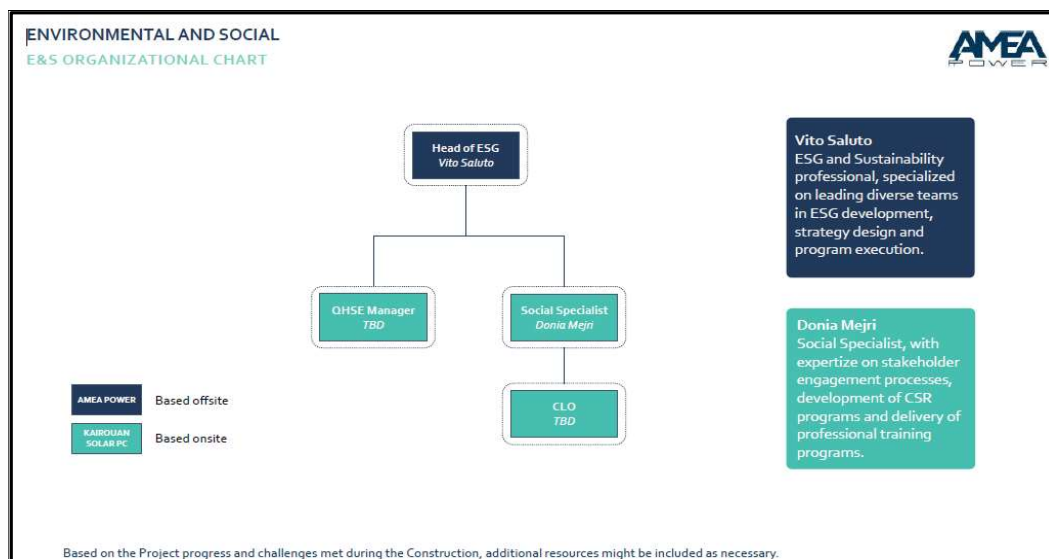
Le projet sollicitera des financements auprès des Institutions Financières Internationales (IFI), qui comprendront principalement la Société Financière Internationale (SFI) et la Banque Africaine de Développement (BAD). Ainsi, l'EIES est basée sur les Normes de Performance (NP) de la SFI en matière de durabilité environnementale et sociale (2012) et sur le Système de Sauvegarde Intégré (SSI) de la BAD.

#### ***(iv) Rôles et responsabilités des acteurs de la mise en œuvre du SGES***

L'Unité Gestion du Projet est mise en place par le promoteur qui sera responsable du suivi de la mise en œuvre du PGES, du PARA et de la préparation des rapports périodiques pour les bailleurs de fonds (SFI et BAD).

L'UGP doit disposer en sein d'un spécialiste en sauvegarde environnementale, d'un spécialiste en sauvegarde social et d'un agent de liaison communautaire.

Le Promoteur a défini des rôles et responsabilités de gestion environnementale et sociale des ressources humaines impliquées dans la mise en œuvre du projet, y compris les contractants et autres personnes travaillant pour le compte de l'entreprise, dans toutes les phases de la mise en œuvre du projet (voir organigramme de l'équipe E&S).



**Figure C** Organigramme de l'équipe E&S

La responsabilité de la mise en œuvre du Plan de Gestion Environnemental et Social (PGES) sera organisée et présidée par le Promoteur du projet qui sera redevable devant les Bailleurs même si certaines meures sont délégués au contractant EPC pendant la phase de construction et par l'opérateur du Projet pendant la phase d'exploitation renforcée par l'équipe E&S du Promoteur.

L'exécution et le suivi des mesures environnementales et sociales se feront conformément au PGES qui constitue le référentiel du projet en matière de sauvegardes environnementales et sociales. Ils seront relayés par les missions de surveillance et de contrôle des travaux agissantes en contrôle externe.

Le suivi périodique sera effectué par les spécialistes en sauvegardes E&S du Promoteur et la Direction Régionale de l'Environnement ou l'ANPE (le cas échéant) en contrôle externe.

L'inspection et la surveillance doivent inclure les éléments suivants :

- Inspection et surveillance HSE quotidiennes sur le site et préparation d'un rapport d'observation quotidien indiquant les mesures correctives sur les déficiences de sécurité, les actes et les conditions dangereuses observés.
- Inspections hebdomadaires du site à réaliser à l'aide du modèle de listes de contrôle des inspections hebdomadaires du site, sur la base des exigences du PGES et du SGES.
- Les audits HSE doivent être effectués mensuellement pendant la phase de construction et trimestriellement pendant la phase d'exploitation.

Une description générale des entités responsables de la mise en œuvre du PGES, ainsi que de leurs rôles et responsabilités respectifs est dans le tableau suivant :

**Tableau 1 - Description générale des entités responsables de la mise en œuvre du PGES**

Entité	Responsabilités
<b>Chef de projet</b>	<ul style="list-style-type: none"> <li>• C'est la personne qui organise et conduit les différentes phases du projet dont il en assume entièrement le management.</li> <li>• Le Chef de projet intervient en amont et en aval du projet, c'est à dire de l'élaboration jusqu'à l'évaluation des résultats du projet géré. Souvent en réunions et constamment à jour des dernières tendances dans son domaine.</li> <li>• Ses principales missions consistent à l'organisation et la conduite du projet de bout en bout, la supervision des différentes phases, depuis la rédaction des spécifications fonctionnelles et techniques à la recette utilisateur voire la mise en production, ainsi que la réalisation d'un suivi auprès du client.</li> <li>• Dans le cadre de ce suivi, il sera amené à contrôler la qualité du travail effectué par l'équipe du projet et à veiller au respect des délais et des coûts. Il communique un compte-rendu à sa hiérarchie comme à son client. Son objectif étant de boucler le projet en temps et en heure, en répondant au mieux au budget et aux attentes exprimées.</li> <li>• Il est chargé de veiller à la mise en œuvre du PGES et du PARA, de tous les autres instruments E&amp;S préparés dans le cadre de ce projet, des engagements dans l'accord de prêt, de réglementation nationale et s'assurer que les contractants et sous contractants en face de même.</li> </ul>
<b>Responsable de site</b>	<ul style="list-style-type: none"> <li>• Le responsable de site est chargé de l'accueil, la surveiller ainsi que de l'entretien d'un site. Avec ses équipes, qu'il coordonne, il organise des interventions techniques. Il peut aussi conseiller techniquement la direction afin de proposer de mettre en place des modifications qu'il juge nécessaires.</li> </ul>
<b>Spécialiste social</b>	<ul style="list-style-type: none"> <li>• Le Spécialiste Social dirigera et coordonnera la planification, l'élaboration et la mise en œuvre de politiques sociales pour les projets initiés par le Promoteur (AMEA Power) ainsi que l'évaluation et la gestion efficace des risques sociaux liés aux activités du projet. Cela comprend l'examen des cadres et des plans de sauvegardes sociales en collaboration avec les agences gouvernementales concernées et les groupes de bénéficiaires locaux, le traitement de la compensation, le suivi de la mise en œuvre du PGES et du PARA et le suivi de la conformité du projet aux politiques de sauvegardes tout au long de sa durée.</li> <li>• Le Spécialiste Social veillera au respect de l'évaluation des risques et impacts sociaux du projet en collaboration avec le spécialiste de l'environnement, en se conformant aux exigences des politiques des bailleurs de fonds (BAD et SFI) en la matière et aux textes nationaux ou à défaut internationaux et notamment l'exécution du PGES et du PARA, de tous les autres instruments E&amp;S préparés dans le cadre de ce projet, des engagements dans l'accord de prêt, de réglementation nationale et s'assurer que les contractants et sous contractants en face de même. Il a pour mission de :                         <ul style="list-style-type: none"> <li>• Surveiller et auditer la conformité sociale dans l'ensemble du projet ;</li> <li>• Analyser, suivre et gérer les conséquences sociales prévues et imprévues, tant positives que négatives, des interventions planifiées (politiques, programmes, plans, projets) ;</li> <li>• Effectuer des inspections d'hébergement du travail et des audits sociaux ;</li> <li>• Veiller à la bonne mise en œuvre des mécanismes de règlement des griefs au niveau du projet ;</li> </ul> </li> </ul>

Entité	Responsabilités
	<ul style="list-style-type: none"> <li>• S'engager, selon les besoins, avec les organisations de la société civile et les organisations non gouvernementales en ce qui concerne les questions sociales ;</li> <li>• Soutenir et mettre en œuvre des activités de développement social (RSE) et des initiatives de développement durable conformément aux stratégies de l'entreprise et spécifiques aux projets ;</li> <li>• Avec le spécialiste environnemental, préparer et soumettre les rapports trimestriels de suivi de la mise en œuvre du PGES, du PARA et autres instruments E&amp;S à la BAD.</li> <li>• Avec le spécialiste environnemental, coordonner la préparation de l'Audit annuel de conformité environnementale et sociale par un auditeur indépendant.</li> </ul>
<b>Spécialiste environnemental</b>	<ul style="list-style-type: none"> <li>• Le Spécialiste environnemental dirigera et coordonnera la planification, l'élaboration et la mise en œuvre de politiques environnementales pour les projets initiés par le Promoteur (AMEA Power) ainsi que l'évaluation et la gestion efficace des risques environnementaux liés aux activités du projet.</li> <li>• Le Spécialiste environnemental veillera au respect de l'évaluation des risques et impacts environnementaux, en se conformant aux exigences des politiques des bailleurs de fonds (BAD et SFI) en la matière et aux textes nationaux ou à défaut internationaux et notamment l'exécution du PGES et du PARA, de tous les autres instruments E&amp;S préparés dans le cadre de ce projet, des engagements dans l'accord de prêt, de réglementation nationale et s'assurer que les contractants et sous contractants en face de même.</li> <li>• Avec le spécialiste social, préparer et soumettre les rapports trimestriels de suivi de la mise en œuvre du PGES, du PARA et autres instruments E&amp;S à la BAD.</li> <li>• Avec le spécialiste social, coordonner la préparation de l'Audit annuel de conformité environnementale et sociale par un auditeur indépendant.</li> </ul>
<b>Agent de liaison avec la communauté</b>	<ul style="list-style-type: none"> <li>• Pour le PARA, l'agent de liaison avec la communauté permet d'assurer une communication et une sensibilisation continues avec les communautés locales pour fournir des mises à jour sur le projet et son avancement par des moyens d'information tels que la consultation publique, le contact direct avec la communauté via le CLO ou le représentant local du Promoteur.</li> <li>• Aider à faire connaître le mécanisme de règlement des griefs, et faciliter l'enregistrement, l'enquête et la résolution des griefs ;</li> <li>• Fournir une assistance continue dans la mise en œuvre du PARA</li> <li>• Rendre compte de l'avancement de la mise en œuvre du PARA</li> <li>• Fournir toute autre assistance qui pourrait être nécessaire pour la mise en œuvre réussie du projet lorsque cela est pertinent et approprié.</li> <li>• Avec les spécialistes E&amp;S, contribuer à la préparation des rapports trimestriels de suivi de la mise en œuvre du PGES, du PARA et autres instruments E&amp;S à la BAD.</li> <li>• Avec les spécialistes E&amp;S, contribuer à la supervision de l'Audit annuel de conformité environnementale et sociale par un auditeur indépendant.</li> </ul>

Entité	Responsabilités
<b>Responsable QHSE</b>	<ul style="list-style-type: none"> <li>• Surveiller et auditer la conformité QHSE sur l'ensemble du site ;</li> <li>• Réaliser des inspections et des audits HSE sur site ;</li> <li>• Identifier les dangers, effectuer des évaluations des risques et s'assurer que les actions correctives ultérieures sont mises en œuvre</li> </ul>
<b>Contractant EPC</b>	<ul style="list-style-type: none"> <li>• Le contractant EPC sera tenu d'affecter un responsable HSE sur site à temps plein et dûment qualifié et un spécialiste social, qui seront tous deux chargés d'assumer les responsabilités suivantes :</li> <li>• Responsabilité générale du développement et de la mise en œuvre des exigences du système de gestion HSSE des entrepreneurs EPC</li> <li>• Assure la disponibilité des ressources nécessaires pour mettre en œuvre correctement les plans et les exigences HSSE</li> <li>• Fournit les exigences de rapport HSSE, le cas échéant</li> <li>• Fournit les exigences de formation HSSE, le cas échéant</li> <li>• Entreprendre les exigences d'inspection et de surveillance HSSE, le cas échéant</li> <li>• Organiser et participer aux réunions HSSE</li> <li>• Rapports sur les incidents HSSE</li> <li>• Veiller à ce que tous les sous-traitants nomment suffisamment d'agents HSE pour la mise en œuvre globale des plans et des exigences HSSE, le cas échéant.</li> <li>• Le responsable HSE doit être assisté par 2-3 (selon le calendrier de construction) agents HSE sur site à temps plein et dûment qualifiés.</li> <li>• Avant le début de tout travail sur site, pour chacun des membres clés du personnel HSSE du site comme indiqué ci-dessus, l'entrepreneur EPC doit soumettre les éléments suivants au développeur pour approbation :                     <ul style="list-style-type: none"> <li>• Curriculum Vitae (CV)</li> <li>• Certificat d'aptitude</li> <li>• Lettre de nomination</li> </ul> </li> <li>• Le développeur examinera les documents soumis et pourra interroger les candidats pour déterminer leur adéquation aux rôles prévus.</li> </ul>
<b>Les Prestataires</b>	<ul style="list-style-type: none"> <li>• Responsables de la prise en compte des aspects environnementaux, sociaux, de santé et de sécurité et d'intégration du genre dans la conception et la mise en œuvre de leurs services conformément aux exigences du SSI et des NP.</li> </ul>
<b>Les ONG</b>	<ul style="list-style-type: none"> <li>• Les ONG du secteur de l'environnement, du social et de développement doivent jouer un rôle dans la sensibilisation des personnes affectées et des communautés locales</li> </ul>

## 5. Base de référence environnementale, écologique et sociale

### (i) Environnement physique

Le Site du Projet est situé au Nord-Est du gouvernorat de Kairouan, au centre-est de la Tunisie, qui fait partie de la terminaison orientale de l'Atlas central, relevant du domaine naturel des basses steppes qui fait la liaison entre Sahel et les hautes steppes de Tunisie. La centrale solaire sera construite sur un terrain relevant du domaine privé de l'Etat tunisien, d'une superficie de 200 hectares.

Le site du Projet est un vaste terrain pratiquement plat - d'où le toponyme -, ne présentant aucune géomorphologie particulière. Il s'agit d'une zone de dépression saline, avec une pente générale douce vers le Sud et l'Est. A plus grande échelle, la zone du projet est principalement entourée par la chaîne montagneuse à l'Ouest et au Nord et les plaines de l'Est du Gouvernorat de 100 m d'altitude. L'aspect général du paysage est illustré ci-dessous.



**Figure C** Topographie générale et paysage du site du projet

- Le site du projet se situe dans des compositions d'alluvions récentes qui comprennent un substratum datant du quaternaire recouvert d'un sol lourd et profond. La nature du sol du site entraîne un développement en profondeur limité des racines des plantes, ce qui le rend impropre aux activités agricoles. Le site du projet n'est ni une zone humide ni une Sabkha.
- La zone du projet fait partie du bassin Sisseb-El Alem qui est affecté par des anomalies proches de la tendance est et nord. La distance aux principales anomalies est toutefois suffisamment grande. Ainsi, de ce point de vue, aucun risque sismique n'est à prévoir.

- La germination des plantes sur le site est fortement limitée par la texture argilo-limoneuse avec une couche de calamine formée en surface.
- Le réseau hydrographique du Site est constitué de trois ruisseaux temporaires avec un écoulement endoréique vers Sebket el-Kelbia :
  - L'oued Boushkima, long de 15 km, traverse le Site du Projet du nord au sud ;
  - L'oued Dalloussi, long de 17 km, est situé plus à l'ouest de l'oued Boushkima ;
  - L'oued Boughal, long de 15 km, intercepte les oueds Boushkima et Dalloussi et se jette dans Sebket el-Kelbia.
- Au cours du premier trimestre 2021, d'importants projets agricoles et hydrauliques ont été réalisés en amont du Site du Projet. Compte tenu de la superficie affectée (400 ha) et des digues construites, ces changements modifieront considérablement le régime d'écoulement dans la zone du projet.
- La zone du projet fait partie de la plaine de Sisseb-El Alem au nord de la plaine de Kairouan. Les ressources en eaux souterraines de cette plaine sont constituées par la nappe phréatique et la nappe profonde de Sisseb – El Alem.
- La région de Kairouan appartient à l'étage bioclimatique aride supérieur avec un hiver tempéré.
- Les températures moyennes annuelles dans la zone d'étude sont de l'ordre de 21,1°C avec des variations de 7 à 9°C selon les saisons.
- La moyenne mensuelle du GHI (Global Solar Radiation) entre 2010 et 2019 varie de 76,5 kWh/m<sup>2</sup> pour le mois de décembre à 229,3 kWh/m<sup>2</sup> en juillet, avec une moyenne annuelle de 1 793 kWh/m<sup>2</sup> par an.
- La pluviométrie annuelle moyenne enregistrée dans la zone d'étude au cours des dernières années (2010 - 2019) est de 298,7 mm.
- L'humidité relative dans la zone d'étude varie de 43% à 64% (2010-2019).
- Les vents dominants sont généralement issus des secteurs nord et sud-ouest.

### ***(ii) Environnement biologique***

Pour évaluer la base biologique, des enquêtes sur le terrain ont été réalisées les 4 septembre 2020 et 9 avril 2021. Pour cela, un biologiste et un ornithologue ont analysé les espèces dominantes ainsi que leur statut de conservation, ont évalué leurs habitats et ont identifié toute autre zone d'importance particulière ainsi que toute caractéristique environnementale pertinente.

- Aucune des principales espèces végétales identifiées sur le site du projet et ses environs n'est considérée comme rare ou en voie de disparition et toutes les espèces sont considérées comme communes à leurs habitats.

- Les résultats d'une recherche documentaire ont révélé trois zones humides d'importance nationale et internationale pour l'accueil et la conservation des oiseaux dans un rayon de 10 km du site, à savoir : les plaines de Kairouan (distance de 5,4 km), Sebkhet el-Kelbia (distance de 5 km) et Metbasta (à 1 km).
- Le site du projet est à caractère hydro-halomorphe et constitue, en raison de la proximité de la route reliant Sbikha à Kairouan, du pâturage, de l'activité de la Zone Industrielle de Metbasta, etc. un biotope inadapté à une faune diversifiée.
- La plupart des espèces animales identifiées dans l'analyse documentaire sont considérées comme peu préoccupantes, à l'exception de la tortue grecque « *testudo graeca* », la Pie-grièche méridionale « *Lanius meridionalis* », ainsi que l'espèce gomphes « *Gomphus lucasii* », qui sont classées comme espèces vulnérables selon l'UICN (Union Internationale pour la Conservation de la Nature) et figurent sur la liste rouge des espèces menacées.
- Il n'y a pas de zones naturelles protégées sur le site du Projet. Le parc national de Jbel Zaghdoud et la réserve naturelle de Sebkhet el-Kelbia sont situés dans la zone d'étude étendue à environ 30 km et, respectivement, à 5 km du site.

### **(iii) Conditions Socio-Economiques**

- Selon l'estimation de l'INS, la délégation de Sbikha comptait 74 464 habitants en 2018.
- Le taux de chômage à Sbikha est inférieur à la moyenne du gouvernorat mais supérieur à la moyenne nationale. Les femmes sont nettement plus touchées par le chômage que les hommes. De plus, le chômage est plus répandu chez les jeunes, spécifiquement les jeunes femmes. Les diplômés sont également confrontés à un taux de chômage élevé, en particulier les jeunes femmes diplômées.
- Les principaux secteurs de l'économie locale sont l'agriculture, le bâtiment et les travaux publics, l'éducation, la santé et les services administratifs.
- Le Gouvernorat de Kairouan est classé au troisième rang des gouvernorats les plus pauvres de Tunisie. Il est caractérisé par une agriculture vivrière, un environnement rural dominant, une faiblesse de l'infrastructure de base, un taux de chômage élevé, un taux d'analphabétisme élevé, un très faible niveau d'éducation de la population, un exode rural assez important et un taux élevé d'abandon scolaire. La délégation de Sbikha atteint la deuxième place nationale en termes d'abandon scolaire.

### **(iv) Occupation des sols**

- Le terrain alloué pour le projet de développement relève du domaine privé de l'État. Un accord de location de terrain a été signé le 22 juin 2021 entre le Gouvernement et le Promoteur.
- Aucune activité agricole n'a été constatée sur le site de la centrale solaire, excepté le

pastoralisme extensif qui concerne toute la région. Le bétail observé est principalement composé d'ovins et de caprins, mais la présence de fèces de dromadaires aux voisinages du site de la centrale solaire (parcours de Metbasta) indique la présence potentielle de camelins.

- Hormis une bande de végétation annuelle qui longe la route Sbikha-Kairouan et ne présente d'intérêt pastoral que pendant de courtes périodes de l'année, le reste de la végétation est dominé par des espèces ligneuses sans grand intérêt pour le cheptel.
- Les consultations ont montré d'autres utilisations mineures des terres, y compris la chasse et la collecte de bois. Cependant, ces activités sont généralement entreprises sur des terres ouvertes, y compris la zone plus large du site du projet.
- Sur la base des consultations des communautés, aucune objection ou préoccupation spécifique n'a été soulevée concernant l'utilisation des terres et les activités de pâturage spécifiquement sur le site de la centrale solaire.

**(v) Archéologie et patrimoine culturel**

- Sur la base d'une étude documentaire, ainsi que d'une enquête sur terrain, aucun site archéologique ou patrimonial n'a été identifié, à l'exception de l'ancienne ferme coloniale française située à 6 km au nord-ouest du site du projet sur le domaine agricole d'El-Alem. Il s'agit vraisemblablement d'une ferme ayant appartenu à la Société des Fermes Françaises de Tunisie. De telles découvertes sont considérées comme non importantes et courantes et n'affectent pas le développement du projet.
- Certaines découvertes d'artefacts ou de vestiges, des céramiques sigillées africaines, des tessons de céramique commune, des traces de murs et fragments épars d'une construction coloniale ont été enregistrées sur le site ; cependant, elles sont de faible portée patrimoniale.

**(vi) Infrastructure et services publics**

- Une visite sur terrain, ainsi qu'une étude bibliographique, ont été effectués pour examiner les composants d'infrastructure et de services publics sur le site, notamment en ce qui concerne l'alimentation en eau potable, la gestion des eaux usées et des déchets solides, les installations de déchets dangereux et les réseaux routiers.
- L'infrastructure clé à proximité du site du projet comprend une route (à 20 m de la limite du site), une ligne de transmission aérienne de 30 kV de la *STEG* et un gazoduc (au sud du site).
- Il existe six stations de traitement des eaux usées dans le gouvernorat de Kairouan, la plus proche du site du projet étant celle de Kairouan (10 km au sud-est). La station de Sbikha, située à 15 km au nord-est de la centrale solaire, est équipée d'une station d'épuration

tertiaire des eaux usées urbaines d'une capacité nominale de 1 200 m<sup>3</sup>/jour. Actuellement, elle traite 700 m<sup>3</sup>/jour d'eaux usées domestiques.

- Les déchets municipaux solides générés par le Projet seront évacués vers une décharge contrôlée pour les déchets ménagers et de construction « la décharge contrôlée sise à El Baten ».
- Les déchets dangereux et spéciaux sont gérés par des entreprises autorisées par le ministère de l'Environnement (ME) (la liste des entreprises autorisées pour la gestion des déchets dangereux est disponible sur le site web de l'ANGED). Au besoin, une zone sera réservée pour le stockage provisoire des déchets dangereux sur site.
- La zone du projet est située à l'ouest de la route nationale RN2. Le trafic routier sur la RN2 et la RR-171 est respectivement estimé à 10 886 et 2 964 véhicules par jour, y compris les poids lourds (DGPC, 2017).

## 6. Impact Environnemental et Social du projet

Un tel projet d'énergie solaire aura des impacts positifs importants et cruciaux sur l'environnement et l'économie au niveau stratégique et national, étant donné les défis actuels auxquels le secteur de l'énergie en Tunisie est confronté, qui ont de sérieuses implications sur la sécurité énergétique de la Tunisie. Ces impacts positifs qui sont importants à souligner, à considérer et à prendre en compte peuvent se traduire comme suit :

- Contribuer à un développement durable en montrant l'engagement du gouvernement tunisien à réaliser sa stratégie énergétique et à atteindre les objectifs fixés pour les sources d'énergies renouvelables ;
- Accroître l'autonomie énergétique en s'appuyant sur une ressource énergétique indigène, inépuisable et majoritairement indépendante des importations. La production d'électricité de la centrale solaire est estimée à 230 GWh par an ; ce qui permettra de répondre aux besoins annuels en électricité de plus de 43 000 ménages locaux ;
- Permettre de réduire la consommation de gaz naturel utilisé dans les centrales thermiques pour la production d'électricité et de réduire les émissions de gaz à effet de serre ainsi que les émissions de polluants atmosphériques - le projet devrait compenser plus de 117 000 tonnes métriques de CO<sub>2</sub> par an ;
- Amélioration des conditions socio-économiques en offrant des opportunités d'emploi et de services.

A l'exception des risques pour la santé et la sécurité de la communauté - transport routier, le Projet n'entraînera pas des impacts environnementaux et sociaux négatifs majeurs.

L'EIES estime que ces impacts sont généralement de nature mineure, bénins et contrôlables et pouvant être atténués de manière adéquate comme indiqué en détail ci-dessous.

Les impacts potentiels concernent principalement les récepteurs suivants :

- La génération de poussière et du bruit résultant des travaux de construction
- Quant à l'effet de lac des panneaux photovoltaïques, des effets significatifs sont jugés peu probables sur la base des recherches scientifiques limitées sur le sujet et selon des impacts potentiels similaires pour les serres couvrant une grande surface un certain temps dans les zones arides. La surveillance de la mortalité des oiseaux devrait être entreprise sur le site opérationnel pour confirmer cela.
- Compte tenu de l'éventuelle présence dans la zone du projet d'une espèce en danger (l'Érismature à tête blanche: *Oxyura leucocephala*) et deux espèces vulnérables (la Sarcelle marbrée : *Marmaronetta angustirostris* et le Fuligule milouin : *Aythya marila*), un programme de surveillance multi-saisons (printemps et automne) de ces espèces pendant la période de construction est recommandé et en cas de confirmation de leur présence dans la zone du projet (centrale photovoltaïque et ligne électrique aérienne à haute tension, une analyse d'habitat critique sera conduite conformément à la Norme de Performance 6 (NP6) relative à la conservation de la biodiversité et gestion durable des ressources naturelles vivantes de la SFI et à la sauvegarde opérationnelle SO3 de la BAD.
- Des cours d'eau et systèmes d'oueds pourraient entraîner des risques potentiels d'inondations locales, en particulier pendant la saison des pluies et pendant les crues soudaines, qui pourraient à leur tour affecter les composantes du projet (entraînant des dommages et la destruction d'équipements et de machines sur le site) et pourraient également avoir des impacts sur la santé et la sécurité des travailleurs sur le site. Un système de protection contre l'inondation est pris en compte dans la conception du projet selon l'étude de protection contre les inondations réalisée en juin 2022.
- L'afflux de travailleurs, intrusion, personnel de sécurité, l'augmentation du trafic et les transports, ainsi que la santé et la sécurité au travail ont été considérés en établissant une série de mesures organisationnelles, opérationnelles et préventives en cas d'urgence, adaptées aux circonstances de telles situations, qui à leur tour assureront la santé et la sécurité des travailleurs, de la communauté et des biens sur le site spécifique du Projet ;

- Le risque de violations du droit de travail au sein de la chaîne d'approvisionnement a été considéré en prenant toutes les précautions nécessaires et en se conformant aux politiques et normes des bailleurs (SFI et BAD);
- Le terrain dédié au projet est utilisé par des éleveurs occasionnels qui fréquentent le site du projet pendant certaines périodes de l'année avec du bétail, principalement des moutons, des chèvres et des chameaux. Le principal impact sur l'utilisation des terres pourrait être la réduction de la superficie du pâturage des éleveurs. Dix (10) éleveurs de Dalloussi et dix (10) éleveurs de Metbasta qui sont identifiés comme utilisant le site du projet pour le pâturage. La taille du bétail des bergers identifiés varie de 30 à 400 têtes. Le nombre de PAPs est de 20 éleveurs. Les enquêtes socio-économiques sur les ménages ont permis d'identifier 64 personnes à charge des PAPs qui peuvent dépendre du bétail des éleveurs. Ce qui a requis la préparation et la mise en œuvre d'un Plan d'Action de Réinstallation Abrégé (PARA). Le coût PARA pour la centrale solaire est estimé à **450 000 DT** (140 000 USD) dont le coût de préparation du Plan de Développement Communautaire qui est estimé à **50 000 DT** (15 000 USD).
- Emploi et gestion de la main d'œuvre avec une considération relative au genre et à la vulnérabilité. En tenant aussi compte du plan de développement communautaire.
- Les impacts sur les infrastructures et les services publics principalement (i) les ressources en eau estimées à 5500 m<sup>3</sup> pendant la phase de construction et à environ 115 m<sup>3</sup>/an pendant la phase d'exploitation en considérant une méthode de nettoyage à sec (l'utilisation de nettoyage à sec permet d'économiser environ 3 000 m<sup>3</sup>/an), (ii) les déchets et rejets, il est à noter que la gestion de déchets dangereux (le cas échéant) doit tenir compte de la disponible du centre de Jeradou.
- Le changement de débit de drainage, la qualité de l'eau et du sol, la production et l'élimination des déchets solides.

Les tableaux ci-dessous fournissent un résumé sur les impacts identifiés pendant les phases de construction, d'exploitation et de démantèlement :

**Tableau 2 : Résumé des impacts pendant la phase de construction du Projet**

Impacts	Type d'effet	Durée	Réversibilité	Sensibilité des récepteurs	Ampleur	Importance sans atténuation	Importance avec atténuation
<b>Impacts sur le milieu physique</b>							
Paysage et Visuel	Direct	Long terme	Irréversible	Faible	Faible	Mineure	Insignifiante
Ressources en sol et en eaux	Direct	Court terme	Réversible	Faible	Faible	Insignifiante	-
Risque d'inondation	Direct	Long terme	Réversible	Moyenne	Faible à moyenne	Modérée	Mineure
Qualité de l'air	Direct	Court terme	Réversible	Faible	Moyenne	Mineure	Insignifiante
Bruit	Direct	Court terme	Réversible	Faible	Moyenne	Mineure	Insignifiante
<b>Impacts sur le milieu biologique</b>							
Flore	Direct & indirect	Long terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
Faune	Direct & indirect	Long terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
<b>Impacts sur le milieu social</b>							
Utilisations des terres	Direct	Long terme	Irréversible	Faible	Faible	Insignifiante	-
Archéologie et patrimoine culturel	Direct	Court terme	Irréversible	Faible	Moyenne	Mineure	Insignifiante
Intrusion de personnel non autorisé	Direct	Court terme	Irréversible	Elevée	Faible	Mineure	Insignifiante
Afflux de travailleurs	Direct	Court terme	Irréversible	Elevée	Moyenne	Modérée	Mineure
Personnels de sécurité	Direct	Court terme	Irréversible	Moyenne	Faible	Mineure	Insignifiante
La santé et la sécurité au travail	Direct	Court terme	Irréversible	Elevée	Faible	Mineure	Insignifiante
Violations du droit du travail dans la chaîne d'approvisionnement	Direct	Court terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
Risques communautaires pour la santé et la sécurité - transport routier	Direct	Court terme	Irréversible	Elevée	Elevée	Majeure	Mineure
Économie nationale, locale et régionale	Direct & Indirect	Court terme	Réversible	Moyenne	Moyenne	Mineure	-
Emploi et gestion de la main-d'œuvre	Direct	Court terme	Réversible	Elevée	Moyenne	Modérée	-
Développement communautaire	Direct	Long terme	Irréversible	Elevée	Moyenne	Modérée	-
<b>Impacts sur les infrastructures et les services publics</b>							
Ressources en eau	Direct	Court terme	Réversible	Moyenne	Faible	Mineure	Insignifiante
Services de déchets	Direct	Court terme	Réversible & Irréversible	Faible	Faible	Insignifiante	-

**Tableau 3 : Résumé des impacts pendant la phase d'exploitation du Projet**

Impacts	Type d'effet	Durée	Réversibilité	Sensibilité des récepteurs	Ampleur	Importance sans atténuation	Importance avec atténuation
<b>Impacts sur le milieu physique</b>							
Paysage et Visuel	Direct & indirect	Long terme	Irréversible	Faible	Moyenne	Mineure	Insignifiante
Risque d'inondation	Direct & indirect	Long terme	Réversible	Moyenne	Elevée	Modérée	-
<b>Impacts sur le milieu biologique</b>							
Flore	Direct & indirect	Long terme	Réversible & Irréversible	Moyenne	Moyenne	Mineure	Insignifiante
Faune	Direct & indirect	Long terme	Réversible & Irréversible	Moyenne	Moyenne	Mineure	Insignifiante
<b>Impacts sur le milieu socio-économique</b>							
Personnels de sécurité	Direct	Long terme	Irréversible	Moyenne	Faible	Mineure	Insignifiante
La santé et la sécurité au travail	Direct	Long terme	Irréversible	Elevée	Faible	Mineure	Mineure
Violations du droit du travail dans la chaîne d'approvisionnement	Direct	Court terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
Économie locale et régionale	Direct & Indirect	Long terme	Réversible	Moyenne	Faible	Mineure	-
Emploi local	Direct & Indirect	Long terme	Réversible	Moyenne	Faible	Mineure	-
Développement communautaire	Direct	Long terme	Irréversible	Elevée	Moyenne	Modérée	-
<b>Impacts sur les infrastructures et les services publics</b>							
Ressources en eau	Direct	Long terme	Réversible	Moyenne	Faible	Mineure	Insignifiante
Services de déchets	Direct	Long terme	Réversible & Irréversible	Faible	Faible	Insignifiante	-

**Tableau 4 : Résumé des impacts pendant la phase de démantèlement du Projet**

Impacts	Type de l'effet	Durée	Réversibilité	Sensibilité des récepteurs	Ampleur	Importance sans atténuation	Importance avec atténuation
<b>Impacts sur le milieu physique</b>							
Paysage et Visuel	Direct	Court terme	Réversible	Faible	Elevée	Mineure	Mineure
<b>Impacts sur le milieu biologique</b>							
Flore	Direct & indirect	Court terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
Faune	Direct & indirect	Court terme	Réversible & Irréversible	Elevée	Moyenne	Modérée	Mineure
<b>Impacts sur le milieu socio-économique</b>							
La santé et la sécurité au travail	Direct	Court terme	Irréversible	Elevée	Faible	Mineure	Mineure
<b>Impacts sur les infrastructures et les services publics</b>							
Ressources en eau	Direct	Court terme	Réversible	Moyenne	Faible	Mineure	Insignifiante
Services de déchets	Direct	Court terme	Réversible & Irréversible	Faible	Faible	Insignifiante	-

## 7. Consultation publique

Des consultations ont été menées au cours de cette phase de préparation de l'EIES. Les consultations clés sont les suivantes :

- Principales entités gouvernementales régionales et locales : Gouvernorat de Kairouan, les députés du gouvernorat de Kairouan à l'Assemblée des Représentants du Peuple (ARP), la Direction du Développement Régional (DDR), Société Tunisienne de l'Electricité et du Gaz (STEG), l'Agence pour la Promotion de l'Industrie et de l'Innovation (APII), l'Union Tunisienne de l'Agriculture et de la Pêche (UTAP), la Municipalité de Sbikha, la Direction régionale des Domaines de l'État et des Affaires Foncières (DRDEAF), le Commissariat Régional au Développement Agricole (CRDA).
  - Une consultation publique a été réalisée le 27 /10/2020 afin de présenter le Projet.
  - Une réunion de divulgation a été réalisée le 03/03/2022 afin de présenter les différents résultats de l'EIES.
- Des consultations avec les entités locales, Agence Nationale de Gestion des Déchets (ANGed), Agence Nationale de Protection de l'Environnement (ANPE), Société Tunisienne de l'Electricité et du Gaz (STEG), Société nationale d'exploitation et de distribution des eaux (SONEDE), Office Nationale de l'Assainissement (ONAS) et le Commissariat Régional au Développement Agricole (CRDA), entreprises pendant la phase de due diligence environnementale et sociale en août et septembre 2021.
- Communauté affectée : utilisateurs des terres, représentants des établissements d'enseignement et des établissements de santé, y compris les groupes vulnérables. Une série de consultation a eu lieu le 19 octobre 2020 dans cinq secteurs :
  - Secteur El Alem : 13 hommes et une femme
  - Secteur El Dalloussi : 10 hommes et 2 femmes
  - Secteur Bir Jdid : 7 hommes
  - Secteur El Bechechma : 10 hommes et 3 femmes
  - Secteur Metbasta : groupe d'hommes
- Une deuxième série de réunion a été menée avec des groupes de discussion de la communauté de Metbasta :
  - Groupe d'hommes (15 personnes), consulté le 04 février 2022.
  - Groupe de jeunes diplômés actifs et non actifs (8 personnes), consulté le 04 février 2022.
  - Groupe de femmes (8 personnes), consulté le 06 février 2022.
- ONG et zone industrielle à proximité.

De manière générale, les principales conclusions et observations du processus de consultation étaient les suivantes :

**Attentes positives du projet** : il a été conféré que la plupart des gens considéraient le projet comme un développement positif pour les communautés, notamment en termes d'opportunités d'emploi et de contrat de sous-traitances, d'améliorations des infrastructures et d'approvisionnement en électricité.

**Restriction d'accès au terrain** : La centrale solaire sera construite sur un terrain relevant du domaine privé de l'Etat tunisien, d'une superficie de 200 hectares. Cela peut entraîner une perte potentielle des moyens de subsistance du pâturage.

Au total 7 éleveurs de bétail ont été rencontrés et interrogés par rapport au projet solaire et de la ligne aérienne de transmission HT associée. Ces consultations ont été réalisées en octobre 2020, 04 février et le 20 août 2022.

Cependant, suite à la consultation des utilisateurs des terres, il appert que l'activité de pâturage n'est pas limitée à la zone du projet ; elle est aussi entreprise dans d'autres zones environnantes suffisantes présentant des caractéristiques biologiques similaires.

## 8. Plan d'Action de Réinstallation Abrégé (PARA)

Les résultats de l'enquête du CRDA (mai 2022) ont conclu que le nombre d'éleveurs utilisant potentiellement le site de la centrale solaire et une section de la LEAHT est limité à une vingtaine (10 éleveurs de Dallousi et 10 éleveurs de Metbasta). La taille du bétail des bergers identifiés varie de 30 à 400 têtes.

Les résultats de l'enquête du CRDA (mai 2022) ont conclu que le nombre d'éleveurs utilisant potentiellement le site de la centrale solaire et une section de la LEAHT est limité à une vingtaine (10 éleveurs de Dallousi et 10 éleveurs de Metbasta).

Le nombre de PAPs est de 20 éleveurs. Les enquêtes socio-économiques sur les ménages ont permis d'identifier 64 personnes à charge des PAPs qui peuvent dépendre du bétail des éleveurs.

Le coût PARA pour la centrale solaire est estimé à **450 000 DT** (140 000 USD). Le coût de la préparation du Plan de Développement Communautaire qui est estimé à **50 000 DT** (15 000 USD).

Le nombre total de Personnes affectées par la Centrale solaire et la LEAHT est de 42 PAPs. Le coût global du PARA est estimé à 900 000 DT soit environ 280 000 USD.

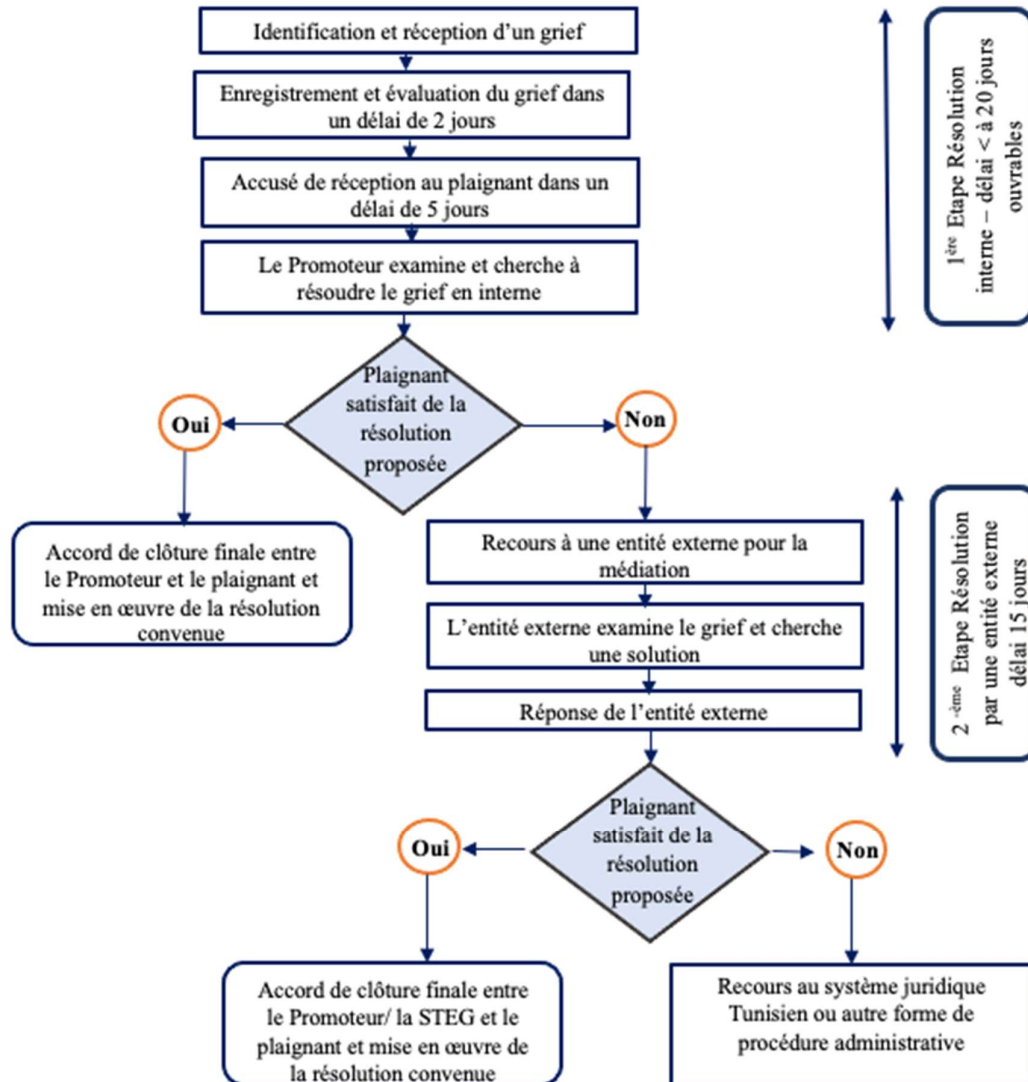
## 9. Mécanisme de gestion des plaintes (MGP) au niveau du projet

Le mécanisme de règlement des griefs vise à résoudre les problèmes rapidement, en utilisant une procédure compréhensible et transparente, culturellement appropriée et facilement accessible, sans frais et sans représailles pour la partie à l'origine du grief. Le mécanisme a été conçu de manière à ne pas entraver l'accès à une future procédure judiciaire ou administrative et à garantir la confidentialité de la personne ou du groupe à l'origine du grief. Tout groupe/individu peut soumettre un grief/une plainte au Promoteur / à la STEG. Toutes les plaintes seront considérées et reconnues comme une opportunité d'amélioration ou une recommandation. Le coût du MGP est estimé à **15 000 DT** (environ 5 000 USD)

Une plainte peut être déposée de l'une des manières suivantes :

- Gouvernorat de Kairouan
  - Adresse : Avenue de l'Environnement 3100, Kairouan, Tunisie
  - Tel : (+216) 77 226 777 / Fax : (+216) 77 228 450
  - E-mail Adresse : [gouv.gouvkairouan@planet.tn](mailto:gouv.gouvkairouan@planet.tn)
- Municipalité de Sbikha
  - Adresse : Rue 18 Janvier 1952 Sbikha, Kairouan, Tunisie
  - Tel : (+216) 77 365 517 / Fax : (+216) 77 365 517
  - E-mail Adresse : [contact@commune-sbikha.gov.tn](mailto:contact@commune-sbikha.gov.tn)
- En transmettant un message par l'intermédiaire du responsable social engagé par le Promoteur pour assurer la liaison avec les plaintes et toutes les questions sociales :  
Donia MEJRI : email : [Donia.Mejri@ameapower.com](mailto:Donia.Mejri@ameapower.com);

En cas de conflit, la résolution à l'amiable par la médiation en suivant les méthodes stipulées ci-dessous est la méthode privilégiée :



### Procédure de gestion d'un grief

#### 10. Plan de Gestion Environnementale et Sociale (PGES)

Un plan de gestion environnementale et sociale (PGES) détaillé a été préparé pour chaque phase du projet (construction, exploitation, démantèlement), y compris l'identification appropriée des (ou de) :

- mesures de gestion identifiées qui visent à éliminer et/ou à réduire l'impact potentiel à des niveaux acceptables. Les mesures de gestion comprennent des actions d'atténuation, des exigences supplémentaires, des études complémentaires, etc ;
- actions de surveillance pour s'assurer que les mesures d'atténuation identifiées sont bien mises en œuvre - sachant que les actions de surveillance comprennent les inspections, l'examen des rapports/plans, les rapports, etc. ;

- la fréquence de mise en œuvre des actions de surveillance qui peuvent être continues tout au long de la période de construction/exploitation (selon la mesure d'atténuation identifiée, il peut s'agir d'une fréquence quotidienne, hebdomadaire ou mensuelle), ou ponctuelles – à l'apparition d'un certain problème ;
- les paramètres et l'emplacement des actions de surveillance, tels qu'identifiés et applicables ;
- l'entité responsable de la mise en œuvre des mesures d'atténuation et des actions de surveillance identifiées.
- l'entité responsable de la mise en œuvre des actions d'atténuation et de suivi identifiées (entrepreneur EPC, opérateur de projet) ;
- le coût lié à chaque action identifiée.

**Tableau 5 : Plan de Gestion Environnementale et Sociale (PGES) de la phase de planification et de construction**

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
Générale	-	Préparer et soumettre un <b>PGES chantier</b> ou PGES-E aux bailleurs (SFI/BAD) pour validation avant l'installation de chantiers et le démarrage de tous travaux.	Exigences supplémentaires	Soumission d'un plan	Une fois avant la construction	Contractant EPC	20,000
		<b>Manuel HSE</b> (en accord avec le Promoteur) qui doit inclure : (i) la politique HSE ; (ii) la politique et les procédures en matière de ressources humaines ; (iii) la structure organisationnelle et les responsabilités HSE ; (iv) le plan de formation, de suivi et de rapport HSE	Exigences supplémentaires	Soumission d'un plan	Une fois avant la construction	Contractant EPC	20,000
	-	S'engager par écrit du respect scrupuleux de cet engagement et soumettra aux bailleurs (SFI/BAD) une description des procédures qu'il mettra en place pour y arriver en collaboration avec le EPC Contractor	Exigences supplémentaires	Soumission d'un plan	Une fois avant la construction	Promoteur	-
Paysage et visuel	Impacts visuels et paysagers dus à la présence d'éléments typiques d'un chantier de construction tels que des équipements et des machines.	S'assurer de la mise en œuvre de mesures appropriées de gestion du personnel et d'entretien général, notamment : (i) s'assurer que le site de construction est laissé en ordre à la fin de chaque journée de travail, (ii) traiter correctement les flux de déchets, (iii) s'assurer que toutes les zones sont entièrement remises en état après avoir été utilisées pour les travaux de construction, (v) s'assurer que toutes les lumières artificielles adoptent une stratégie d'éclairage vers le bas afin de limiter leurs émissions en dehors du site du projet.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	20,000
Utilisation des terres	Le projet réduira les pâturages disponibles pour les bergers.	Entreprendre des consultations avec ces utilisateurs des terres avant le début de toute activité de construction pour les informer du calendrier du projet, de la construction de la clôture de délimitation, des activités de construction à entreprendre, des impacts attendus, et souligner que le pâturage peut être entrepris dans les zones environnantes. Mise en œuvre du Plan d'Action de Réinstallation Abrégé	Exigences supplémentaires	Soumission d'un plan	Une fois avant la construction	Promoteur	-
Géologie, hydrologie & hydrogéologie	Risque de contamination des sols et des eaux souterraines au cours des diverses activités de construction par des fuites et des déversements provenant de l'utilisation des engins de construction et des activités de ravitaillement en carburant, ainsi que par le rejet des eaux usées du camp de vie des travailleurs. En plus, l'utilisation d'engins de construction entraînera la dégradation des sols et la modification des flux de drainage locaux (compactage du sol, perturbation physique, création de tranchées le long des traces de pneus, excavations et stockage de matériaux). Cela pourrait entraîner la turbidité des récepteurs d'eau de surface à proximité.	Veiller à la disponibilité des kits de déversement à certains endroits du site, notamment dans la zone de ravitaillement en carburant.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	10,000
		Le camp de vie et le site de construction seront situés à plus de 100 mètres du cours d'eau le plus proche afin de réduire le risque de pollution directe par les installations sanitaires, le stockage de quelques matières dangereuses et la zone bétonnée.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Une zone dédiée au ravitaillement en carburant sera utilisée et équipée d'une surface imperméable, de puisards de délimitation pour récupérer tout déversement localisé avant qu'il ne puisse s'échapper dans l'environnement. Cette zone sera également protégée des eaux de pluie.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	10,000
		Les engins de construction ne seront pas autorisés à circuler en dehors des routes.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Assurer un entretien régulier des machines, afin de diminuer le risque de pollution accidentelle.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	15,000
		Les premiers 20-30 cm de terre seront excavés et stockés pour une réutilisation ultérieure afin de préserver la couche arable pendant les travaux d'excavation. Cette terre sera stockée sur une zone dédiée, non compactés de 1 à 2 m de hauteur, afin de préserver la qualité du sol. La terre arable sera réutilisée pour la restauration et la réhabilitation.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	50,000
	Risque d'inondations locales, en particulier pendant la saison des pluies et les crues soudaines, en raison de la présence de trois systèmes d'oueds.	Entreprendre une <b>évaluation des risques d'inondation</b> qui devrait identifier les mesures d'ingénierie à mettre en œuvre pour éliminer ces risques. Il est recommandé d'effectuer une évaluation des risques liés au changement climatique sur la zone du projet et de mettre en œuvre un scénario d'inondation pour prédire et quantifier les changements futurs des risques d'inondation. Les risques d'inondation projetés (étendue et élévation du niveau de l'eau) ainsi que les zones potentiellement affectées peuvent être modélisés dans le cadre des scénarios actuels et futurs.	Etudes supplémentaires	Soumission de l'évaluation des risques d'inondation	Une fois avant la construction	Contractant EPC	50,000
Biodiversité	Les activités de construction comprenant le défrichage, la circulation des véhicules de construction, la construction de routes pourraient perturber les habitats existants (flore, faune, avifaune) et toute espèce qui pourrait être présente sur le site du projet.	Entreprendre un inventaire supplémentaire des espèces pendant la saison humide pour vérifier l'absence de flore protégée qui pourrait être présente autour du cours d'eau de Boushkima et du ruisseau temporaire au sud.	Etudes supplémentaires	Soumission de l'inventaire des espèces	Une fois avant la construction	Contractant EPC	10,000
		Entreprendre un inventaire supplémentaire des espèces pendant la saison humide pour détecter les oiseaux et les amphibiens afin d'éviter les zones ou les espèces sensibles, proposer des mesures d'atténuation supplémentaires et mieux comprendre la circulation de la faune sur le site et l'utilisation du cours d'eau Boushkima et de la zone humide par la faune locale (amphibiens, oiseaux et mammifères).	Etudes supplémentaires	Soumission de l'inventaire des espèces	Une fois avant la construction	Contractant EPC	10,000
		Réaliser les travaux de défrichage et de terrassement pendant la période sèche (juillet - septembre) afin de limiter les impacts sur la faune (période de nidification des oiseaux s'étend	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
		de mi-mars à mi-juillet) et d'éviter si possible les périodes pluvieuses.					
		Afin de ne pas introduire d'espèces végétales invasives pendant les travaux, il est recommandé de nettoyer les machines avant leur arrivée sur le site. Des contrôles de qualité des équipements apportés sur le site seront également effectués.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000
		Baliser et clôturer les activités de construction.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	Inclus dans le coût du projet
		Planifier la préparation du site et la construction en ayant le moins d'impacts possible sur la couverture végétale et le sol.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Prévoir des interstices dans les clôtures pour permettre à la faune de passer.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000
		Choisir une conception des infrastructures respectueuse de la faune, par exemple, des clôtures surélevées pour permettre aux petits mammifères de se déplacer, des canaux de drainage bien conçus pour éviter que les animaux ne soient piégés à l'intérieur.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Planifier le tracé des infrastructures en évitant autant que possible les caractéristiques des habitats naturels	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Limiter les déplacements des véhicules sur des routes sales/non pavées afin de réduire les impacts sur la végétation naturelle environnante.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Éviter les abords du cours d'eau Boushkima pour préserver les habitats humides, notamment pendant la saison des pluies, afin de réduire les impacts sur les oiseaux, les batraciens et les mammifères.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Assurer une gestion appropriée des risques de pollution pour prévenir tout impact sur la faune et en particulier les batraciens.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Établir et former les travailleurs sur un code de conduite approprié à respecter, incluant l'interdiction de couper des arbres, de chasser, de conduire hors les routes sélectionnées, etc.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000
		Engager un écologiste pour le suivi les mesures environnementales pendant la phase de construction, en particulier pour le défrichage et le terrassement.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	30,000
		La restauration et la revégétalisation (restauration écologique) des zones d'utilisation temporaire, des zones de dépôt et des zones distribuées pendant la construction des panneaux PV, dès la fin des activités de construction. La conception de la méthode de restauration sera effectuée par un spécialiste compétent.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	30,000
		Restauration des habitats naturels qui seront perturbés pendant le développement des panneaux PV afin d'atteindre l'objectif de l'absence de perte nette pour la biodiversité.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	50,000
		La zone de l'étang temporaire de l'habitat naturel de <i>Gomphus lucasii</i> sera protégée autant que possible. La sensibilité de cette zone sera communiquée à tous les travailleurs sur le site. Aucun véhicule ne sera autorisé à circuler dans cette zone. La végétation sera immédiatement restaurée si elle est endommagée.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Il est recommandé d'intégrer des éléments d'éco-conception afin de fournir des zones humides temporaires dans les fossés de délimitation comme habitat pour <i>Gomphus lucasii</i> .	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000
		La digue sera construite de manière à reproduire le canal d'un cours d'eau naturel, en prévoyant des zones d'étangs et des berges de différentes pentes.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	10,000
Archéologie	Les activités de construction pourraient endommager/déranger les vestiges archéologiques potentiels qui pourraient être enfouis dans le sol (le cas échéant).	Mettre en place une procédure de découverte fortuite de tout vestige archéologique pendant la construction. Cela implique notamment d'arrêter les activités de construction et de clôturer la zone, tout en informant immédiatement l'Institut National du Patrimoine (INP) et en suivant les procédures applicables. Aucun travail supplémentaire ne sera autorisé avant que l'INP n'évalue le site archéologique potentiel découvert et n'accorde l'autorisation de reprendre les travaux. Les activités de construction peuvent se poursuivre dans d'autres parties du site si aucun vestige archéologique potentiel n'a été découvert.	Mesures d'atténuation	Soumission d'un rapport à l'INP	À l'occurrence	Contractant EPC	5,000
Infrastructures et services publics	Besoins en eau - les besoins en eau du projet pourraient entraîner des contraintes pour les utilisateurs existants.	Préparer un <b>plan de gestion de l'eau</b>	Exigences supplémentaires	Soumission d'un plan	Une fois avant la construction	Contractant EPC	2,000
		Documenter la consommation d'eau du projet.		Soumission d'un rapport mensuel	Continue	Contractant EPC	2,000
		Minimisation par des contrôles de réduction, impliquant la prise de mesures de conservation de l'eau et de gestion des eaux usées (par exemple, installation de recyclage de l'eau).	Mesures d'atténuation	Inspection	Chaque trimestre	Contractant EPC	15,000

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
	Services publics de gestion des déchets - il est important de s'assurer que les services publics existants seront en mesure de traiter la quantité de déchets solides, d'eaux usées et de déchets dangereux.	Coordonner avec l'ANGED la collecte des déchets non dangereux du site vers la décharge de Kairouan ou un autre endroit, qui sera inspecté avant utilisation.	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant la construction	Contractant EPC	2,000
		Utilisation des services des sociétés spécialisées autorisées par le Ministère de l'Environnement (ME) pour la gestion des déchets dangereux (la liste des entreprises autorisées pour la gestion des déchets dangereux est disponible sur le site web de l'ANGED). Réservation d'une zone pour le stockage provisoire des déchets dangereux sur site, si nécessaire.	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant la construction	Contractant EPC	50,000
		L'élimination finale sera contrôlée pour vérifier la conformité avec les normes de la SFI/BAD et de la GIIP.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	5,000
		Élaborer un <b>plan de gestion des déchets</b> comprenant des mesures visant à éviter, minimiser, réutiliser et recycler les déchets avant qu'ils ne soient envoyés pour traitement/élimination. Et prévoir des mesures pour la gestion temporaire des déchets dangereux pendant la fermeture provisoire du centre de Jeradou. Prévoir des mesures pour la gestion temporaire des déchets dangereux pendant la fermeture provisoire du centre de Jeradou.	Etudes supplémentaires	Soumission du plan de gestion des déchets	Une fois avant la construction	Contractant EPC	10,000
		Fournir des installations sanitaires adéquates, c'est-à-dire des toilettes et des douches pour la main-d'œuvre pendant la phase construction ;	Mesures d'atténuation	Inspection	Chaque trimestre	Contractant EPC	Inclus dans le coût du projet
		Toute installation de gestion des déchets ou société de transport/manutention tierce sera inspectée avant son utilisation afin de s'assurer qu'elle est exploitée en conformité avec la législation nationale et le GIIP. Les eaux usées sanitaires seront collectées dans une fosse étanche et évacuées par camion-citerne la station ONAS de Sbikha, ou tout autre endroit.	Mesures d'atténuation	Inspection	Chaque trimestre	Contractant EPC	5,000
		Tous les transferts de déchets seront accompagnés d'une documentation sur la chaîne de possession qui enregistre le lieu d'origine des déchets, le type de déchets, le transporteur des déchets et la destination finale des déchets. Un registre détaillé sera tenu pour enregistrer et documenter tous les flux de déchets.	Mesures d'atténuation	Examiner les dossiers/registres de la chaîne de possession pour en assurer la cohérence.	Chaque trimestre	Opérateur du projet	2,000
Qualité de l'air et bruit	Les activités de construction entraîneront probablement une augmentation du niveau d'émissions de poussières et de particules qui, à leur tour, auront un impact direct sur la qualité de l'air ambiant.	Réduire au minimum le stockage des déchets et autres matières poussiéreuses.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Appliquer des mesures de contrôle et de réduction de la poussière, notamment l'arrosage régulier des routes, la planification des activités génératrices de poussière afin de réduire la durée pendant laquelle ces activités ont lieu	Mesures d'atténuation	Inspection	Continue	Contractant EPC	20,000
		Inspecter et recouvrir régulièrement les stocks et les matériaux d'excavation si ces derniers ne peuvent pas être facilement utilisés ailleurs.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	20,000
		Recouvrement adéquat des camions transportant des agrégats et des matériaux fins.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	20,000
		Respecter une limite de vitesse de 15-20 km/h pour les véhicules sur le site de construction.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Interdire la marche au ralenti des véhicules afin de minimiser autant que possible la consommation de carburant et les émissions atmosphériques.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Interdire le brûlage des déchets solides sur le site.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Élaborer un programme d'inspection et d'entretien régulier des véhicules, des machines et des équipements qui seront utilisés pendant la phase de construction, afin de détecter rapidement les problèmes et d'éviter les émissions polluantes inutiles, avant d'être autorisés à être déployés/utilisés sur le site.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	2,000
		Optimiser les itinéraires afin de réduire le nombre de véhicules pour le transport du personnel et des équipements.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Informar la zone industrielle voisine de la date de début des travaux de construction et de la génération potentielle d'émissions dans l'air et de poussières. Cette information comprendra des détails sur le mécanisme de règlement des griefs du projet.	Etudes supplémentaires	Plan d'engagement des parties prenantes	Continue	Contractant EPC	-
Évaluation de l'état initial de la qualité de l'air	Recommandation	Inspection	Une fois avant la construction	Contractant EPC	5,000		
Les éventuelles émissions sonores dans l'environnement dues aux activités de	Seulement des équipements bien entretenus doivent être utilisés sur le site afin d'éviter de générer des sources de bruit inutiles.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-	

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
	construction, qui comprendront l'utilisation d'engins et de véhicules.	Respecter une limite de vitesse de 15-20 km/h pour les véhicules sur le site de construction.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Interdire la marche au ralenti des véhicules.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Optimiser les itinéraires afin de réduire le nombre de véhicules pour le transport du personnel et des équipements.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Aucun travail ne sera effectué la nuit afin d'éviter des perturbations importantes pour les communautés environnantes. Les opérations les plus bruyantes (battage de pieux, dynamitage, marteau hydraulique, terrassement et nivellement) ne seront effectuées qu'entre 8h et 18h	Mesures d'atténuation	Inspection	Continue	Contractant EPC	-
		Informers la zone industrielle voisine de la date de début des travaux de construction et des éventuelles émissions sonores. Cette information comprendra des détails sur le mécanisme de règlement des griefs du projet.	Etudes supplémentaires	Plan d'engagement des parties prenantes	Continue	Contractant EPC	-
Socio-économique	Le projet aura une influence positive sur l'économie régionale et nationale pendant la construction grâce à l'achat et à la fourniture directe de matériaux et de services par des entreprises basées dans le gouvernorat de Kairouan et ailleurs en Tunisie.	Il est recommandé que le contractant EPC adopte et mette en œuvre une <b>politique de contenu local</b> qui vise à acquérir des biens et des services auprès de PME basées à Kairouan afin de renforcer les impacts économiques qui résulteront du développement du projet au niveau du gouvernorat. Ce plan doit être élaboré sous la supervision du Promoteur.	Recommandation	Soumission de la politique	Une fois avant la construction	Contractant EPC (sous la supervision du Promoteur)	15,000
	Le projet devrait offrir des opportunités d'emploi aux communautés locales. Cela pourrait contribuer à améliorer le cadre de vie de ses habitants et apporter une prospérité économique et sociale à la communauté locale, y compris aux groupes vulnérables tels que les femmes.	Il est recommandé que le Contractant EPC adopte et mette en œuvre un <b>Plan d'Emploi Local de Construction</b> pour travailler avec les membres de la communauté locale pendant la phase de construction. Le plan doit viser à soutenir la communauté locale en énonçant ses buts et objectifs et doit reconnaître l'importance de construire une relation socio-économique solide avec la communauté locale par le biais d'un programme de planification participative. Le plan doit être élaboré sous la supervision du Promoteur.	Recommandation	Soumission du plan	Une fois avant la construction	Contractant EPC (sous la supervision du Promoteur)	15,000
	Le projet apportera une série d'avantages aux communautés locales dans les environs du projet.	Le Promoteur élaborera et mettra en œuvre un <b>plan de développement communautaire (CDP)</b> .	Recommandation	Soumission du plan	Une fois avant la construction	Promoteur	30,000
Santé et sécurité au travail	Le travail sur les chantiers de construction comporte certains risques génériques pour la santé et la sécurité des travailleurs, car il augmente le risque de blessures ou de décès dus à des accidents.	Préparer un <b>plan de santé et de sécurité au travail</b> et adopter et mettre en œuvre ses recommandations/provisions du plan de santé et de sécurité au travail.	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	15,000
		Un rapport de gestion et de performance HSE sur les travaux en cours sur le site du projet sera présenté chaque mois et chaque trimestre. Chaque rapport est remis au maître d'ouvrage et à la branche HSE responsable au plus tard le 5 du mois suivant la fin du trimestre concerné et devra contenir les données suivantes conformément aux procédures de surveillance et d'établissement de rapports HSE d'entreprise du projet : Résumé des accidents/incidents survenus au cours du dernier mois ; Résumé des heures de travail quotidiennes et cumulées ; Pertes de temps dues aux accidents/incidents ; Données relatives aux soins de premiers secours ; Quasi-accidents/conditions dangereuses signalées ; Exercices d'urgence effectués ; Nombre d'heures de formation, y compris la formation sur la boîte à outils ; Audit de sécurité et informations sur les réunions ; Déchets collectés et éliminés ; Consommation d'eau ; Consommation d'électricité ; Consommation de carburant ; Données relatives à la surveillance environnementale	Exigences complémentaire	Inspection	Chaque mois et chaque trimestre	Contractant EPC	15,000
		Préparer un <b>plan de préparation et de réponse aux urgences</b> qui prend en compte une série de mesures organisationnelles, opérationnelles et préventives en cas d'urgence. Le gazoduc sera pris en compte dans le plan de préparation et de réponse aux urgences en coordination avec la STEG et les autorités compétentes.	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	15,000
Violations potentielles du droit du travail dans la chaîne d'approvisionnement des panneaux solaires photovoltaïques (Travail des enfants / travail forcé / esclavage moderne)	L'utilisation d'une chaîne d'approvisionnement introduit le risque de violations du droit du travail. (Travail des enfants / travail forcé / esclavage moderne dans la chaîne d'approvisionnement solaire photovoltaïque).	Faire la diligence raisonnable et prendre toutes les précautions nécessaires et faire des investigations anticipatives et approfondies pour s'assurer de l'origine et des modalités d'approvisionnement des équipements, des composants, des matériaux et autres fournitures utilisés pour la construction de la centrale solaire afin que ceux-ci ne seraient pas fabriqués et approvisionnés par des firmes (ou des sous-traitants) qui ne se conforment pas aux politiques et normes des bailleurs (BAD et SFI) qui interdisent catégoriquement et bannissent (i) le travail des enfants ou l'emploi abusif des personnes vulnérables et (ii) la pratique du travail forcé, de la traite des personnes et de l'esclavage moderne. Utiliser le formulaire d'évaluation des risques de la BAD	Exigences complémentaire	Inspection	Avant la construction et en continue	Promoteur/ Contractant EPC	15,000
Santé et sécurité communautaires		Installer une clôture autour des limites du projet pour limiter l'accès du public au site.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	Inclus dans le coût du projet

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
	L'intrusion de personnes non autorisées sur le site du projet pourrait entraîner des risques potentiels liés à plusieurs dangers.	Des agents de sécurité seront chargés d'empêcher tout accès non autorisé.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	50,000
		Veillez à ce que les clôtures soient équipées de panneaux d'avertissement (en arabe et en français) afin de dissuader les gens de pénétrer sur le site.	Mesures d'atténuation	Inspection	Continue	Contractant EPC	Inclus dans le coût du projet
	L'afflux de travailleurs du projet pourrait avoir certains impacts sur la santé, la sûreté et la sécurité de la communauté, tels que des maladies à risque, un code de conduite inapproprié, une augmentation des vices sociaux, etc.	Préparer et mettre en œuvre un plan d'hébergement des travailleurs conformément au contenu applicable de la publication de la SFI/BERD intitulée : "Workers' accommodation : processes and standards - A guidance note (2010)".	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	10,000
		Préparer un <b>plan d'hébergement des travailleurs</b> , qui doit fournir des détails sur les besoins en hébergement de la main-d'œuvre, notamment l'emplacement, les installations, les besoins en transport, etc.	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	5,000
		Préparer et mettre en œuvre un <b>plan d'afflux de travailleurs</b> .	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	5,000
	Une gestion inappropriée des questions de sécurité et des incidents par le personnel de sécurité envers les communautés locales pourrait entraîner du ressentiment, de la méfiance et des conflits.	Préparer un <b>plan de gestion de la sécurité</b> qui doit identifier les mesures appropriées pour l'embauche, les règles de conduite, la formation, l'équipement et le suivi du personnel de sécurité pour contrôler et gérer ces questions.	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Contractant EPC	10,000
	L'utilisation de véhicules de transport pourrait entraîner des risques importants pour la santé et la sécurité des communautés.	Préparer et mettre en œuvre un <b>plan de circulation et de transport</b> avant le début de toute activité de transport afin de s'assurer que le processus de transport est correctement et adéquatement géré.	Etudes supplémentaires	Soumission du plan	Une fois avant la construction	Etudes supplémentaires	10,000
Formation et sensibilisation							50,000
<b>Coût du PGES phase construction en Dinars Tunisien</b>							<b>785,000</b>
<b>Coût du PGES phase construction équivalent en dollars</b>							<b>245,000</b>

Tableau 6 : Plan de Gestion Environnementale et Sociale (PGES) de la phase d'exploitation

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
Biodiversité	Perturbation des habitats existants (flore, faune, avifaune) qui pourraient être présents sur le site du projet. En plus, d'autres impacts pourraient être dus à une mauvaise gestion du site (par exemple, l'utilisation de pesticides).	Mettre en œuvre et entreprendre un programme de lutte contre la mortalité des oiseaux pendant la phase d'exploitation, qui comprend une enquête de recherche sur la mortalité des oiseaux.	Exigences supplémentaires	Soumission d'un rapport annuel de surveillance de la mortalité des oiseaux	Trois ans d'exploitation au moins (à réviser après)	Opérateur du projet	85,000
		Utilisation de la fragmentation croissante des surfaces polarisantes des panneaux PV par une grille blanche afin de réduire leur attrait pour les insectes polarotactiques. Mettre en œuvre et entreprendre un programme de surveillance des insectes, en particulier du <i>Gonphus luscasii</i> , sera mis en place pendant la phase d'exploitation, y compris une enquête sur les invertébrés pour s'assurer que les mesures d'atténuation ont été mises en œuvre avec succès.	Exigences supplémentaires	Soumission d'un rapport	Une fois ; avant le début de l'exploitation	Opérateur du projet	5,000
Infrastructures et services publics	Besoins en eau - les besoins en eau du projet pourraient entraîner des contraintes pour les utilisateurs existants.	Préparation du <b>plan de gestion de l'eau</b> en tenant compte de la mise en place d'une méthode de nettoyage à sec	Exigences supplémentaires	Soumission d'un plan	Une fois ; avant le début de l'exploitation	Opérateur du projet	15,000
		Documenter la consommation d'eau du projet.	Exigences supplémentaires	Soumission d'un rapport mensuel	1 fois par mois	Opérateur du projet	5,000
	Services publics de traitement des déchets - il est important de s'assurer que les services publics existants seront en mesure de traiter la quantité de déchets solides, d'eaux usées et de déchets dangereux.	Coordonner avec l'ANGed la collecte des déchets non dangereux du site vers la décharge de Kairouan ou un autre endroit, qui sera inspecté avant utilisation.	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant l'exploitation	Opérateur du projet	-
		Utilisation des services des sociétés spécialisées autorisées par le Ministère de l'Environnement (ME) pour la gestion des déchets dangereux (la liste des entreprises autorisées pour la gestion des déchets dangereux est disponible sur le site web de l'ANGED). Réservation d'une zone pour le stockage provisoire des déchets dangereux sur site, si nécessaire.	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant l'exploitation	Opérateur du projet	-
		L'élimination finale sera contrôlée pour vérifier la conformité avec les normes de la SFI/BAD et de la GIIP.	Mesures d'atténuation	Inspection	Continue	Opérateur du projet	-
		Élaborer un <b>plan de gestion des déchets</b> comprenant des mesures visant à éviter, minimiser, réutiliser et recycler les déchets avant qu'ils ne soient envoyés pour traitement/élimination. Prévoir des mesures pour la gestion temporaire des déchets dangereux pendant la fermeture provisoire du centre de Jeradou.	Mesures d'atténuation	Soumission du plan de gestion des déchets	Une fois avant l'exploitation	Opérateur du projet	15,000
		Toute installation de gestion des déchets ou entreprise de transport/manutention tierce doit être inspectée avant d'être utilisée afin de s'assurer qu'elle est exploitée en conformité avec la législation nationale et la GIIP. Les eaux usées sanitaires seront collectées dans une fosse étanche et évacuées par camion-citerne vers la station ONAS de Sbikha, ou autre endroit.	Mesures d'atténuation	Inspection	Continue	Opérateur du projet	50,000
		Tous les transferts de déchets seront accompagnés d'une documentation sur la chaîne de possession qui enregistre le lieu d'origine des déchets, le type de déchets, le transporteur des déchets et la destination finale des déchets.	Mesures d'atténuation	Examen des registres de la chaîne de possession pour en assurer la cohérence	Continue	Opérateur du projet	-
Socio-économique	Le projet aura une influence positive sur l'économie régionale et nationale pendant son fonctionnement, du fait de l'achat direct et de la fourniture de matériaux et de services par	Il est recommandé que l'Opérateur adopte et mette en œuvre une <b>Politique de Contenu Local</b> qui cherche à acquérir des biens et des services auprès des PME basées à Kairouan pour renforcer les impacts économiques qui résulteront du développement du Projet au niveau du Gouvernorat. Ce plan	Recommandation	Soumission de la politique	Une fois avant l'exploitation	Opérateur du projet (sous la supervision du Promoteur)	15,000

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
	des entreprises basées dans le gouvernorat de Kairouan et ailleurs en Tunisie.	devrait être élaboré sous la supervision du Promoteur.					
	Le projet devrait offrir des opportunités d'emploi aux communautés locales. Cela pourrait contribuer à améliorer le cadre de vie de ses habitants et apporter une prospérité économique et sociale à la communauté locale, y compris aux groupes vulnérables tels que les femmes.	Il est recommandé que l'Opérateur adopte et mette en œuvre un <b>Plan d'Emploi Local</b> pour travailler avec les membres de la communauté locale pendant la phase d'exploitation. Le plan doit viser à soutenir la communauté locale en énonçant ses buts et objectifs et doit reconnaître l'importance d'établir une relation socio-économique solide avec la communauté locale par le biais d'un programme de planification participative. Le plan doit être développé sous la supervision du Promoteur.	Recommandation	Soumission du plan	Une fois avant l'exploitation	Opérateur du projet (sous la supervision du Promoteur)	15,000
	Le projet fournira un ensemble d'avantages pour les communautés locales à proximité du projet.	La société de projet développera et mettra en œuvre un <b>plan de développement communautaire</b> (PDC).	Recommandation	Soumission du plan	Une fois avant l'exploitation	Promoteur	-
Santé et sécurité au travail	Le travail sur les sites opérationnels présentera certains risques génériques pour la santé et la sécurité des travailleurs, car il augmente le risque de blessures ou de décès dus à des accidents.	Préparer un <b>plan de santé et de sécurité au travail</b> et adopter et mettre en œuvre ses recommandations.	Etudes supplémentaires	Soumission du plan	Une fois avant l'exploitation	Opérateur du projet	15,000
		Préparer un <b>plan de préparation et de réponse aux urgences</b> qui prend en compte une série de mesures organisationnelles, opérationnelles et préventives en cas d'urgence.	Etudes supplémentaires	Soumission du plan de préparation et de réponse aux situations d'urgence	Une fois avant l'exploitation	Opérateur du projet	15,000
Violations potentielles du droit du travail dans la chaîne d'approvisionnement des panneaux solaires photovoltaïque (Travail des enfants / travail forcé / esclavage moderne)	L'utilisation d'une chaîne d'approvisionnement introduit le risque de violations du droit du travail. (Travail des enfants / travail forcé / esclavage moderne dans la chaîne d'approvisionnement solaire photovoltaïque).	Faire la diligence raisonnable et prendre toutes les précautions nécessaires et faire des investigations anticipatives et approfondies pour s'assurer de l'origine et des modalités d'approvisionnement des équipements, des composants, des matériaux et autres fournitures utilisés pour la construction de la centrale solaire afin que ceux-ci ne seraient pas fabriqués et approvisionnés par des firmes (ou des sous-traitants) qui ne se conforment pas aux politiques et normes des bailleurs (BAD et SFI) qui interdisent catégoriquement et bannissent (i) le travail des enfants ou l'emploi abusif des personnes vulnérables et (ii) la pratique du travail forcé, de la traite des personnes et de l'esclavage moderne. Utiliser le formulaire d'évaluation des risques de la BAD	Exigences complémentaire	Inspection	Une fois avant la construction	Opérateur du projet	-
Santé et sécurité communautaires	Gestion inappropriée des questions de sécurité et des incidents par le personnel de sécurité envers les communautés locales.	Préparer un <b>plan de gestion de la sécurité</b> qui doit identifier les mesures appropriées pour le recrutement, les règles de conduite, la formation, l'équipement et le suivi du personnel de sécurité afin de contrôler et de gérer ces questions.	Etudes supplémentaires	Soumission du plan de gestion de la sécurité	Une fois avant l'exploitation	Opérateur du projet	15,000
<b>Coût du PGES phase exploitation en Dinars Tunisien</b>							<b>250,000</b>
<b>Coût du PGES phase exploitation équivalent en dollars</b>							<b>77,500</b>

**Tableau 7 : Plan de Gestion Environnementale et Sociale (PGES) de la phase de démantèlement**

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
Paysage et visuel	Incidences visuelles et paysagères dues à la présence d'éléments typiques d'un site de démantèlement, tels que des équipements et des machines.	S'assurer de la mise en œuvre de mesures appropriées de gestion du personnel et d'entretien général, notamment : (i) s'assurer que le site de construction est laissé en ordre à la fin de chaque journée de travail, (ii) traiter correctement les flux de déchets, (iii) s'assurer que toutes les zones sont entièrement remises en état après avoir été utilisées pour les travaux de démantèlement, (v) s'assurer que toutes les lumières artificielles adoptent une stratégie d'éclairage vers le bas afin de limiter leurs émissions en dehors du site du projet.	Mesures d'atténuation	Inspection	Continue	Opérateur du projet	50,000
		Soumettre un plan de démantèlement qui identifie les éléments suivants : (i) la méthodologie et les activités de démantèlement pour chaque composante du projet ; (ii) la méthodologie d'élimination pour chaque composante du projet (en tenant compte des mesures identifiées dans le cadre de l'infrastructure et des services publics ci-dessous) ; (iii) le plan de réhabilitation du site qui doit viser à restaurer la zone de manière similaire aux caractéristiques d'avant la construction, y compris l'identification de toute mesure d'aménagement paysager, le cas échéant ; (iv) les activités de surveillance à entreprendre ; (v) les rôles et responsabilités.	Etudes supplémentaires	Soumission du plan	Une fois avant le démantèlement	Opérateur du projet	50,000
Biodiversité	Les activités de démantèlement comprenant le démantèlement et l'enlèvement de la clôture du périmètre de sécurité, des bâtiments et des pistes d'accès, de l'infrastructure électrique et des panneaux solaires ainsi que de leurs composants structurels associés pourraient perturber les habitats existants (flore, faune, avifaune) et toutes les espèces qui pourraient être présentes sur le site du projet.	Examiner l'ensemble des données de surveillance accumulées au cours du cycle de vie du projet et entreprendre des enquêtes sur le terrain, si nécessaire, pour confirmer les espèces sensibles à prendre en compte lors du démantèlement ;	Mesures d'atténuation	Inspection	Une fois avant le démantèlement	Opérateur du projet	20,000
		Établir un calendrier des travaux qui tiendra compte de la nature saisonnière du climat du projet. En ce sens, il est recommandé de réaliser les travaux de démantèlement pendant la saison sèche (juillet à septembre) afin de limiter les impacts sur la faune (période de nidification des oiseaux s'étend de mi-mars à mi-juillet) et d'éviter si possible les périodes pluvieuses.					
		Limiter les déplacements des véhicules sur des routes sales/non pavées et maintenir la vitesse des véhicules à 15-20 km/h ;					
		Limiter les déplacements des véhicules sur des routes sales/non pavées afin de réduire les impacts sur la végétation naturelle environnante.					
		Éviter les abords du cours d'eau Boushikma pour préserver les habitats humides, notamment pendant la saison des pluies, afin de réduire les impacts sur les oiseaux, les batraciens et les mammifères.					
		Minimiser la perturbation de l'habitat lors de la suppression des infrastructures ;					
		Minimiser les impacts sonores sur la faune liés aux procédures de retrait des infrastructures ;					
		Assurer une gestion appropriée des risques de pollution afin de prévenir tout impact sur la faune et en particulier les batraciens ;					
		Assurer de bonnes pratiques pour la réutilisation, le recyclage ou l'élimination des composants mis hors service ;					
		Établir et former les travailleurs sur un code de conduite approprié à respecter, incluant l'interdiction de couper des arbres, de chasser, de conduire hors les routes sélectionnées, etc.					
Infrastructures et services publics	Services publics de gestion des déchets - il est important de s'assurer que les services publics existants seront en mesure de gérer la quantité de déchets	Élaboration d'un plan-cadre de démantèlement comprenant toutes les options d'élimination et les coûts correspondants. Les composants de l'infrastructure de la centrale solaire en fin de vie, y compris les panneaux solaires et les câbles en aluminium et en cuivre, devront être recyclés ou éliminés de manière responsable.	Etudes supplémentaires	Soumettre le plan cadre de démantèlement	Une fois avant le démantèlement	Opérateur du projet	Inclus dans les coûts de démantèlement
		Restauration du site dans son état d'origine dans la mesure du possible. En outre, le réseau routier interne sera restauré et les barrières et clôtures seront enlevées. Les mesures de restauration respectant les bonnes pratiques environnementales doivent être privilégiées durant cette phase.	Mesures d'atténuation	Inspection	Continue		Inclus dans les coûts de démantèlement
Infrastructures et services publics	Services publics de gestion des déchets - il est important de s'assurer que les services publics existants seront en mesure de gérer la quantité de déchets	Étant donné qu'à ce stade il y a beaucoup d'incertitude dans la phase de démantèlement du projet (en ce qui concerne la partie responsable, les perspectives sur les installations d'élimination des déchets en Tunisie, etc.), il est recommandé qu'avant toute activité de démantèlement, un plan d'élimination des panneaux PV soit préparé. Ce plan doit envisager les options suivantes et comparer les coûts/avantages de chacune d'elles : (i) il est recommandé que le plan opte d'abord pour l'élimination des panneaux à la fin de leur durée de vie dans le cadre des programmes internationaux de recyclage des	Etudes supplémentaires	Soumission du plan	Une fois avant le démantèlement	Opérateur du projet	30,000

Désignation	Impact potentiel	Action de gestion	Type de gestion	Action de suivi	Fréquence	Entité responsable	Coût (DT)
	solides, d'eaux usées et de déchets dangereux.	panneaux PV (tels que le programme de recyclage de PV CYCLE) ; et (ii) si ce qui précède ne pouvait pas être réalisé, comme dernière option, le plan doit étudier l'élimination des panneaux dans les installations de déchets existantes en Tunisie en coordination avec ME.					
		Coordonner avec l'ANGed la collecte des déchets non dangereux du site vers la décharge de Kairouan ou un autre endroit, qui sera inspecté avant utilisation	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant le démantèlement	Opérateur du projet	10,000
		Utilisation des services des sociétés spécialisées autorisées par le Ministère de l'Environnement (ME) pour la gestion des déchets dangereux (la liste des entreprises autorisées pour la gestion des déchets dangereux est disponible sur le site web de l'ANGED). Réservation d'une zone pour le stockage provisoire des déchets dangereux sur site, si nécessaire.	Exigences supplémentaires	Soumission d'une preuve de coordination avec les autorités	Une fois avant le démantèlement	Opérateur du projet	-
		Élaborer un plan de gestion des déchets comprenant des mesures visant à éviter, minimiser, réutiliser et recycler les déchets avant qu'ils ne soient envoyés pour traitement/élimination.	Etudes supplémentaires	Soumission du plan de gestion des déchets	Une fois avant le démantèlement	Opérateur du projet	Inclus dans les coûts de démantèlement
		Le site restauré sera contrôlé pour vérifier la conformité avec les normes de la SFI/BAD et de la GIIP.	Mesures d'atténuation	Inspection	Continue	Opérateur du projet	-
		Toute installation de gestion des déchets ou entreprise de transport/manutention tierce doit être inspectée avant d'être utilisée pour s'assurer qu'elle est exploitée conformément à la législation nationale et à la GIIP. Les eaux usées sanitaires seront collectées dans une fosse étanche et évacuées par camion-citerne vers la station ONAS de Sbikha, ou autre endroit.	Mesures d'atténuation	Inspection	Continue	Opérateur du projet	50,000
		Tous les transferts de déchets seront accompagnés d'une documentation sur la chaîne de possession qui enregistre le lieu d'origine des déchets, le type de déchets, le transporteur des déchets et la destination finale des déchets.	Mesures d'atténuation	Examen des registres de la chaîne de possession pour en assurer la cohérence	Continue	Opérateur du projet	20,000
Santé et sécurité au travail	Le travail sur le site de démantèlement présentera certains risques génériques pour la santé et la sécurité des travailleurs, car il augmente le risque de blessures ou de décès dus à des accidents.	Préparer un plan de santé et de sécurité au travail et adopter et mettre en œuvre ses recommandations.	Etudes supplémentaires	Soumission du plan	Une fois avant le démantèlement	Opérateur du projet	15,000
		Préparer un plan de préparation et de réponse aux urgences qui prend en compte une série de mesures organisationnelles, opérationnelles et préventives en cas d'urgence.	Etudes supplémentaires	Soumission du plan de préparation et d'intervention d'urgence	Une fois avant le démantèlement	Opérateur du projet	10,000
<b>Coût du PGES phase démantèlement en Dinars Tunisien</b>							<b>260,000</b>
<b>Coût Total – PGES phase démantèlement en dollars</b>							<b>78,000</b>

**Tableau 8- Coût Global du PGES du Projet (LEAHT & Centrale Solaire)**

Coûts des mesures de mitigation	Coût en Dinars Tunisien	Coût en Dollars US
Coût du PGES Phase de construction de la Centrale Solaire	<b>785000</b>	<b>261667</b>
Coût du PGES Phase d'exploitation de la Centrale Solaire	<b>250000</b>	<b>83333</b>
Coût du PGES Phase de démantèlement de la Centrale Solaire	<b>255000</b>	<b>85000</b>
Coût du PGES Phase de construction de la LEAHT	<b>635000</b>	<b>211667</b>
Coût du PGES Phase d'exploitation de la LEAHT	<b>195000</b>	<b>65000</b>
Coût du PGES Phase de démantèlement de la LEAHT	<b>255000</b>	<b>85000</b>
Coût du Plan d'Engagement des Parties Prenantes	<b>60000</b>	<b>20000</b>
Mécanisme de gestion des plaintes	<b>30000</b>	<b>10000</b>
Coût du Plan d'Action de Réinstallation Abrégé de la centrale solaire	<b>450000</b>	<b>150000</b>
Coût du Plan d'Action de Réinstallation Abrégé de la LEAHT	<b>450000</b>	<b>150000</b>
Coût du Plan de Développement Communautaire (A négocier et déterminer avant démarrage)	<b>A déterminer</b>	<b>A déterminer</b>
Coût du Recrutement d'un spécialiste en sauvegardes environnementales	<b>30000</b>	<b>10000</b>
Coût du Recrutement d'un spécialiste en sauvegardes sociales	<b>30000</b>	<b>10000</b>
Coût du Recrutement d'un agent de liaison communautaire	<b>40000</b>	<b>13333</b>
Coût des (03) Audits annuels de conformité E&S (2023 et 2024 et 6 après Achèvement)	<b>60000</b>	<b>20000</b>
<b>COÛT TOTAL DU PGES</b>	<b>3,525,000</b>	<b>1,175,000</b>

## ملخص غير فني

### 1. مقدمة

في إطار المخطط الشمسي التونسي، تم التعاقد مع الائتلاف المتكون من AMEA Power-TBEA (المشار إليه فيما يلي باسم "المطور")، في ديسمبر 2019، لتطوير محطة للطاقة الشمسية الكهروضوئية 100 ميغا وات في ولاية القيروان بالبلاد التونسية (يشار إليه فيما بعد باسم "المشروع").

شركة AMEA Power مؤسسة إماراتية تنشط في مجال الطاقات المتجددة تسعى لتطوير وامتلاك وإدارة مشاريع الطاقة الحرارية والمتجددة في إفريقيا والشرق الأوسط وآسيا.

أما شركة TBEA فهي مؤسسة دولية مقيمة بالصين تقدم لعملائها في عشرات البلدان حول العالم مجموعة من الخدمات في مجال الطاقة الخضراء والتنمية المستدامة. ومع افتتاح سوق الطاقة الشمسية في تونس، عملت شركة TBEA على تطوير حلول متكاملة لتوفير الطاقة الشمسية في الأسواق الإفريقية.

يتكون مشروع القيروان من عنصرين:

- محطة لتوليد الطاقة الكهربائية الضوئية (100 ميغاواط) يتم انشاؤها وتشغيلها من قبل المطور.
- خط لنقل الطاقة الكهربائية (بطول 8 كم - 225 كيلو فولت) يتم إنشاؤه وتشغيله من قبل الشركة التونسية للكهرباء والغاز.

(STEG)

تعد الشركة التونسية للكهرباء والغاز (STEG) مؤسسة عمومية تحت إشراف وزارة الصناعة والطاقة والمناجم تنفرد حصرياً بنقل الكهرباء والغاز بالبلاد التونسية. وتتمثل مهمتها الرئيسية في تغطية احتياجات البلاد من الطاقة الكهربائية في أفضل الظروف الاقتصادية والتقنية والبيئية.

وبناء على ذلك، يسعى المطور للحصول على تمويل للمشروع من المؤسسات المالية الدولية (IFIs) بما في ذلك مؤسسة التمويل الدولية (IFC) والبنك الإفريقي للتنمية (AfDB) عبر تصميم المشروع وتطويره وفقاً لأفضل المعايير الدولية ومنها:

(1) سياسة الاستدامة البيئية والاجتماعية ومعايير الأداء لمؤسسة التمويل الدولية (IFC, 2012) وكذلك الإرشادات بشأن البيئة والصحة والسلامة (EHS) التابعة لها، و

(2) نظام الضمانات المتكاملة (ISS) التابع للبنك الإفريقي للتنمية (AfDB)

(3) القوانين الوطنية والمحلية المعمول بها.

تجدر الإشارة إلى أن المشروع قد تم تصنيفه ضمن الصنف "ب" وفقاً لمعايير الأداء PSs التابعة لمؤسسة التمويل الدولية وفي الصنف 2 وفقاً لنظام الضمانات المتكاملة للبنك الإفريقي للتنمية.

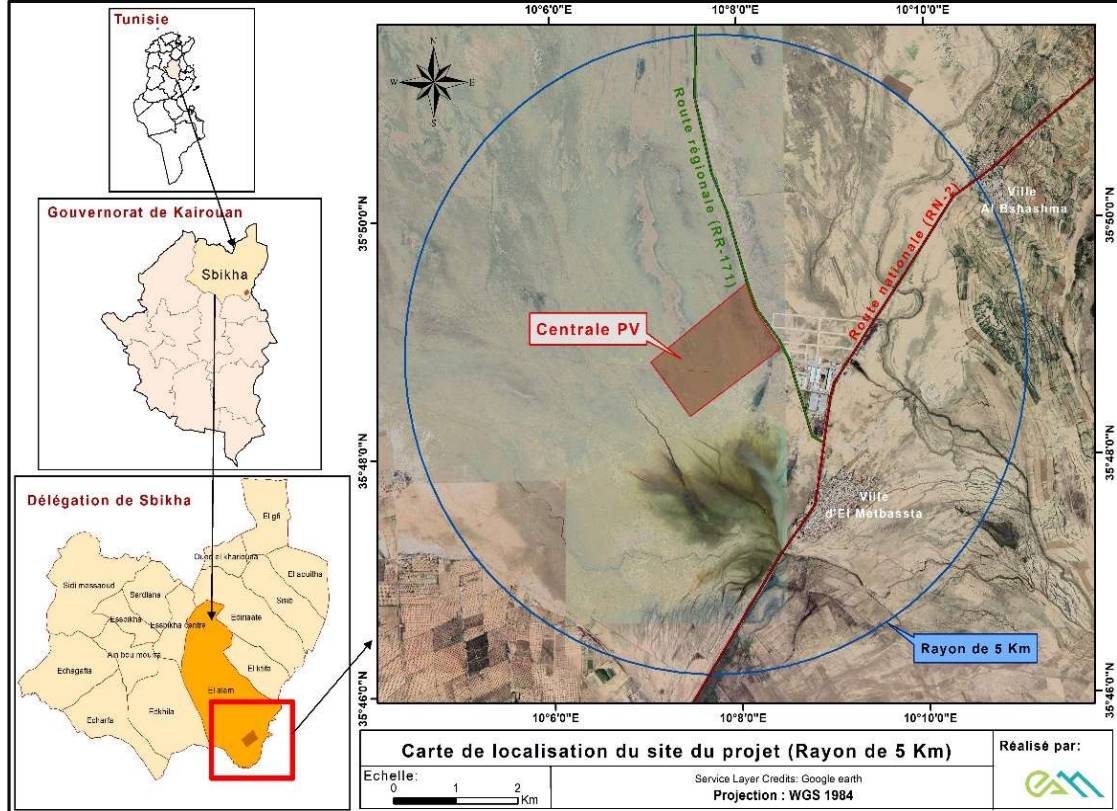
لهذا الغرض، تم تعيين مكتب دراسات التقييم والعناية بالبيئة (EAM) من قبل شركتي AMEA Power-TBEA لإجراء دراسة تقييم الأثر البيئي والاجتماعي للمشروع وفقاً للمتطلبات الوطنية وكذلك متطلبات مؤسسة التمويل الدولية والبنك الإفريقي للتنمية على النحو المحدد أعلاه.

وتعرض هذه الوثيقة دراسة التقييم البيئي والاجتماعي المتعلقة بمشروع محطة الطاقة الشمسية بالقيروان.

## 2. وصف المشروع

### موقع المشروع

- يقع مشروع الطاقة الشمسية في عمادة العلم التابعة لمعمدية السبيخة من ولاية القيروان. تبعد قرية المتبسطة (أقرب تجمع سكني) عن الموقع حوالي 2,2 كم في اتجاه الجنوب.
- سيتم إنشاء محطة الطاقة الشمسية على أرض مستأجرة على ملك الدولة الخاص بمساحة 200 هكتار. المنطقة مسطحة، ومكشوفة، يتراوح ارتفاعها بين 30 و32 مترًا فوق مستوى سطح البحر. ويمكن الوصول إليها بسهولة عن الطريق الوطنية RN-2 والطريق الجهوية RR171 كما يوضح الشكل (أ) خريطة موقع المشروع.



### الشكل أ: موقع المشروع

- تقع محطة الطاقة الشمسية على بعد حوالي 500 م من المنطقة الصناعية السبيخة 1 وعلى بعد 100 م من المنطقة الصناعية السبيخة 2 (قيد الإنشاء) وبجوار مراعي وأراضي فلاحية.

### وصف المشروع

- يعتمد توليد الكهرباء من الطاقة الشمسية على الخلايا الكهروضوئية التي تنتج تيارا مستمرا يقع تحويله إلى تيار متردد بواسطة عاكسات (*Inverter*) ولربط المحطة بالشبكة الكهربائية يقع رفع الجهد إلى مستوى جهد الشبكة الكهربائية الناقل للطاقة.
- يتمثل المكون الرئيسي للمشروع في أربع أقسام متكونة من مصفوفات لألواح كهروضوئية (انظر الشكل ب). تم تجهيز كل مجموعة بهيكل تركيب يتكون من متتبع أفقي بحدود واحد يحمل المصفوفة ويوجهها نحو الشمس.
- يتصل كل قسم بعكاس مركزي لتحويل الكهرباء المنتجة من التيار المستمر إلى التيار المتردد.

- ولربط المحطة بالشبكة الكهربائية التابعة للشركة التونسية للكهرباء والغاز يتم رفع الجهد بواسطة محمول كهربائي إلى 225 كيلو فولت.
- تضاف إلى ذلك معدات البيانات والتحكم وأنظمة الاتصالات من أجل التشغيل المحطة وصيانتها وخزانات مياه الشرب والتنظيف ومستودع لتخزين المعدات والآلات ومرآب للسيارات.

#### استخدام الأراضي لمحطة الطاقة الشمسية

تبلغ مساحة الأرض المخصصة لبناء محطة توليد الطاقة الكهربائية الضوئية في القيروان 200 هكتار، وهي على ملك خاص للدولة حسب رسم تملك رقم 20323/9796 والذي يغطي مساحة 7323 هكتارا 23 آر و 47 سنتار في منطقة المتبسطة، التابعة لمعمدية السبيخة من ولاية القيروان، بالجمهورية التونسية. وقد تم توقيع اتفاقية كراء الأراضي في 22 جوان 2021 بين الحكومة التونسية ممثلة بوزير أملاك الدولة والشؤون العقارية (المالك) والمطور.

لم تخضع الأرض المخصصة لمحطة الطاقة الشمسية لحيازة عقارية أو عملية تعويض مسبقه كما لم يلاحظ أي نشاط زراعي في موقع محطة الطاقة الشمسية، باستثناء الرعي الذي تختص به بكاملها.

وخلصت نتائج المسح الذي قامت به المندوبية الجهوية للتنمية الفلاحية بالقيروان في ماي 2022 إلى أن عددا من مربي المواشي الذين يحتمل أن يستخدموا موقع محطة الطاقة الشمسية يقتصر على حوالي عشرين (10 مربيين من عمادة الدلوسي و10 مربيين من عمادة المتبسطة) ويتراوح حجم قطع الماشية لكل مربي من 30 إلى 400 رأس.

#### مراحل المشروع

سيتم تطوير المشروع على ثلاث مراحل: (1) البناء، (2) التشغيل و (3) التفكيك، وقد تم تلخيص كل منها أدناه.

#### مدة الأشغال

من المتوقع أن يبدأ بناء المشروع في أوائل عام 2023، على مدى حوالي 16 شهراً. من المتوقع أن تبدأ فترة الاستغلال في جويلية 2024 وتمتد 20 عاما.

#### تعليقات المشروع

بالاستناد إلى مفهوم التنمية المستدامة فإن المشروع يهدف إلى خلق توازن بين أبعاده الاقتصادية والبيئية والاجتماعية وذلك من خلال:

- تنفيذ استراتيجية الحكومة في مجال الطاقة وتحقيق الأهداف المرسومة فيما يخص الطاقات المتجددة؛
- السعي لتحقيق الاكتفاء الذاتي في مجال الطاقة؛
- خفض استهلاك الغاز الطبيعي المستخدم في محطات الطاقة الحرارية لإنتاج الكهرباء والحد من انبعاثات غازات الاحتباس الحراري وانبعاثات ملوثات هوائية أخرى؛
- تحسين الظروف الاجتماعية والاقتصادية للسكان بتوفير فرص العمل والخدمات.

#### وصف المحيط البشري والاجتماعي والاقتصادي لمنطقة تأثير المشروع

##### التقسيم الإداري

تتبع منطقة المشروع معمدية السبيخة من ولاية القيروان.

##### السكان

وفقاً لتعداد المعهد الوطني للإحصاء، بلغ عدد سكان معمدية السبيخة 74464 نسمة في عام 2018.

##### التعليم

الخصائص التعليمية لمعتمدية السبيخة.

المستوى التعليمي	نسبة الأميين	نسبة تعليم الابتدائي	نسبة تعليم الثانوي	نسبة تعليم عالي	الفئة العمرية 10 سنوات وما فوق
الذكور	26,3	43,6	26,4	3,6	27 878
الإناث	52,9	26,5	17,3	3,3	30 049
المجموع	40,1	34,7	21,7	3,5	57 927

#### البنية التحتية

عقب زيارة الموقع، ترد أدناه قائمة البنية التحتية الرئيسية لموقع المشروع أو بجواره مباشرة:

- الطريق الجهوية RR171 على بعد 20 مترا من حدود موقع المشروع؛
- خط علوي لنقل الكهرباء 30kV لـ STEG على طول الطريق الجهوية RR171 من السبيخة إلى القيروان؛
- أنبوب بقطر 8 بوصات يمتد على طول الحد الجنوبي لحقل الطاقة الشمسية لتزويد منطقة السبيخة الصناعية بالغاز الطبيعي بضغط 20 بار.

#### مناطق صناعية

تشمل ولاية القيروان 6 مناطق صناعية تمتد على مساحة اجمالية تقدر 133,5 هكتار وهي:

المنطقة	المساحات (هك)	العدد الإجمالي للمقاسم	المقاسم المبيعة	المقاسم المنشأة	المقاسم بصدد الإنشاء
<b>الجهة صاحبة المصلحة: الوكالة العقارية الصناعية</b>					
القيروان 1	10	33	33	28	0
القيروان 2	26	85	66	11	7
الحاجب	10	43	34	11	2
السبيخة	50	21	17	2	10
المجموع	96	182	150	60	19
<b>الجهة صاحبة المصلحة: المجلس الإقليمي</b>					
طريق تونس	1	44	60	59	12,5
طريق الباطن	-	33	61	41	25
المجموع 2	-	-	-	-	37,5
المجموع	1	77	121	100	133,5

#### التشغيل

حسب التعداد العام للسكان والسكنى لسنة 2014 للمعهد الوطني للإحصاء (INS) فإن معدل نسبة النشاط الإجمالي في معتمدية السبيخة (42,65%) يفوق معدل ولاية القيروان (40,20%) ويقل عن المعدل الوطني (46,55%). كما تشير الإحصائيات إلى أن البطالة في معتمدية السبيخة تبلغ 15,30% من الناشطين مقارنة بـ 16,96% كمعدل بولاية القيروان و14,82% على المستوى الوطني.

تمس البطالة بدرجة كبيرة الشباب من حاملي الشهادات العليا وبالخصوص الإناث منهم كما هو يظهر في الجدول الآتي :

النشاط حسب الوسط والجنس	معتمدية السبيخة	ولاية القيروان	الجمهورية التونسية
مجموع نسبة النشاط	42,65	40,20	46,55

14,82	16,96	15,30	مجموع نسبة البطالة
65,47	62,37	64,47	نسبة النشاط لدى الذكور
11,43	12,87	12,41	نسبة البطالة لدى الذكور
28,20	19,69	22,85	نسبة النشاط لدى الإناث
22,45	28,95	22,72	نسبة البطالة لدى الإناث
12,12	16,52	19,48	نسبة البطالة لحاملي الشهادات العليا لدى الذكور
28,80	37,51	42,61	نسبة البطالة لحاملي الشهادات العليا لدى الإناث
20,06	26,63	30,45	مجموع نسبة البطالة لحاملي الشهادات العليا

### الآثار البيئية والاجتماعية والاقتصادية المحتملة للمشروع وتدابير التخفيف

#### الآثار الإيجابية

للمشروع آثار بيئية واقتصادية إيجابية هامة على المستويين الاستراتيجي والوطني بالنظر إلى التحديات الحالية التي يواجهها قطاع الطاقة في تونس. وتشمل ما يلي:

- تحقيق الأهداف الإستراتيجية في مجال الطاقة وفق الخطط المرسومة.
- مساهمة المشروع في تقليص عجز الميزان الطاقوي من خلال الاعتماد على مورد للطاقة محلي متجدد عوض الغاز الطبيعي المستورد.
- توفير الطاقة والبنية التحتية اللازمة لإنجاز المشاريع والبرامج التنموية بالجهات وبالبلاد التونسية.
- تحسين الظروف الاجتماعية والاقتصادية للسكان من خلال توفير فرص العمل والخدمات.
- الحد من انبعاثات غازات الدفيئة وتلوث الهواء حيث إن استخدام الطاقة الكهروضوئية يكاد يكون خاليًا من التلوث أثناء التشغيل. من المرجح أن يحدث المشروع تقليص انبعاثات ثاني أكسيد الكربون بأكثر من 117 ألف طن مكافئ سنويًا.
- خلق توازن بين الأبعاد الاقتصادية والبيئية والاجتماعية لتحقيق التنمية المستدامة.

#### الآثار السلبية

من المتوقع أن تترتب عن المشروع بعض الآثار البيئية السلبية. ومع ذلك، خلص تقييم الأثر البيئي والاجتماعي إلى هذه الآثار ستكون بشكل عام طفيفة في مجملها ولن تشكل أي مصدرا جديا للقلق بحيث يمكن التحكم عليها والتخفيف من حدتها بشكل مناسب كما ورد في الخطة الإدارة البيئية والاجتماعية المصاحبة لهذه الدراسة مع الإشارة إلى أن استعمال مساحة الأرض المخصصة للمشروع من طرف مربحي الماشية من حين لآخر وفي أوقات معينة من السنة لرعي الأغنام والماعز قد يتسبب في تقليص مساحة الرعي لعشرة (10) رعاة من قرية الدلوسي وعشرة (10) رعاة من قرية المتبسطة حسب الاستشارة الميدانية قد أخذ في الحسبان وسيتم تعويض الخسائر الناجمة عن فقدان المرعى طيلة انشاء واستغلال المشروع حسب معايير بنك التمويل الدولي ذات العلاقة.



## 1.0 INTRODUCTION

The consortium AMEA Power-TBEA (hereafter referred to as “the Developer”), was awarded in December 2019, an Agreement for the development of a 100 Mega Watt (MW) Photo Voltaic (PV) Solar power plant in the governorate of Kairouan, Tunisia (hereafter referred to as “the Project”). The consortium was selected after an international competitive bidding process launched by the Government of Tunisia, represented by the Ministry of Industry, Energy and Mining under the Tunisian Solar Program.

A signed copy of the Concession Agreement, which is concluded between the Tunisian Government, represented by the Ministry of Industry, Energy and Mining and the Developer is provided in Annex (see Annex I).

The purpose of this Agreement is to authorize the Developer to construct, own, operate, maintain and, if required, dismantle on the Site a Solar Plant of the capacity defined in the Power Purchase Agreement (PPA), for the exclusive sale to Tunisian Company of Electricity and Gas (STEG) of the net electricity generated by the Project during the Initial Term (without prejudice to any extension thereof), under the terms and conditions and at the Transfer Price defined in the Project Agreements.

The Developer will be seeking financing for the Project from International Financing Institutions (IFIs) to include the International Finance Corporation (IFC) and the African Development Bank (AfDB). Therefore, they are inclined to design and develop the Project in accordance with international best practice – this includes undertaking an Environmental and Social Impact Assessment (ESIA) in accordance with the IFC Performance Standards (PSs) on Environmental and Social Sustainability (2012), and AfDB’s Integrated Safeguards System (ISS).

For this purpose, Environmental Assessment and Management (EAM), along with ECO Consult and ESAS as subcontractors, has been appointed to carry out the ESIA study for the Project in accordance with national requirements as well as IFC and AfDB requirements as identified above.

This document presents the ESIA study undertaken for the Project.

### 1.1 *Project Background*

Tunisia has adopted in 2014 the “Energy Transition Policy” which aims for a 30% reduction of its primary energy consumption by 2030 and a 30% contribution of renewable energy in electricity production by the same period. To achieve these objectives, Tunisia

has adopted several measures, including the following:

- The creation of the Energy Transition Fund in 2014; and
- The promulgation of the law on electricity production from renewable energies in 2015.

The Tunisian Solar Program "TSP" is the operational program to achieve the objective of the Energy Transition Policy in terms of introducing Renewable Energy in Tunisia.

The TSP aims at increasing electricity production of renewable energies from 3% in 2016 to 30% in 2030. This includes 10% from solar energy, including 7% PV and 3% Concentrated Solar Thermal (CSP).

To achieve the above-mentioned intermediate target, the Tunisian authorities published, in December 2016, the 2017-2020 program to install an additional capacity of 1000 MW of renewable energy, including 500 MW under the concession regime.

Under the Tunisian Solar Program (TSP), the Government of Tunisia represented by its Ministry of Industry, Energy and Mining, launched an international competitive bidding process for selection of companies for the development of solar PV Projects.

Under the bidding process, in December 2019, the Developer has been selected for the Development of the Project as discussed earlier. The Developer will benefit from a 20-year power purchase agreement (PPA) to be signed with the national utility in Tunisia – Tunisian Company of Electricity and Gas (STEG).

The Project will be built on a land allocated to the Project by the Tunisian government.

## **1.2 Project Setup and Responsibilities**

Different entities are involved in the planning and implementation of the Project. Responsibilities along with a general role description of each entity are listed hereafter:

- Consortium of AMEA Power and TBEA: AMEA Power is an Emirati company active in renewable energies and TBEA is an international company which offers its customers a range of services in the field of green energy and sustainable development. The consortium will be the owner and developer of the Project (hereafter referred to as 'the Developer');
- General Directorate of Energy and Renewable Energies (DGEER): the regulator of the energy sector authorizing the development of energy production activities from renewable energy sources (PV and wind power).

- National Environmental Protection Agency (ANPE): the official governmental entity responsible for protection of the environment in Tunisia. The Agency is responsible for granting environmental clearance for the Project.
- Engineering, Procurement, and Construction (EPC) Contractor: will be responsible The contractor is responsible for the detailed design and layout of the Project; the supply of materials and equipment (panels, inverters, etc.); the construction of the Project and its various components (assembly structure, internal roads, buildings, etc.). The EPC contractor is a joint venture between Northwest Electric Power Design Institute Co. The EPC contractor is a joint venture between Northwest Electric Power Design Institute Co. of China Power Engineering Consulting Group (NWEPCDI) and Tianjin Electric Power Construction Co. of China (TEPC).
- Project Operator: the responsible for Operation and Maintenance (O&M) of the Project. The Project operator has not been assigned yet.
- Tunisian Company of Electricity and Gas (STEG): will be of the off taker of electricity and is the entity that signed the Power Purchase Agreement (PPA) with the Developer. In addition, STEG will be responsible for designing, building, and operating the associated interconnection facilities. This will include the Overhead Transmission Line (OHTL) to be connecting the Project site to the existing national grid.
- ESIA Consultant (EAM together with ECO Consult, Jordan and Environmental & Social Advisory Services, ESAS-UK): hereafter referred to as the ‘ESIA Team’ who is the ESIA Practitioner, and the consultant commissioned by the Developer to prepare the ESIA for the Project in accordance with local requirements as well as international best practice Environmental and Social (E&S) requirements.

### **1.3 Content of the ESIA Report**

The Tunisian Government Decree 2016-1123 of August 24<sup>th</sup>, 2016 states that energy production from renewable energies requires the preparation of an Environmental Impact Study. This study should be prepared according to the “Guidelines for Environmental Impact Assessment” drawn by the National Environmental Protection Agency (ANPE).

With reference to the Decree no. 2005-1991, dated 11 July 2005, related to the Environmental Impact Assessment (EIA) and defining the categories of units subject to the Environmental Impact Assessment and the categories of units subject to the Book of Specifications (BOS): only Power Generation Units with at least 300MW capacity are subject to EIA studies. Therefore, the project for the construction of a 100 MW

photovoltaic power plant and a 225 kV overhead power line does not require the approval of the ANPE and does not require an environmental permit for its implementation..

The 100 MW Kairouan solar PV project is categorized as “Category B –”in accordance with the IFC Performance Standards (PSs) on Environmental and Social Sustainability (2012), and Category 1 within AfDB’s Integrated Safeguards System (ISS).

The structure of the ESIA report is provided below:

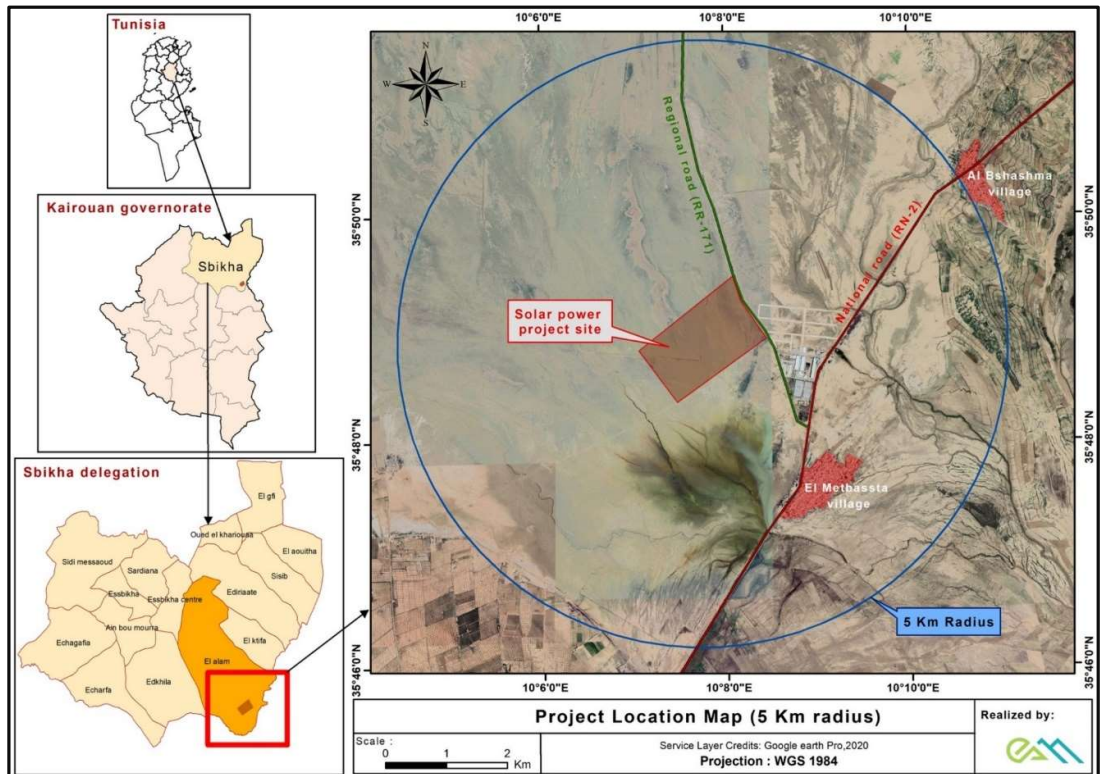
Chapter	Title	Description of Content
<i>Chapter 0</i>	Non-Technical Summary	Introduces the ESIA, together with a clear and concise summary of the EIA framework, baseline environment, key species or habitats, proposed operations, potential impacts, mitigation measures and any residual Significant Impacts. It includes a summary of environmental management plans and monitoring programs going forward.
<i>Chapter 1</i>	Introduction	Introduction and background information on the Project.
<i>Chapter 2</i>	Project Description	Technical description of the Project & related infrastructure and activities.
<i>Chapter 3</i>	ESIA Approach and Methodology	Presents the methodology and approach that was adopted for the ESIA Study.
<i>Chapter 4</i>	Analysis of alternatives	This chapter investigates several alternatives to the Project development and the reasons for the preferred choice.
<i>Chapter 5</i>	Applicable Legal and Regulatory Framework	Discusses the applicable environmental and social regulatory framework and its relevance for the Project.
<i>Chapter 6</i>	Stakeholder Engagement	Provides an overview of the stakeholder engagement activities undertaken during the ESIA including stakeholder categorization and profiling.
<i>Chapter 7</i>	Environmental, Ecology and Social Baseline	Outlines Environmental, Ecology and Social Baseline status in the study area of the Project.
<i>Chapter 8</i>	Impact Assessment and Mitigation Measures	This section includes details of identified environmental and social impacts and associated risks due to Project activities, assessment of significance of impacts and presents mitigation measures for minimizing and /or offsetting adverse impacts identified.
<i>Chapter 9</i>	Assessment of cumulative impacts	This section includes the cumulative impacts which could result from incremental impacts from other known existing and/or planned developments in the area.
<i>Chapter 10</i>	Environmental and Social Management Plan	Outline of the ESMP taking into account identified impacts and planned mitigation measures and monitoring requirements.

**2.0 PROJECT DESCRIPTION**

**2.1 Project Location**

From the administrative point of view, Tunisia is divided 24 Governorates which are then subdivided into 264 Delegations. Delegations are then subdivided into municipalities and sectors.

The Project site is located within Kairouan Governorate, and more specifically in the delegation on Sbikha, and within El Alem Sector. The closest community settlement to the Project site is Metbasta, located around 2.2 km South of the Project site.



**Figure 2.1 - Project Location Map**

The solar plant will be constructed on a leased land that is currently under governmental ownership with an area of 200 hectares. The area is reasonably flat, well exposed, easily accessible, with sufficiently compacted ground and an elevation around 30-32m above sea level.

The geographic and UTM coordinates of the solar plant area is as follows:

**Table 2.1** - Project Site Coordinates in Geographic and UTM

Summits	Projected coordinate System UTM zone 32, WGS 84		Geographic Coordinate System WGS 84	
	X (m)	Y (m)	Longitude (DMS)	Latitude (DMS)
A	600964.14	3963831.11	10° 7'3.31"E	35°48'48.33"N
B	602490.29	3965054.44	10° 8'4.68"E	35°49'27.46"N
C	603043.03	3964053.22	10° 8'26.24"E	35°48'54.76"N
D	601594.99	3962995.86	10° 7'28.07"E	35°48'20.99"N

The Project site is characterized by a saline depression with a gentle general slope towards the South and the East and clay like soil with associated vegetation that is composed of a halophilic vegetation community. The project site is neither a wetland nor a Sabkha. In addition, small intermittent watercourses, Boushkima and Dalloussi wadis, are located within the Project area.

The site is accessible by key roads which include the national road RN-2 linking Enfidha to Kairouan and the regional road RR-171 connecting Metbasta to Sbikha.

**2.2 Existing Infrastructure**

The site of the photovoltaic power plant is located near the developed industrial zone of Sbikha which is served by :

- The STEG Low and Medium Voltage electrical networks;
- The SONEDE water network;
- The STEG natural gas network;
- The Tunisie Télécom telephone network;
- The wastewater collection network of the industrial zone;
- The national road RN-2 and the regional road RR-171.

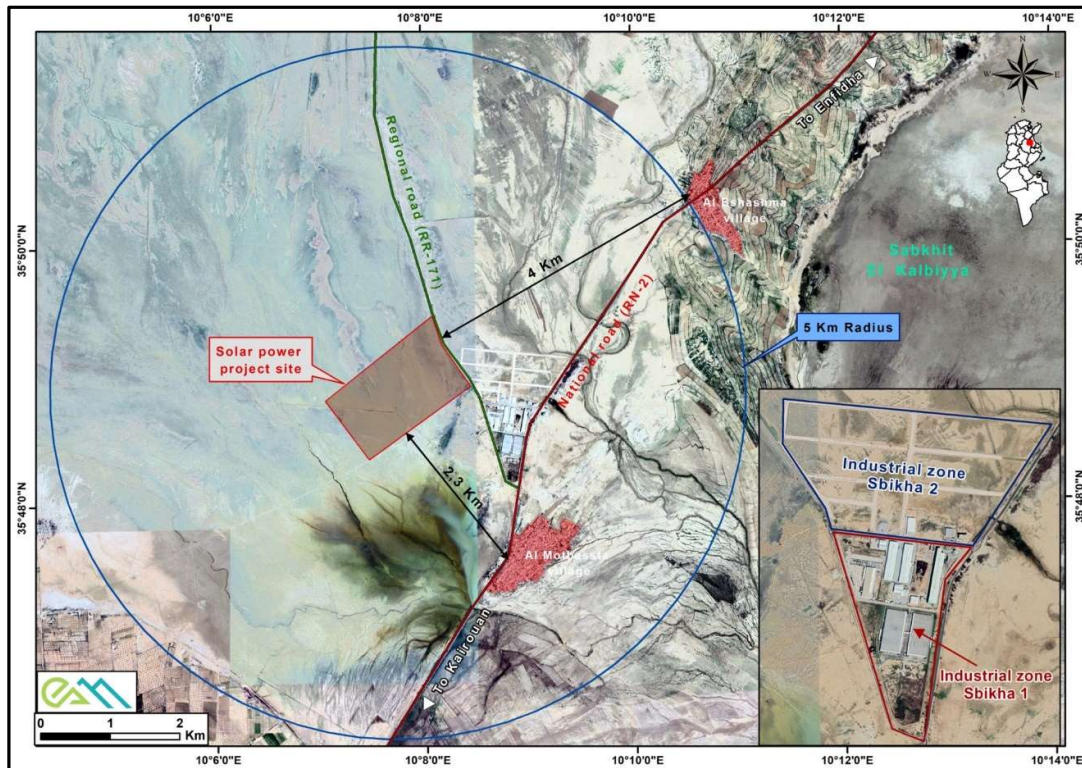
**2.3 Site Vicinity**

Satellite imagery and site visits undertaken at the Project site identified several receptors within the area to include industrial areas and villages and other. Identified receptors are listed in the table below.

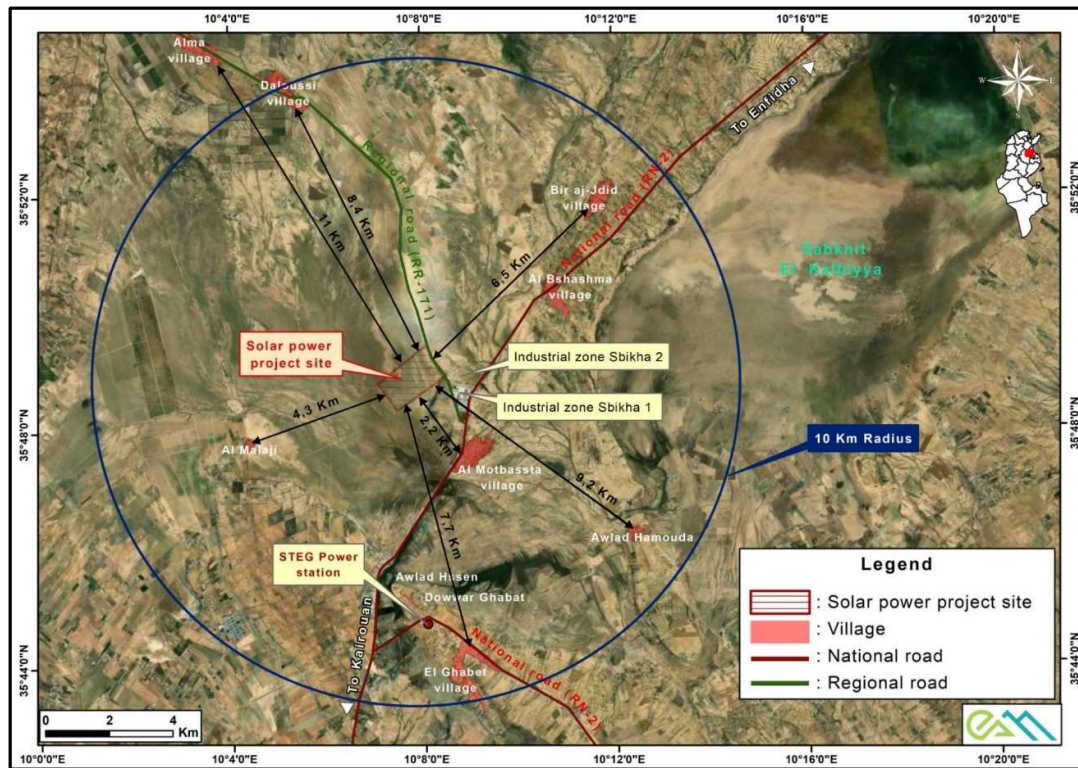
**Table 2.2** - Distances between the solar site and surrounding area

Surrounding Area	Description	Distances (as the crow flies)
Industrial zone Sbikha 1	Carried out by the Industrial Land Agency (AFI) in 2010 on a land of 50 ha and includes 10 industries.	500 m

Surrounding Area	Description	Distances (as the crow flies)
Industrial zone Sbikha 2 (planned development)	It extends over an area of 100 ha. The industrial zone Sbikha 2 is currently under construction (state of progress: 10%)	100 m
Metbasta (Village)	Village which belongs to Kairouan Nord delegation and includes 615 dwellings and 539 households.	2200 m
El Bechachma (Village)	Village which belongs to the Kondar delegation (Governorate of Sousse) and includes 373 dwellings and 388 households.	4000 m
Al Malaji	Individual household	4300 m
Dowwar Ghabat	Individual household	6000 m
Awlad Hssen	Individual household	6100 m
Bir Aj-Jdid (Village)	Village which belongs to the Kondar delegation (Governorate of Sousse) and includes 201 dwellings and 195 households.	6500 m
STEG Substation	Kairouan 225kV STEG substation	6600 m
Awlad Hamouda	Individual household	7500 m
El Ghabet (Village)	Belongs to Kairouan Nord delegation and includes 1145 dwellings and 996 households.	7800 m
Daloussi (Village)	Belongs to Sbikha Delegation	8400 m
El Alem (Village)	Belongs to Sbikha Delegation and includes 1210 dwellings and 1052 households.	11000 m



**Figure 2.2 - Radius of 5 km around the Project Area**



**Figure 2.3 - Radius of 10 km around the project area**

**2.4 Description of Project Components**

An explanation of PV technology functionality is as follows. PV is a method of generating electricity through solar panels which are composed of a number of solar cells. Such cells convert solar energy (radiation from the sun) into electricity using semiconductors (photovoltaic material that exhibit the photovoltaic effect); following the exposure of the PV panel to light, voltage is created in the material as photons from sunlight excite electrons in those materials into a higher state of energy, allowing them to act as charge carrier for an electric current.

Solar cells produce Direct Current (DC) electricity from sun light, which can be used for grid connected power generation. However, electricity at the grid is usually in a different form (known as Alternating Current (AC)) and thus inverters are used to convert the DC current to AC current. In addition, cells produce electricity at a certain voltage which must be matched to the grid it connects to. Therefore, transformers are used to convert the output from the panels to a higher voltage that matches the grid.

The table below provides a summary of the key project components for the 100MW Project, along with a detailed description of each of those components to follow. It is important to note that following information is based on preliminary data and design details provided by the Developer.

**Table 2.3 - Summary of Key Project Components**

Component	Description
Project Generation Capacity	120 MWp – 100 MW
Project area	2 km <sup>2</sup> (200 hectares)
Module	Monocrystalline-PERC Bifacial modules Name Capacity : 535Wp – 545Wp* Total Modules in plant : 220416
Tables	Modules per table : 84 Number of tables : 2624 Structure foundation : Driven piles or Screw piles
Tracking system	Single Axis Trackers with up to +/- 60 degrees tilt angle. Total trackers in plant : 2624
Inverters	Inverters stations : 16 Modules per string : 28 DC cable trenches will run at the depth of 700mm below ground as per IEC 60364-5-52
On-site Substation	225kV/33kV plant substation includes HV Switchgear, 2 HV/MV Transformers, MV Switch room including MV Feeder relay, Control Building, Auxiliary MV/LV transformers and back up Diesel Generators and all the associated equipment.
Utilities	Warehouse Site Office Building 15 Cubic Meter Storage Tank for potable water
Associated facilities	A high voltage Overhead Transmission Line (OHTL) that will be developed by STEG that will connect the substation onsite with the National Grid.

\*At the time of procurement, there may be more efficient modules available. Since the total project capacity will remain 120 MWp, the total quantity of modules may be reduced, which in turn will reduce the quantity of tables and trackers.

**(i) PV Arrays**

According to the preliminary design details available, the Project will be divided into blocks, where each block will be composed of PV Power arrays (typical structure of power arrays is presented in the figure below).

- PV Arrays: each array is made of PV panels. The selected technology is monocrystalline solar module technology which utilizes silicon as a semiconductor material for generation of electricity. Silicon is considered a non-hazardous material
- Each array is equipped with a mounting structure and for this Project it is expected to be a single axis horizontal tracker which carries the array and orients it towards the sun throughout the day to maximize the amount of energy produced.



**Figure 2.4 - Typical Power Arrays Composed of PV Panels**

**(ii) Infrastructure and Utilities**

- a. Each block within which the PV arrays are located, will include a central inverter station. The inverter station converts the electricity produced from the panels from Direct Current (DC) to Alternating Current (AC).
- b. The central inverter stations will then connect through underground electrical cables to the substation locations onsite.
- c. The substation will then convert the voltage produced to an appropriate voltage for connection with the National Grid.
- d. Building Infrastructure will mostly include offices for normal daily operational related work, control building including data, control and voice communication system for proper operation and maintenance of the solar farm as well as a warehouse / workshop for storage of equipment and machinery and maintenance and car parking.
- e. Road network to include: (i) internal road network for ease of access to the modules for operation and maintenance purposes and (ii) security road around the perimeter of the Project site for security patrolling; and (iii) access road from the highway to the site.
- f. Fencing around the entire facility and security along with remote cameras, automatic night lighting will be required to ensure safety from criminal activity and trespassing of unauthorized personnel.
- g. Monitoring System: provides information of the plant equipment performance for operation and maintenance.
- h. Water network / water tank: water supply requirements for the Project will be provided

by SONEDE. Water use will be limited to sanitary needs by site personnel and to supply substation & main control room water deluge system. A dry-cleaning method will be adopted for PV panels to prevent dust build-up since this would affect their performance.

***(iii) Associated Facilities***

As discussed earlier, STEG will be responsible for offsite connection works from the onsite substation to the National Grid. STEG will be responsible for preparing the detailed design (including finalization of the OHTL route), construction activities as well operation and maintenance activities.

A detailed ESIA OHTL was prepared for this Associated Facility (see Annex II). Key components are expected to include transmission towers.

Each transmission tower will consist of: (i) foundations so that the tower is fixed and bolted to the ground which are made of reinforced concrete foundations; and (ii) cross-arms which connects the conductors with the towers; and (iii) the conductor is the line used to carry electrical energy from one tower to the next until its connection with the High Voltage National Grid. The conductor will be a 225kV line.

Figure below shows typical HV lines within the study area and figure 2.6 shows the STEG electrical substation.



**Figure 2.5 - Typical HV Lines**



**Figure 2.6 - STEG Electrical Substation**

## 2.5 *Summary of Project Activities*

The Project will be developed in a three-phase sequence, as follows for which the potential impacts will be assessed:

- Planning & Construction Phase
- Operation Phase
- Decommissioning Phase

Potential impacts are assessed throughout the various Project phases as defined below.

### **Planning and Construction Phase**

This includes preparing the detailed design and layout of the Project, transportation of Project components onsite, as well as site preparation and construction activities for installation of PV modules, inverter stations, substation, internal access roads, office and warehouse, OHTL, etc.

Construction phase of project activities will include the following:

- Contractor mobilization;
- Site Preparation including fencing, site clearing levelling and grading (no ground levelling will be required. Vegetation will only be cleared on the main internal roads);
- Transportation of project components. All PV panels, electrical and structural equipment is planned to be shipped through sea or air to a seaport or airport and then trucked to site via road in containers;
- Construction of site office and internal roads;
- Construction of temporary storage facilities;
- Hydro-infrastructure;
- Foundation laying for ground mounted structures;

- Laying of internal electrical connections;
- Construction of sub-station and office buildings;
- Installation of inverter and transformers; and
- Commissioning tests which usually involve standard electrical tests for the electrical infrastructure as well as the panels, and inspection of routine civil engineering quality records. Careful testing at this stage is vital if a good quality PV farm is to be delivered and maintained.

The construction activities will start early 2023 for a duration of 16 months. Commercial operation of the Project is expected to commence in 2024 for a period of 20 years.

The project layout of the proposed photovoltaic plant is provided within Figure 2.7.

### **2.5.1 Operation Phase**

This includes activities to be undertaken by the Project Operator. Activities expected to take place mainly include the normal daily operation of the PV Plant and the routine maintenance activities of the PV Project (e.g. PV module cleaning, inverter servicing, checks on structural integrity, storage and disposal of broken PV panels, etc.).

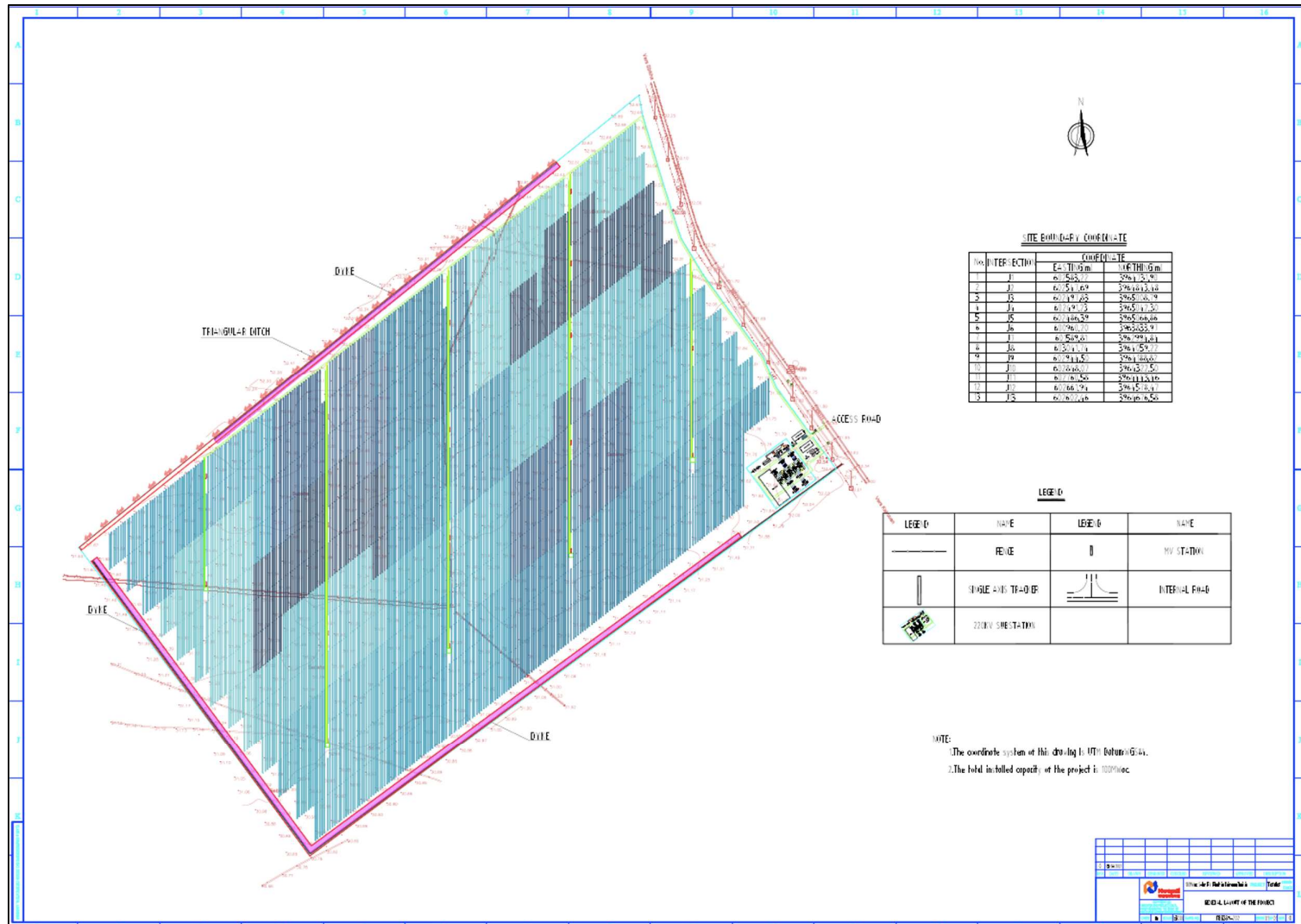


Figure 2.7 –Layout of the Proposed Photovoltaic Plant

Operation and Maintenance (O&M) activities of the PV Project include as follows:

- Monitoring, Maintenance, Inventory management, Administration warranties, Spare parts, Safety equipment and storage, Ensuring site security, Implementation, and follow-up of the ESHS plan.

The solar project will require a dedicated O&M team comprising of technical staff to conduct the O&M activities.

### **2.5.2 Decommissioning Phase**

According to the Power Purchase Agreement (PPA), the project is expected to be operational for 20 years, after which the solar power plant will be handed over to STEG. In the case of a complete dismantling of the PV park, the dismantling activities could include the disconnection of the different components of the Project (PV panel, central inverter stations, substation, etc.) for final disposal. The site will be restored to its original state or reused. Site abandonment includes, among other things, the restoration of the internal road network and the removal of gates and fences.

The cost of implementing the ESMP during the decommissioning phase is estimated at US\$ 79,000. It should be noted that decommissioning costs are estimated at USD 1,440,000.

### **2.6 Workforce**

According to information provided by the Developer, the Project will require the following workforce throughout the construction and operation phase:

- Around 450 job opportunities at peak during the construction phase for a duration of approximately 16 months. This will mainly include around 100 skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and 350 unskilled job opportunities (mainly laborers but will also include security personnel).
- Around 45 job opportunities during the operation phase for a duration of 20 years. This will include around 10 skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and 35 unskilled job opportunities (such as security personnel, drivers, etc.).

Taking the above into account, the Developer is aiming to hire local community members to the greatest extent possible throughout the construction and operation phase for skilled and unskilled jobs. The Developer is committed to adhering to transparent recruitment procedures which includes local community members.

**Table 2.4 - Workforce during construction and operation phases**

Workforce requirements	Construction phase (during 16 months)	Operation phase
Skilled labor	100	10
Unskilled labor	350	35

## 2.7 Land Requirement

### 2.7.1 Land Ownership

The land allocated for the construction of the photovoltaic power plant of Kairouan, with an area of 200 hectares, is part of the private domain of the State. This land is the object of the land title n° 9796/20323 K which covers an area of 7323 hectares 23 ares and 47 centiares in Metbasta, in the delegations of Kairouan Nord and Sbikha, in the governorate of Kairouan, Tunisia.

A land occupation agreement was signed on June 22, 2021 between the Tunisian government, represented by the Minister of State Domains and Land Affairs (the Owner), and the Developer for its exclusive availability to the Project Developer for the construction, ownership, operation, maintenance and, if applicable, dismantling of the Solar Power Plant, with a view to the exclusive sale to STEG of the net electricity produced by the Solar Power Plant during the Initial Term (without prejudice to its possible extension).

A copy of this agreement is provided in annex (Annex III).

The entire project area has always been owned by the government and has not been subject to any land acquisition or compensation process.

Therefore, no other private property is assumed to be directly affected by the construction of the Kairouan solar power plant.

### 2.7.2 Land Use

The Project site is extending over an area of 200 ha divided as follows:

▪ PV Module Arrays Area:	160 ha
▪ Inverter Stations Area	4 ha
▪ Main Substation Area	1.3 ha
▪ Office/O&M Building Area	0.2 ha
▪ Drainage Area	4.5 ha
▪ Roads Area	2 ha
▪ Unused/Buffer Area	28 ha
▪ Total Plot Area	200 ha

The project site is vacant, with no physical structure. Apart from cattle grazing, no other economic activities are undertaken on the site.

The general landscape of the project area is a rangeland called "Metbasta rangeland". It is mainly composed of halophilic vegetation that has undergone a major metamorphosis into a true therophytic vegetation zone, following the germination of annual species. The presence of certain edible species during specific periods of the year is of interest to livestock farmers, both sheep and goats and even camels.

Figure 2.8 below illustrates the livestock encountered within the Metbasta range during the site visit on 26 September 2020.



**Figure 2.8 - Livestock grazing in Metbasta Rangeland (26/09/2020)**

It should be noted that extensive pastoralism is undertaken in the open lands of the Metbasta region, which cover an area of more than 10,000 hectares and are covered by land titles 20321 Kairouan, 20523 Kairouan, 20323 Kairouan and 33767 Kairouan. Based on information provided by the CRDA of Kairouan, the number of breeders who frequent the Metbasta grazing area is about 30 shepherds for a herd of 3000 head of cattle, to which must be added about 20 breeders who practice transhumance (who come from neighbouring areas) and whose herd size is estimated at 2000 head of cattle.

The site of the solar power plant, which covers 200 ha, i.e. 2% of the area of the Metabasta grazing area, has a vegetation cover of 2.5%, consisting of the same plant species as those existing in the vast Metbasta grazing area. These plant species have the same ecosystem value and are therefore useful for grazing activities.

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the solar power plant site and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of the identified herders varies from 30 to 400 heads.

## 2.8 *Resource Use Efficiency*

The objective of this section is to demonstrate how the Project design has endeavored to optimize the use of natural resources involved in the Project processes to the greatest extent possible.

- 1) Electricity & Greenhouse Gas Emissions: One of the key positive impacts of the Project, as far as resource efficiency, is that it will be utilizing solar energy to produce electricity. The Project will be of an installed capacity of 100 MW that will contribute to the national grid and reach end users and help meet the increasing electricity demands throughout Tunisia – as opposed to meeting such increasing demands through conventional electricity production from thermal power plants.

The Project is expected to provide around 230-Gigawatt Hour (GWh) of electricity per year, which is enough to power around 42,878 households in Tunisia.

Tunisia is a signatory of the 2015 Paris Climate Agreement. The State is thus committed at the level of the Nationally Determined Contribution (NDC) to reduce its greenhouse gas emissions in all sectors to reduce its carbon intensity by 41% in 2030 compared to the 2010 base year. The reduction specifically targeted in 2030 for the energy sector is 46%. This reduction in carbon intensity is achieved through the use of renewable energy projects, which is framed by the Tunisian Solar Plan. The operation of a solar power plant in Kairouan with an installed capacity of 100 MW will have a positive impact on air quality in general and is a means of combating global warming, as it is a clean energy production system that does not generate greenhouse gases during its operation, as well as other pollutant emissions (e.g. SO<sub>2</sub>, NO<sub>2</sub>, CO, etc.). The project will likely avoid more than 117,000 tons of CO<sub>2</sub> per year. Thus, it will contribute to the reduction of GEG emissions by 0.45%, based on 26 million tons of GEG estimated in 2030 (Source: MALE, 2020).

- 2) Water Resources: It is expected that the Project throughout the construction phase will require 5 438 m<sup>3</sup> of water. During operation phase, the PV modules will be cleaned on a regular basis to prevent dust build-up which could affect their performance. A dry-cleaning method is proposed with a dry rolling brush, which is propelled by a vehicle (tractor) that traverses between the module rows. No water or cleaning solvent

is used for cleaning. The cleaning occurs during the early morning and late evening, so as not to reduce PV generation with shading. A total of three vehicles are required to clean the entire PV array, at a frequency of 12 times per year to maintain a reasonable soiling loss (<2%). Thus, the use of dry-cleaning saves approximately 3 000 m<sup>3</sup> of water per year (based on approx. 250 m<sup>3</sup> of water per clean of the entire PV array). The operation phase will require approx. 10 m<sup>3</sup>/Month. An on-site water tank of 15 m<sup>3</sup> will be used for potable water.

### 3.0 ESIA APPROACH AND METHODOLOGY

This Chapter presents the approach and methodology that was undertaken for the ESIA study in accordance with good international industry practice, this mainly includes (i) the IFC Policy on E&S Sustainability (2012), IFC Performance Standards (2012), and IFC EHS Guidelines; and (ii) AfDB Integrated Safeguards System (2015) (iii) along with applicable national, state, and local regulations.

#### 3.1 *Delineation of Study Boundaries and Scope of Assessment*

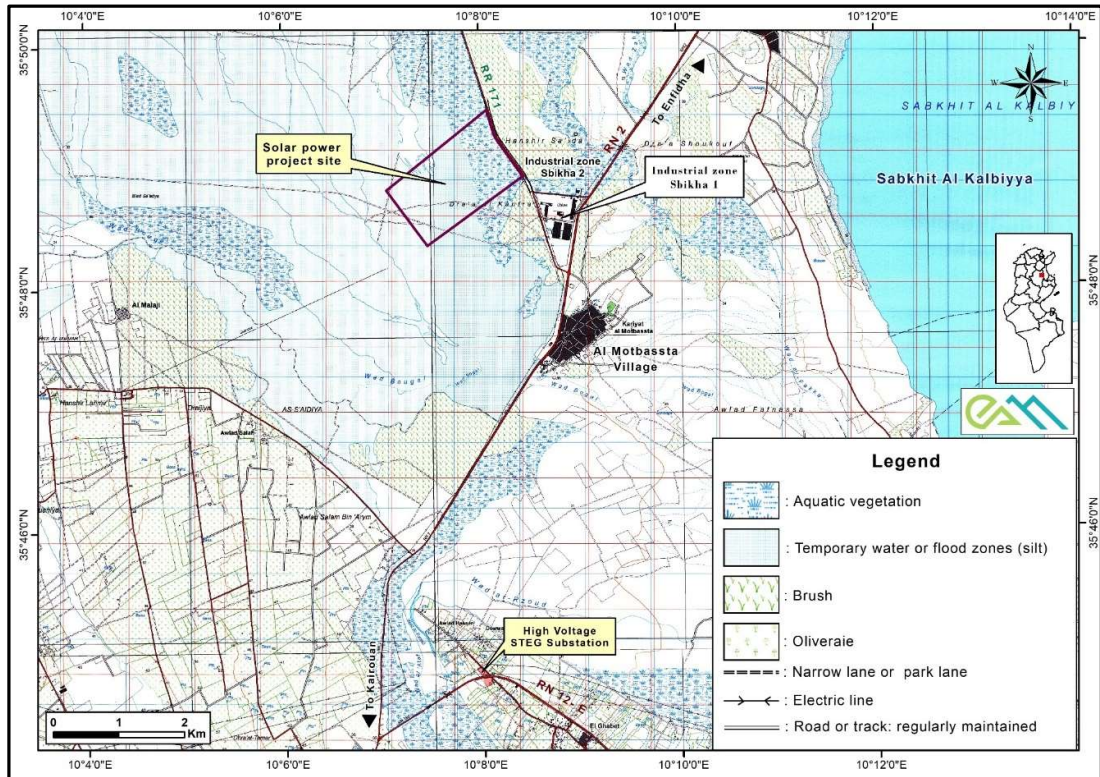
Before detailing the methodology of the assessment, it is important to delineate the study boundaries and the scope of the assessment that will be undertaken, both of which are discussed below.

#### 3.2 *Definition of Spatial Study Area*

The overall Study Area for the ESIA represents the potential area of influence of the Project. This is ‘*the area over which significant effects of the Project could reasonably occur, either on their own, or in combination with those of other developments and projects*’. In general terms, the Study Area for the Project ESIA will include the footprint of Project disturbance as demarcated in red in the figure below – this includes the Solar PV Project site). However, for the assessment of the individual environmental and social parameters (socio-economic, infrastructure and utilities, etc.), an appropriate thematic Study Area will be determined for each theme on a case-by-case basis. Such a thematic Study Area are clearly identified throughout this ESIA under each chapter as relevant.

In identifying these thematic Study Areas, the type and degree of the potential direct and indirect effects will be taken into consideration. The core area where direct effects are likely to occur will be determined, as well as the wider area of influence where indirect, combined, and cumulative effects are likely to occur on the surrounding areas and communities.

***Note: it is important to note that the spatial Study area will not include the footprint of the OHTL that will be subject to a separate ESIA (see Annex II)***



**Figure 3.1 - Study Area**

**Scope of the Assessment**

The Project will be developed in a three-phase sequence, as follows for which the potential impacts will be assessed:

- Planning & Construction Phase
- Operation Phase
- Decommissioning Phase

Potential impacts are assessed throughout the various Project phases as defined below.

***(i) Planning and Construction Phase***

This includes preparing the detailed design and layout of the Project, transportation of Project components onsite, as well as site preparation and construction activities for installation of PV modules, inverter stations, substation, internal access roads, office and warehouse, etc.

***(ii) Operation Phase***

This includes activities to be undertaken by the Project Operator. Activities expected to take place mainly include the normal daily operation of the PV Plant and the routine maintenance activities of the PV Project (e.g., PV module cleaning, inverter servicing, checks on structural integrity, etc.).

### ***(iii) Decommissioning Phase***

According to the PPA, the Project is expected to be operational for 20 years and then the plant shall be handed over to the STEG. In the case of the complete decommissioning of the PV farm, decommissioning activities could include the disconnection of the various Project components (PV array, central inverter stations, substation, etc.) for final disposal. In addition, internal road network will be restored, and gates and fences will be removed.

### ***3.3 Screening and Scoping***

A Screening and scoping assessment was undertaken for the Project through: (i) a desktop study related to the surrounding project area prior to the site visit to gain an understanding of the project site that also included analysis and review of secondary data available on the Project area; and (ii) a site reconnaissance visit for the project site on September 4<sup>th</sup> and 6<sup>th</sup>, 2020 to gather data on the environmental and social conditions of the project area and to identify any key environmental or social sensitivities that may guide any necessary modifications to the project. The scoping report is presented in Annex (see Annex IV).

### ***3.4 Analysis of Alternatives***

This chapter investigates several alternatives to the Project development and the reasons for the preferred choice.

The examination of alternatives is considered to be a key element of the ESIA process under good international practice, and according to IFC PS1 and AfDB OS1.

The analysis of alternatives is presented in “**Chapter 4**”. This chapter investigates and compares several alternatives to the Project development in relation to: (i) the Project site (ii) the chosen technology of power generation, (iii) the Project design, and (iv) finally investigates the ‘no action alternative’ – which assumes that the Project development does not take place. In addition, this section considers the promotion of Renewable Energy in Tunisia and the project justification.

### ***3.5 Environment and Social Baseline Conditions***

The description of the Environmental and Social Baseline conditions in the project site is based on literature and desktop review relevant to the study area, completed by field surveys and site investigations by relevant experts.

The Environmental and Social Baseline conditions are presented in “**Chapter 7**” and include:

- Description of physical environment of the study area (geomorphology, geology, pedology, hydrology, hydrogeology, climatology, ambient air quality and noise level);

- Definition of biological environment (fauna, flora and protected area);
- Definition of the socio-economic (population, socio-economic activities in the area, rate of electrification, cultural and archaeological heritage and landscape).
- Characterization of the existing infrastructure within the area related to:(i) wastewater infrastructure and utilities; (ii) solid waste infrastructure and utilities; (iv) hazardous waste infrastructure and utilities and (v) road networks.

### **3.6 Stakeholder Consultation and Engagement**

Stakeholder consultation and engagement is an essential part of the ESIA process and has been carried out in accordance with the IFC & AfDB requirements. The previous and future stakeholder consultation and engagement for the Project are discussed in detail in “Chapter 6”.

### **3.7 Environmental & Social Constraints**

The outcomes of the scoping report and baseline conditions led to develop an E&S constraint analysis mapping and to identify any key environmental and social sensitivities that may prompt any necessary modifications to the project’s design and future management of E&S risks and impacts.

The E&S constraints report is presented in Annex V.

### **3.8 Assessment of E&S Impacts**

The adverse and beneficial environmental and social impacts of the Project have been identified and assessed against the established baseline. A consistent approach to the assessment of impacts was followed to enable environmental and social impacts to be broadly compared across the ESIA. A set of generic criteria were used to determine significance (see below) which will be applied across the various environmental social and environmental parameters.

A qualitative assessment was conducted using professional experience, judgment, and available knowledge, and including the consideration of stakeholder views. Where there are limitations to the data, and/or uncertainties, these have been recorded in the relevant chapters, along with any assumptions that were taken during the assessment.

In order to determine the significance of each impact, two overall factors are considered:

- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions; and
- Magnitude and Nature of the impact.

### **Sensitivity of the Receiving Parameter**

Receiving parameter sensitivity will be determined using information taken from the baseline description on the importance, significance or value of the social or environmental component under examination. It is important to understand the sensitivity of the receiving parameter, as this is a measure of the adaptability and resilience of an environmental parameter to an identified impact. The following categories of sensitivity will be applied to the assessment:

- *High*: The environmental parameter/receptor is fragile, and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.
- *Medium*: The parameter/receptor has a degree of adaptability and resilience and is likely to cope with the changes caused by an impact, although there may be some residual modification as a result; and
- *Low*: The parameter/receptor is adaptable and is resilient to change.

### **Magnitude and Nature of the Impact**

The magnitude of the impact is the scale of change which the impact may cause compared to the baseline and how this change relates to accepted thresholds and standards. The following categories will be applied to the assessment:

- *High*: a large change compared to variations in the baseline. Potentially a clear breach of accepted limits;
- *Medium*: change which may be noticeable and may breach accepted limits; and
- *Low*: when compared with the baseline, change which may only just be noticeable. Existing thresholds would not be exceeded.

Furthermore, in determining the magnitude of the impact it is important to consider several other factors which define the nature of the impact. This includes the following:

### **Type of Impact**

- *Positive*: applies to impacts that have a beneficial environmental result, such as enhancement of the existing environmental & social conditions; and
- *Negative*: applies to impacts that have a harmful aspect associated with them such as loss or degradation of environmental resources.

### **Type of Effect**

- *Direct*: applies to impacts which can be clearly and directly attributed to a particular environmental or social parameter (e.g. generation of dust directly impacts air quality);

and

- *Indirect*: applies to impacts which may be associated with or are subsequent to a particular impact on a certain environmental or social parameter (e.g. high levels of dust could entail nuisance and health affects to construction workers onsite).

*Duration (how long the stressor or its effect last)*

- *Short Term*: applies to impacts whose effects on the environment will disappear within a 1-year period, or once construction activities are completed;
- *Medium Term*: applies to impacts whose effects on the environment will disappear within a 5-year period; and
- *Long Term*: applies to impacts whose effects on the environment will disappear in a period greater than 5 years.

*Reversibility*

- *Reversible*: applies to impacts whose significance will be reduced and disappeared over time (either naturally or artificially), once the impacting activity ceases; and
- *Irreversible*: applies to impacts whose significance will not be reduced nor disappeared over time (either naturally or artificially), once the impacting activity ceases.

*Assessing the Significance of the Impacts*

The concept of ‘significance’ is central to the ESIA process and aids the identification and categorization of environmental and social effects. As noted, in order to determine impact significance, the sensitivity of each environmental and social parameter/receptor is considered in combination with the magnitude of the impact. The table below demonstrates how these parameters are considered in the assessment of significance.

**Table 3.1 - Assessment of the Significance of the Impact**

Assessment of the Significance of the Impact		Magnitude and Nature of the Impact		
		Low	Medium	High
Sensitivity of Receptors	Low	Not significant	Minor	Minor
	Medium	Minor	Minor	Moderate
	High	Minor	Moderate	Major

\*The positive impacts will be indicated with shading.

While the above matrix provides a framework for the determination of significance, and enables comparison across environmental and social parameters, a degree of professional

judgement must be used and some parameter-specific factors to be considered in making the determination of significance.

Below provides additional guidance to the degrees of significance to be used in the ESIA:

- ***Major significance***: requires thorough investigation in the ESIA and thus such impacts need to be studied extensively by consulting expertise in the areas of the identified impacts to design needed mitigation and environmental management measures. Moreover, conducting specific studies and assessments to some of the key issues identified;
- ***Moderate significance***: requires reasonable investigation in the ESIA. These impacts will be studied by expertise in the areas of the identified impacts to design needed mitigation and environmental management measures.
- ***Minor significance***: must be listed, and addressed in some way, but which did not require detailed assessment in the ESIA.
- ***Not significant***: For completeness, impacts which have been included in the assessment but determined not to be significant, will be rated formally as ‘not significant’.

### **Mitigation and Monitoring**

A vital step in the ESIA process is the identification of measures that can be taken to ensure that impacts are mitigated or reduced to acceptable levels. The ESIA will firstly consider the significance of any impacts caused by the Project and then assign mitigation options through applying the following hierarchy:

- Avoiding or ‘designing out’ impacts wherever possible;
- Considering alternatives or modifications to the design to reduce the impacts wherever possible;
- Applying measures to minimise and manage impacts on the receptor; then As a last resort,
- identifying fair compensation, remediation and offsetting measures to address any potentially significant residual effects.

Some negative impacts can be easily mitigated, whilst others cannot or are too difficult and costly to mitigate. The various potential impacts will be described in the ESIA, along with the provision of ‘feasible mitigation measures’ that can be implemented. Moreover, for positive impacts it is not possible to identify mitigation measures, but rather recommendations will be identified which aim to enhance the positive impact.

In addition, monitoring measures will also be identified and developed to ensure that the identified mitigation measures are taken into account, implemented properly, and are sufficient measures for the protection of environmental and social receptors.

#### **Assessment of Residual Effects**

If there are mitigation measures it is then necessary to make an assessment of the ‘residual significance’ after mitigation has been taken account. A re-assessment of Project impacts will then be made, taking into account the effect of the proposed mitigation measures in order to determine the significance of the *residual effects*.

#### **Assessment of Cumulative Impacts**

For each of the impacts assessed, the ESIA will investigate the cumulative impacts which could result from incremental impacts from other known existing and/or planned developments in the area and based on currently available information on such existing/planned developments.

Impact Assessment and Mitigation Measures are presented in “Chapter 8”.

### **3.9 Environmental and Social Management Plan (ESMP)**

Based on the results of the impact assessment, the development of mitigation measures and the monitoring plan, an ESMP has been compiled in a single table that details all of the above. The ESMP will be a key document that consolidates the environmental requirements and details the procedures necessary to manage the significant environmental issues associated with the proposed project activities. The ESMP will also include the identification and definition of the roles and responsibilities of all entities involved in the implementation of the ESMP.

The ESMP will be developed specifically to provide flexibility in the exact nature and location of operations, while ensuring that all potential impacts are identified and properly mitigated and monitored throughout the subsequent stages of the project. This ESMP can be used as a stand-alone document during the different phases of the project by the Promoter, the EPC contractor, the Project operator and other responsible parties to develop their own site ESMPs.

The development and implementation of an Environmental and Social Management System (ESMS) according to the project and site specific Environmental, Health and Safety and Social (EHSS) guidelines is considered a key requirement by the IFC Performance Standard PS1 and the AfDB Operational Safeguard SO1. The implementation of an environmental and social management system (ESMS) ensures that project related HSE

impacts are properly managed and controlled.

In general, the management system (ESMS) is based on the general requirements of the ESMP. In the context of the ESIA, the general framework, structure and main requirements of this system have been developed for the main entities involved in the project, namely the Promoter, the EPC contractor and the project operator.

## 4.0 ANALYSIS OF ALTERNATIVES

This chapter investigates several alternatives to the Project development and the reasons for the preferred choice.

The examination of alternatives is considered to be a key element of the ESIA process under good international practice, and according to IFC PS1 and AfDB OS1.

### 4.1 *Promotion of Renewable Energy in Tunisia*

The Tunisian energy sector is facing strategic, economic, social and environmental challenges. Energy sourcing, particularly in the power sector, relies heavily on natural gas (97% of total power generation), of which 50% is imported from Algeria, given the limited available national resources. Furthermore, electricity demand is increasing. As a consequence, the primary energy balance deficit has been aggravating for the past 15 years, reaching 50% in 2018.

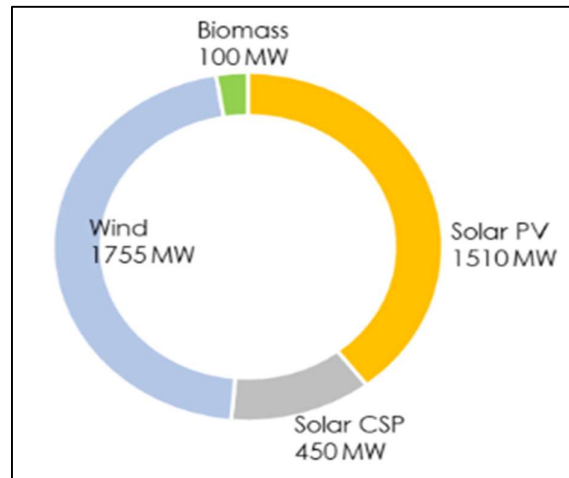
This situation of energy dependence imposes major challenges on Tunisia related to the security of its energy supply and the competitiveness of its economy. It should be noted in this context that the increase in imports of energy products, to cope with this deficit, increasingly affects the situation of the national trade balance and foreign exchange earnings of the country.

In order to meet these energy sector challenges, the National Agency for Energy Conservation (ANME), a public institution under the supervision of the Ministry of Industry, Energy and Mining, was created in 1985 to ensure the implementation of State policy in the field of energy management, including the promotion of energy efficiency and renewable energies.

Tunisia has thus adopted an energy transition strategy based on two main axes:

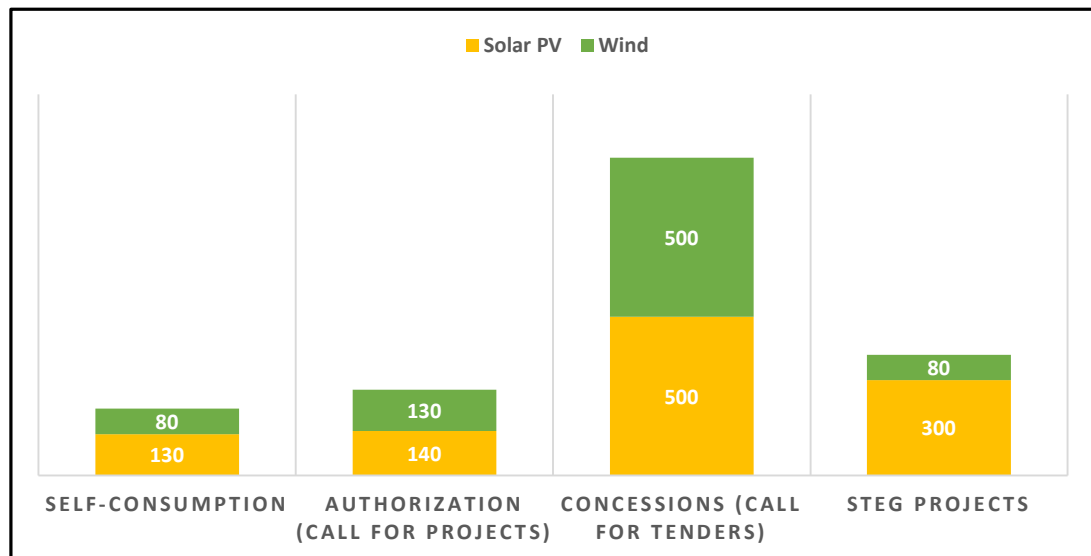
- The rational use of energy, with the objective of reducing its primary energy consumption by 30% by 2030, and
- A policy of diversifying its energy mix which is essentially based on the development of renewable energies.

The Tunisian Solar Program (TSP) is the national program aiming at reaching the renewable energy development strategy targets. The goal is to increase the total share of renewables in the electricity generation mix from 3% to 30% by 2030 by developing an additional renewable energy installed capacity of 3815 MW by 2030 (Source GIZ, 2019).



**Figure 4.1** - Tunisian Solar Program 2030 installed capacity targets by technology (MW) - (Source GIZ, 2019)

Tunisia has implemented a new regulatory framework through the enactment, in 2015, of Law no. 2015-12 relative to electricity generation by renewable energy sources, which details three regulatory schemes: self-consumption, “authorizations” through call for projects, and “concessions” through call for tenders.



**Figure 4.2** - Tunisian Solar Program 2017-2022 installed capacity targets by technology (in MW) (source GIZ, 2019)

The number of operational plants producing electricity from renewable energy to date are limited in Tunisia, despite the abundant resources. The main achievements so far can be summarized as follows (GIZ, 2019):

**Table 4.1 - Operational RE plants in Tunisia (source GIZ, 2019)**

Technology	Realization
Wind	2 farms totaling an installed capacity of 245 MW in northern Tunisia
Solar PV	Installed capacity of over 55 MW under the self-consumption scheme (mainly connected to the LV grid)
Hydropower	Global installed capacity of 62 MW

**4.2 Site Selection Alternatives**

Tunisia has extremely favorable sunshine conditions and has vast open spaces that can accommodate large electricity production capacities. The construction of solar power plants will allow the increase of the country's production capacities and the satisfaction of the national demand for electrical energy. The development of solar energy and the increase in energy efficiency will lead to a diversification of the energy mix and a reduction in the dependence and risks associated with the massive use of fossil fuels.

At the industrial level, these technologies are undergoing substantial development: they therefore represent a significant potential for the creation of new markets and are promising in terms of job creation, technology transfer and therefore economic and social development.

Under the Tunisian Solar Program, the Government of Tunisia represented by its Ministry of Industry, Energy and Mining, launched an international competitive bidding process for selection of companies for the development of solar PV Projects. A total capacity of about 500 MW plus auxiliary facilities will be developed in the following proposed areas located in the governorates of Tozeur (50 MW), Sidi Bouzid (50 MW), Kairouan (100 MW), Gafsa (100 MW) and Tataouine (200 MW).

The project site selection justification takes into account the technical, environmental, economic and social aspects of the project.

Several factors were taken into account by STEG to ensure that an optimal location was chosen for the development of this solar photovoltaic project, including:

- Electricity demand in the study area especially during day pick hours.
- **Good solar irradiance:** Kairouan region has an average GHI (Global Horizontal Irradiance) that varies from 76.5 kWh/ m<sup>2</sup> in December to 229.3 kWh/m<sup>2</sup> in July with an annual average of 1 793.3 kWh/m<sup>2</sup> (2010-2019);
- **Proximity to the road network:** access to the project site will be from the national road RN-2 linking Enfidha to Kairouan and the regional road RR-171 connecting Metbasta to Sbikha. Besides reducing costs, this will avoid environmental impacts

associated with the construction of roads.

- **Proximity to the STEG electricity network:** The solar plant is located near STEG electrical substation (radius of 6.6 km) capable of receiving the energy produced.
- **Distance to Key Sensitive Receptors:** The Project site in general is located at a reasonable distance from any key potential sensitive receptors which includes community settlements and environmental sensitive areas (IBAs).
- **Natural Landscape of the Site:** PV solar developments generally require a flat terrain for the installation of the various Project components to include the PV arrays. The Project area in general can be characterized as being dominantly of fairly flat surfaces and therefore site preparation and earthwork activities are not expected to be substantial.
- **Availability of Governmental Lands:** priority was for selecting areas that included governmental owned lands which would therefore eliminate costs related to land acquisition.

In this context, the Developer was awarded in December 2019 the Agreement for a 100 MW PV Solar power plant in the governorate of Kairouan within the Project site that was provided to the Developer by the Government of Tunisia. Therefore, there are no site-specific alternatives that were considered by the Developer.

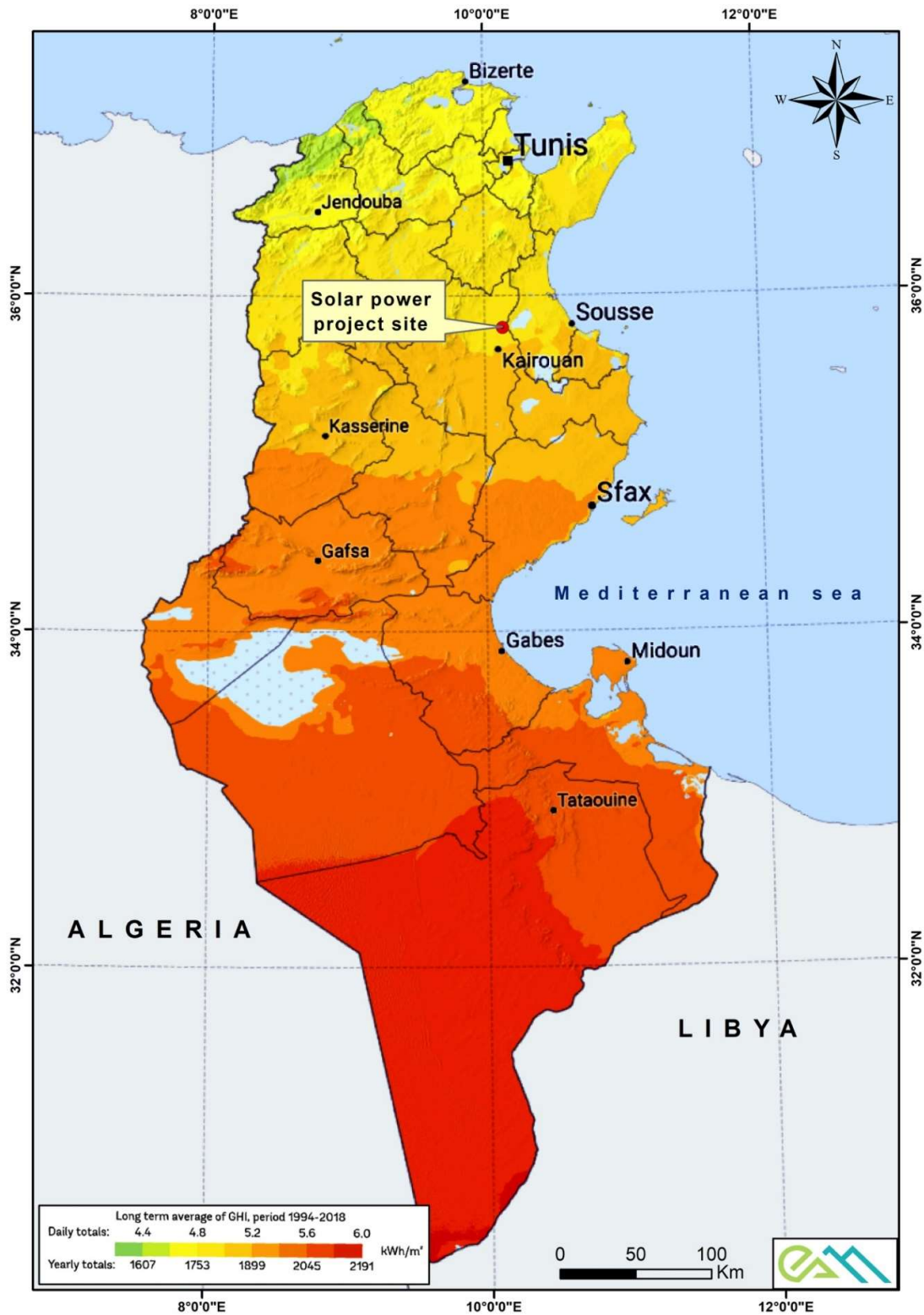


Figure 4.3 - Solar Resource Map of Tunisia

### 4.3 *Technology Alternatives*

This section discusses several alternatives besides the development of a solar PV project. It mainly covers the wind technology and the thermal power plant.

- Wind Technology Alternative

The annual average wind speed in Tunisia is modest. It varies between a minimum of 2.09 m/s (in Kairouan) and a maximum of 5.45 m/s (in Thala). In general, an average exceeding 4 m/s is required to justify the installation of a wind turbine (IREC, 2010). Furthermore, the natural characteristics of the Project site are likely to be considered unsuitable for the development of a feasible wind farm at a commercial scale.

- Thermal Power Plant Alternative

Mainly composed of thermal power plants, the power generation fleet in Tunisia is the largest national consumer of natural gas. Given the decrease in natural gas production (-36% over period 2010-2018), the heavy reliance on hydrocarbons poses a serious threat to the security of power generation. **About 97% of electricity is generated by natural gas; the share of renewables has not exceeded 3%.** In addition, thermal power plants are well known for their environmental impacts when compared to this Project and could include significantly higher water consumption, generation of air pollutants and greenhouse gas emissions, noise generation, etc. More importantly, such developments would not be in line with the national energy strategy which aims to secure the country's supply of electricity and the promotion of renewable energy, with the objective of reaching 30% by 2030 in installed capacity of which 10% from solar energy (including 7% photovoltaic and 3% concentrated solar thermal, CSP).

### 4.4 *Project Design Alternatives*

One of the objectives of this ESIA is the identification of any environmental and social constraints on the site-specific level which must be taken into account by the Project developer throughout the planning and design phase of the Project. Such constraints could include possible onsite archaeological resources of significant value, critical habitats which must be protected, infrastructure and utilities constraints and restrictions amongst others.

However, as presented throughout the ESIA, the main constraint identified in relation to the Project site is the flooding risk, which need to be taken into account throughout planning and design phase of the Project.

In addition, as noted throughout this ESIA study, the significance of the anticipated impacts from the Project are generally minor. Furthermore, as presented throughout this ESIA, appropriate mitigation and management measures have been identified for such impacts,

and there are no significant residual effects which would require compensation or offsetting, excepted the potential loss of grazing area for the shepherds and Natural habitat losses.

Nevertheless, some project design alternatives were investigated with the Developer as highlighted below which took into account environmental considerations (although not considered constraints), including mainly eco-design features, drainage ditch, etc. In addition, the PV modules will be cleaned on a regular basis to prevent dust build-up which could affect their performance. A dry-cleaning of the panels will be used which does not entail the use of water. This involves the use of a dry rolling brush which is propelled by a vehicle (tractor). However, it is expected that there would be situations where water will still be required to clean the panels (e.g. when dust becomes adhesive from rain or humidity). Nevertheless, the dry brush cleaning program is considered to maximize water use efficiency at the Project site and reduce water consumption levels during the operation phase.

#### **4.5 No Project Alternative**

The “No Project” alternative considers that the 100MW Project will not be developed. Should this be the case, then :

- The Project site area would remain unchangeable;
- The land area would remain with its current characteristics - a saline depression with clay soil and a halophilic vegetation community;
- The land use of the area would most likely remain unchanged, uninhabited and unused (except for grazing by livestock);
- The negative environmental and social impacts generated, **described in this ESIA report**, would thus be avoided, although they could be considered to be appropriately controlled and reduced through the implementation of mitigation measures.

However, the positive environmental and economic impacts associated with the Project would not be realized. This includes the following in particular:

- The development allows for more sustainable development and shows the commitment of the Government of Tunisia to realizing its energy strategy and meeting the set targets for renewable energy sources.
- The Project in specific will contribute to increasing energy security through reliance on an indigenous, inexhaustible and mostly import-independent energy resource which as discussed earlier is considered a key issue for Tunisia.

- Generating electricity through solar PV power is rather pollution-free during operation. Compared with the current conventional way of producing electricity in Tunisia through thermal power, the clean energy produced from renewable energy resources is expected to reduce consumption of fossil fuels (natural gas mainly), and will thus help in reducing GHG emissions, as well as air pollutant emissions. As discussed previously, the Project will likely displace more than 117,000 tons of CO<sub>2</sub> per year and thus, it will contribute to the reduction of GEG emissions by 0.45%, based on 26 million tons of GEG estimated in 2030.
- The Project will help improve socio-economic conditions for local communities to some extent through providing job and procurement opportunities.

In conclusion, an ESIA must investigate all potential positive and negative impacts from a project development. In the case of this Project, it is important to weigh the significant positive economic and environmental impacts incurred from the Project development, against the negative environment and social impacts anticipated at the site-specific level – The comparison clearly concludes that the ‘no project’ alternative is not a preferable option.

## 5.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### 5.1 *Environmental Permitting Requirements*

The Tunisian Government Decree 2016-1123 of August 24<sup>th</sup>, 2016 states that energy production from renewable energies requires the preparation of an Environmental Impact Study. This study should be prepared according to the “Guidelines for Environmental Impact Assessment” drawn by the National Environmental Protection Agency (ANPE). However, based on Decree no. 2005-1991, dated 11 July 2005, related to the Environmental Impact Assessment (EIA) and defining the categories of units subject to the Environmental Impact Assessment and the categories of units subject to the Book of Specifications (BOS): only Power Generation Units with at least 300MW capacity are subject to EIA studies. **Therefore, the project for the construction of a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the approval of the ANPE and does not require an environmental permit for its implementation.**

The Developer intends to undertake an Environmental and Social Impact Assessment (ESIA) for the project, in accordance with International Finance Corporation (IFC) Performance Standards 2012 and the African Development Bank (AfDB) Integrated Safeguards System (ISS). Therefore, the Developer wishes to design and manage the project in accordance with good international industry practice – for the purpose of the ESIA, it will be based on: (i) the IFC Policy on E&S Sustainability (2012), IFC Performance Standards (2012), and IFC EHS Guidelines; and (ii) the AfDB Integrated Safeguards System (2015) along with applicable national, state and local regulations. This chapter encompasses the environmental and social legal framework applicable for the proposed 100 MW solar project in Kairouan. Consideration is first given to the national legislations pertaining to the execution of the ESIA, followed by a review of guidelines of international financing institutions for environmental and social requirements relevant to the project.

### 5.2 *Environmental and Social Requirements in Tunisia*

#### 5.2.1 Institutional Framework

##### *(i) Ministry of Industry, Energy and Mining*

The energy and renewable energy sector is placed under the supervision of the Ministry of Industry, Energy and Mining. The mission of the Ministry is to develop and implement government policy in areas related to industry, agri-food industries, services related to industry, energy and mining, industrial cooperation and industrial, energy and mining security.

- **The National Agency for Energy Conservation (ANME)**

The main areas of intervention of ANME are the promotion of renewable energies, rational use of energy and energy substitution. ANME is in charge of implementing the State's energy policy through the promotion of energy efficiency and support for renewable energies. In the field of photovoltaic solar installations, ANME is, in particular, responsible for:

- The promotion and management of existing support mechanisms for photovoltaic electricity production,
- The granting of approvals to companies active in the photovoltaic field,
- Equipment eligibility (PV modules...).

ANME manages the Energy Transition Fund (FTE), which grants subsidies for investments to promote renewable energy and rational use of energy.

- **The Tunisian Company of Electricity and Gas (STEG):**

STEG, which was created by Decree-Law 62-8 of 3 April 1962 as amended and supplemented by Law 96-27 of 1 April 1996, has for essential missions, the electrification of the country, the development of the Gas Nature network, the realization of an electric and gas infrastructure. STEG is responsible for the production of electricity and Liquefied Petroleum Gas (LPG) as well as for the development of the natural gas network.

*(ii) Institutions in charge of environmental and social issues*

Many qualified institutions deal with the management and protection of the environment and social aspects. The institutions directly involved in this project are:

- **Ministry in charge of Environment (Ministry of Local Affairs and Environment**

Is in charge of the environmental policies of the State) and public institutions under supervision such as :

**The National Environmental Protection Agency (ANPE) :** ANPE is in charge of the application of regulatory texts relating to environmental protection, the examination of EIAs and specifications and ensures compliance with the related recommendations, environmental control and monitoring.

**The National Waste Management Agency (ANGed):** is in charge of the following missions in particular:

- Participate in the development of national waste management programs;
- Helping to support and consolidate the regional groupings or structures that local

authorities create in the field of sustainable management of facilities and controlled landfills;

- Provide technical assistance to industry in the field of waste management;
- Manage public waste management systems (plastic packaging, lubricating oils and used oil filters, batteries, etc.);

Promote waste recycling and recovery collection systems and programs.

**The Coastal Protection and Development Agency (APAL):** APAL's missions generally concern the management of the maritime public domain as well as the management of coastal areas (carrying out expert studies, monitoring and control of development and protection operations). They include, in particular, the setting up of an observatory of coastal ecosystems, the enhancement of natural areas and sensitive zones and the management and protection of wetlands, coastal forests, islands...

**The National Sanitation Office (ONAS).** It was created under Law No. 73-74 dated August 3, 1974, and then restructured under the supervision of the Ministry of the Environment by Law No. 93-41 dated April 19, 1993. Its mission is mainly to combat sources of water pollution.

- **The Ministry of Agriculture**

Notably the Directorate General of Forestry (DGF), whose mission is to ensure the protection and management of the State's forest estate, including national parks and nature reserves. At the regional level, the services of the Ministry of Agriculture are grouped together within the administrative boundaries of each governorate in a Regional Commission for Agricultural Development (CRDA). The CRDAs could be involved in this project through their roles in the management and conservation of natural resources in accordance with the recast Forest Code (Law 88-20 of 13/04/1988) and its implementing decrees.

- **Ministry of Culture, in particular the National Heritage Institute (INP)**

Which is responsible for preserving, safeguarding, and restoring heritage; it could intervene in this project if necessary to collect and monitor information on discoveries related to archaeology and properties of an archaeological nature or to record and monitor the state of archaeological, historical, and traditional heritage.

- **Ministry of Social Affairs**

Whose mission is to implement the social policy of the state aimed at ensuring

balanced social development between different categories and generations of Tunisian society, consolidate social welfare in the areas of health, occupational safety, social security, promotion of vulnerable categories and special needs, adult education, supervision of the Tunisian community abroad and social housing. The Ministry draws up plans at the national, regional, and sectoral levels, develops projects, ensures the participation of civil society, implements cooperation projects, supervises and assists in the promotion of communication and social information.

- **Ministry of State Property and Land Affairs (MDEAF)**

Who is in charge of the conception and implementation of the State's policy concerning the public and private domains constituted by all movable and immovable property and rights belonging to it. The MDEAF is responsible for the management control of movable and immovable property belonging to the State, regional and local public authorities and public establishments and enterprises; the allocation and disposal of State-owned immovable properties; the acquisition and expropriation of immovable properties for the benefit of the State and public administrative establishments, etc.

- **NGOs and Civil Society**

Tunisian civil society associations cover a large number of areas of intervention (culture, support for the disabled, human rights, health, the various productive sectors and small income-generating activities, environmental protection, education, etc.). Gathered for some time in a national platform <http://jamaity.org/>, these various associations have a growing impact on the daily life of Tunisian citizens, particularly in the preservation of the environment and sustainable development.

### **Local Regulatory and Legislative Framework**

The legal framework established in Tunisia covers most aspects related to environmental protection, pollution control and improvement of the living environment. It includes preventive (EIA) and incentive instruments (financial aid and tax incentives) as well as coercive measures against natural and legal persons committing pollution or environmental degradation offences.

The local regulatory and legislative framework is presented in the following table:

**Table 5.1 - Local Regulatory and Legislative Framework**

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
<b>RENEWABLE ENERGIES</b>		
Decree No. 96-1125 of June 20, 1996	Setting the terms and conditions for granting electricity production concessions to private individuals	Applicable because the Kairouan PV plant is part of a concession programme launched by the Tunisian government.
Law No. 2009-7 of February 9, 2009	Supplementing the law No. 2004-72 establishes the framework for the production of electricity from renewable energy sources for the own consumption of industrial, agricultural or tertiary establishments which benefit from the right of access to the STEG network for the transport of the electricity produced to their points of consumption as well as the right to sell their surpluses exclusively to STEG.	Applicable because the Kairouan PV plant is part of a concession programme launched by the Tunisian government.
Decree No. 2009-2773 of September 28, 2009	Setting the conditions for access to the network and the transfer to STEG of surplus electricity produced from renewable energy sources within the limit of 30% of the production	Not applicable as the Kairouan PV plant is part of a concession programme launched by the Tunisian government. An Electricity Transfer Agreement has been concluded between STEG and the Promoter, for the exclusive sale to STEG of the net electricity produced by the Project during the Initial Term (without prejudice to any possible extension thereof), under the terms and conditions and at the Transfer Price defined in the Project Agreement.
Decree of the Minister of Energy and Technology of May 12, 2011	Approving the specifications relating to the technical conditions for connecting and evacuating electrical energy from cogeneration and renewable energy installations to the national electricity grid	Applicable because the Kairouan PV plant is part of a concession programme launched by the Tunisian government.
Law No. 2015-12 of May 11, 2015	Defines the legal regime relating to the realization of projects of production and transport of electricity from renewable energy sources, either for self-consumption or to meet the needs of local consumption or for export.	Not applicable as the Kairouan PV plant is part of a concession programme launched by the Tunisian government.
Government Decree No. 2016-1123 of August 24, 2016	Setting the terms and conditions for the implementation of projects for the production and sale of electricity from renewable energies.	Applicable because the Kairouan PV plant is a project to produce and sell electricity from renewable energy.
Order of the Minister of Energy, Mines and Renewable Energies dated February 09, 2017	Approving the specifications relating to the technical requirements of connection and evacuation of the energy produced from renewable energy installations connected on the high and medium voltage networks.	Not applicable as the Kairouan PV plant is part of a concession programme launched by the Tunisian government.

LAWS, DECREES AND ORDERS		LEGISLATIF TEXT	Applicability
ENVIRONMENT AND PROTECTION OF NATURAL RESOURCES			
EIA Legislation	Law No. 88-91 of August 02, 1988	Creating the National Environmental Protection Agency (ANPE) and amended by Law No. 92-115 of November 30, 1992. This law introduced, in its Article 5, the obligation to carry out an environmental impact assessment (EIA) and to obtain the approval of the ANPE before the establishment of any industrial, agricultural or commercial unit whose activity presents risks of pollution or environmental degradation	The project for the construction of a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the opinion of the ANPE and does not require an environmental permit for its implementation
	Decree No. 2005 - 1991 of July 11, 2005	Amending Decree No. 91-362 of March 13, 1991, on EIA. This decree specifies the content of the EIA and classifies the projects in three categories and lists them in two annexes; Annex 1 which concerns the projects submitted to the EIA, of category A (medium size projects) or category B (large projects) and Annex 2 which concerns the projects not submitted to the EIA, for small projects or those whose impact is deemed low, and which are subject to specifications. The ANPE is responsible for granting environmental authorization for the project. To date, renewable energy projects in Tunisia (solar and wind energy projects) with a capacity of less than 300 MW do not require an environmental permit under the 2005-1991 EIA decree. Therefore, an environmental permit from the Tunisian authorities is not required for the proposed project.	The project for the construction of a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the opinion of the ANPE and does not require an environmental permit for its implementation
Water Code	Law No. 75-16 of March 31, 1975	Promulgating the Water Code which contains various provisions governing, safeguarding, and enhancing the public hydraulic domain. According to the terms of article 109 of this code, it is forbidden to let flow, discharge or throw in the waters of the public hydraulic domain, conceded or not, residual waters as well as waste or substances likely to harm public health or the good use of these waters for any possible use.	Not directly applicable, but indirectly applicable when considering water use management and sanitation facilities for the project.
Pollution Prevention Legislation	Liquid discharges	Decree No. 85-56 of January 2, 1985	<b>Relating to the regulation of discharges into the receiving environment.</b> This decree sets out the conditions for prohibiting and the procedures for authorizing discharges into the receiving environment. Any discharge into the public hydraulic domain is subject to authorization by Office of Planning and Hydraulic Balances (BPEH) of the Ministry of Agriculture.
		The Order of the Minister of Local Affairs and the Environment and the Minister of Industry and Small and Medium Enterprises of March 26, 2018	<b>Setting the limit values for effluent discharges into the receiving environment.</b> It repealed the order of the Minister of National Economy of July 20, 1989, approving the Tunisian Standard NT 106.02 which sets the conditions for effluent discharges into the water environment (public maritime domain, public hydraulic domain and public sanitation networks).

LAWS, DECREES AND ORDERS		LEGISLATIF TEXT		Applicability
Air emissions	Law n° 2007-34 dated 4 June 2007	Relating to the air quality		Not applicable
	Decree n°2010-2519 dated 28 September 2010	Fixing the limit values of air pollutants from stationary sources.		Not applicable
	The government decree No. 2018-447 of May 18, 2018	<b>Setting the limit values and alert thresholds for ambient air quality.</b> This decree repealed the Order of the Minister of National Economy of December 28, 1994, approving the Tunisian standard NT 106.04 relating to limit values and guide-values of pollutants in ambient air.		applicable for air quality monitoring measures
Disposal of solid waste	Law No. 96-41 of June 10, 1996	On waste and the control of its management and disposal: this law defined the specific framework for waste management and disposal methods as well as the provisions relating to: (i) the prevention and reduction of waste production at source; (ii) the recovery, recycling and reuse of waste; and (iii) the disposal of final waste in controlled landfills.		Applicable because waste will be generated during the project phases
	Decree No. 2005-2317 of August 22, 2005	Creating a National Waste Management Agency (ANGED). According to article 4, the Agency prepares the specifications and the files of the authorizations relating to the management of waste provided for in the regulations in force and follows their execution. In addition, the Agency is in charge of following the registers and the notebooks that must be kept by the establishments and the companies, which proceed on a professional basis, to the collection, transport, elimination and recovery of waste for their account or for that of others.		Applicable because waste will be generated during the project phases
	Decree no. 2005-3395 of December 26, 2005	Sets the conditions and procedures for the collection of used batteries and accumulators.		Applicable because waste will be generated during the construction and operation phases of the project
	Decree No. 2008-2565 of July 7, 2008	Amending and supplementing Decree No. 2002-693 of April 1, 2002, sets the conditions and procedures for the return of used lubricating oils and oil filters and their management.		Applicable as waste will be generated during the construction and operation phases of the project
Management of waste and hazardous products	Circular of the Ministry of Commerce of May 12, 1987	Prohibiting the importation into Tunisia of transformers and all other equipment or products based on PCBs.		--
	The Law No. 96-41 of June 10, 1996	On waste and control of their management and disposal		Applicable because waste will be generated during the construction and operation phases of the project
	The Law No. 97-37 of June 02, 1997	Fixing the rules organizing the transport by road of dangerous materials in order to avoid the risks and the damages likely to reach the persons, the goods and the environment.		Applicable because hazardous materials will be used during the project phases

LAWS, DECREES AND ORDERS		LEGISLATIF TEXT		Applicability
		Decree No. 2000-2339 dated October 10, 2000	Establishing the list and classification of hazardous waste.	Applicable because hazardous waste will be generated during the project phases
		Decree No. 2005-3079 of November 29, 2005	Establishing the list of hazardous materials that are transported by road compulsorily under the control and with the accompaniment of security units.	Applicable, to establish the list of hazardous materials that will be used during the project phases
		Order of the Minister of the Environment and Sustainable Development dated March 23, 2006	Relating to the creation of a hazardous waste treatment unit and reception, storage and transfer centers.	Not applicable
		Order of the Minister of the Environment and Sustainable Development dated January 17, 2007	Concerning the conditions and procedures for carrying out the activities of collection, transport, storage, treatment, recycling and recovery of non-hazardous waste	
		Decree No. 2009-1064 of April 13, 2009	Setting the conditions for granting authorizations for the exercise of hazardous waste management activities and authorizations for the disposal of waste or other materials at sea.	Not applicable
Prevention of noise pollution	Neighborhood noise	Order of the President of the Municipality, Mayor of Tunis of August 22, 2000	Fixes the authorised noise limit values within the municipal perimeter of Tunis.	Noise limit values are considered for the project area as this is the only decree that specifies thresholds in dB (night, intermediate period and day)
	Noise emitted by motor vehicles	Highway Code	Laying down provisions relating to motor vehicles such as: (i) prohibiting the use of multiple or high-pitched sound generators; (ii) prohibiting the free exhaust of gases; and (iii) setting maximum noise levels for each type of vehicle.	Applicable, noise will be generated due to construction activities
	Noise from industrial activities	Decree No. 84-1556 of December 29, 1984	Regulating industrial subdivisions. Under the terms of article 26 of this decree, the daytime noise level generated by a company must not exceed 50 decibels, measured at the frontage of the homes closest to the business park.	applicable
	Noise in the workplace	Order of the Ministers of Public Health and Social Affairs establishing the list of occupational diseases of January 10, 1995	Sets the daily noise exposure level at 85 dB(A).	applicable

LAWS, DECREES AND ORDERS		LEGISLATIF TEXT	Applicability
Protection of agricultural land	Law No. 83-87 relating to the protection of agricultural land	<p>Aims to protect agricultural land from urbanization and sets the terms and authorizations required for changing the status of agricultural land. It classifies agricultural land into three categories of zones:</p> <p><i>Prohibited areas</i>: these include public irrigated perimeters, forest land under the State Forest Domain and land subject to the forestry regime with the exception of rangelands. The vocation of these zones can only be modified within the framework of the specific laws governing them.</p> <p><i>Safeguard zones</i>: these cover land irrigated by hydraulic works carried out by the State or by private individuals or legal entities and not included in the public IP, oases, olive groves, areas dominated by fruit trees, forests not subject to the forestry regime, managed rangelands, etc. These lands are protected by law because of the effects of a possible change in their vocation on national agricultural production.</p> <p><i>Other agricultural land</i>: covers all agricultural land not included in the prohibited and safeguard zones. Any request to change the vocation of these zones must be submitted for the opinion of the regional technical commissions for agricultural land. A preliminary environmental assessment (PEA) is required for projects for which the proponent is applying for a change in land use. The decision to change land use is conditional, in particular, on obtaining the agreement in principle of the national environmental protection agency.</p>	<p>Not applicable</p> <p>Law No. 2019-47 of 29 May 2019, on improving the investment climate.</p> <p>According to Article 11 bis, the realisation of electricity production projects from renewable energies does not require the change of vocation of agricultural land.</p>
	Law No. 2019-47 of 29 May 2019, on improving the investment climate.	According to Article 11 bis, the realisation of electricity production projects from renewable energies does not require the change of vocation of agricultural land.	Applicable
	Law No. 95-70 of July 17, 1995, Relating to the conservation of water and soil.	The purpose of this law is the conservation of areas threatened by water erosion, wind erosion and silting. Water and soil conservation works, carried out through anti-erosion actions, are implemented within the framework of intervention perimeters according to development plans	Applicable for the conservation of water and soil
	Law No. 2001-119 of December 6, 2001	The felling and uprooting of olive trees are forbidden unless authorization is issued by the governor, territorially competent, within a period not exceeding two months from the date of filing a duly constituted application at the headquarters of the governorate.	Applicable for the 225 kV OHTL associated with the solar plant
<b>LAND TRANSPORT</b>			
Land transport	Law n°2004-33 of 19 April 2004 on the organisation of land transport. The purpose of this law is to organise the land transport of people and goods and to set the rules and conditions of activity in this field.	Applicable	
<b>PROTECTION OF BIODIVERSITY</b>			

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
<i>Biodiversity in Tunisia</i>	<p><i>Biodiversity in Tunisia is related to 69 sets of natural ecosystems and 12 sets of agrosystems. A total of 7212 species including 3749 terrestrial plant and animal species and 3463 marine and aquatic plant and animal species have been identified.</i></p> <p><i>Tunisia is well engaged in all the processes of environmental and biodiversity protection and has ratified all related international conventions and agreements. Apart from these conventions, a legal arsenal has been put in place to preserve and protect biodiversity, the most important texts cited below:</i></p>	Applicable for biodiversity conservation
The Forestry Code, promulgated in 1966 and recast in 1988	<p>As amended and supplemented by Law No. 2005-13 of January 26, 2005, constitutes the basic legal framework for the conservation of the natural environment (forests, estuaries, rangelands, forest land, national parks and nature reserves, wildlife, and wild flora) and the management of national parks. It stipulates that work and development projects can only be undertaken in areas governed by the Forestry Code after authorisation from the Minister of Agriculture.</p> <p>Among the provisions relating to National Parks, the Forestry Code: Prohibits or restricts all actions likely to hinder the natural development of fauna and flora, notably hunting, advertising and commercial activities, extraction of materials, use of water, public traffic, etc. ;</p> <p>Defines as serious and non-transactional, offences concerning protected wildlife committed in national parks.</p>	Applicable for the conservation of the natural environment
Law No. 92-72 of August 03, 1992	Recasting the legislation relating to plant protection, sets the general provisions for plant protection and the organization of the sector of pesticides for agricultural use.	Applicable for plant protection
Order of the Minister of Agriculture of June 29, 2006	Setting the conditions for granting authorizations for temporary occupations in the State Forest estate, prohibits temporary authorization for any work that will have a negative impact and risks on the environment and natural resources in the forest estate, national parks, nature parks, wildlife protection areas.	Applicable for the conservation of the natural environment
Order of the Minister of Agriculture and Water Resources of July 19, 2006	Establishing the list of rare and endangered wild fauna and flora.	Applicable for the conservation of the natural environment
<b>LAND OCCUPATION &amp; ACQUISITION</b>		

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
<p>Temporary occupation and easement of passage: Decree of May 30, 1922</p>	<p>Relating to the establishment, maintenance and operation of electric transmission lines.</p> <p>Allowing power line projects to cross private property (including agricultural land or land used for other productive purposes) without the need for land acquisition. There is therefore no transfer of ownership or expropriation to be carried out in connection with the power lines, neither at the line nor at the masts.</p> <p>Easements are compensable: when they cause damage to the land crossed, compensation must be paid.</p> <p>Compensation is paid to the operators of the land crossed, whether they own it. When a piece of land is owned by an owner but operated by another person, it is the latter who is entitled to receive compensation. The passage of a power line is prohibited through any fenced property overhanging existing buildings. Tunisian law thus de facto minimizes the impacts that a proposed line could have on physical movement by prohibiting it.</p> <p>In the framework of the right of easement, STEG concludes temporary occupation agreements with owners and/or farmers before the start of work. The same agreements are entered into with the owners and farmers using the land where the towers will be installed, even if the occupation will be for a much longer period. These agreements give rise to the payment of compensation when crop damage occurs.</p>	<p>Applicable for the 225 kV OHTL associated with the solar plant</p>
<p>Land acquisition: Tunisian Law No. 76-85 of August 11, 1976 on expropriation in the public interest, as amended by Law No. 2003-26 of April 14, 2003, and in 2016 by Law No. 2016-53 of July 11, 2016.</p>	<p>STEG favors land under the domain of the State to avoid making a land acquisition from a private owner.</p> <p>In the case where land is privately owned, STEG sets up a procedure of amicable negotiations and only resorts to expropriation, governed by Tunisian Law n°76-85 of August 11, 1976 relating to expropriation for public utility purposes as amended by Law n°2003-26 of April 14, 2003, and amended in 2016 by Law n°2016-53 of July 11, 2016, when the owner opposes the purchase of his land.</p> <p>Expropriation for reasons of public utility (ECUP) is an administrative operation by which the administration obliges a private individual to transfer ownership of a building (land) to it, for a public utility purpose, and in return for the payment of fair and prior compensation.</p>	<p>Applicable for the 225 kV OHTL associated with the solar plant</p>
<b>PROTECTION OF CULTURAL RESOURCES</b>		
<p>The Heritage Code: Law No. 94-35 of February 24, 1994</p>	<p>On the protection of historic monuments and natural and urban sites) defines the regulatory provisions for safeguarding and protecting the archaeological, historic or traditional and cultural heritage integrated into the public domain</p>	<p>Applicable in case of accidental discovery</p>

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
	<p>of the State. It submits to the prior authorization of the minister in charge of heritage the works relating to the electrical networks undertaken within the safeguarded sectors, in the vicinity of historic monuments, within the limits of the perimeter of a cultural site. In addition, the Code requires, in case of accidental discoveries of remains, that the discoverer immediately informs the competent services of the Ministry in charge of Heritage which will take all necessary measures for the conservation and will ensure, if necessary, the supervision of the work in progress (Art. 68). In addition, the legal texts relating to public contracts include an article in the General Administrative Clauses (GACC) that defines the precautions and measures to be taken when work uncovers objects or remains of an archaeological or historical nature.</p>	
<b>GENDER AND ASSISTANCE TO THE VULNERABLE POPULATION</b>		
<p><i>Gender-related legislation</i></p>	<p><i>With regard to gender equality, Tunisia's legal framework has developed rectifications and improvements over the last six decades, providing in many respects a protection of women's rights far more advanced than anywhere else in the region.</i></p> <p><i>The flagship texts of this legislative improvement are:</i></p>	
<p>Decree of August 18, 1958</p>	<p>Promulgating the Code of Personal Status (CSP): stipulating equal rights between the sexes regarding divorce, employment, business property and the banking sector: but also prohibiting polygamy, establishing a legal age of marriage at 18 for girls.</p>	<p>Applicable</p>
<p>Law No. 85-68 of July 12, 1985</p>	<p>Ratifying the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) but with some reservations.</p>	<p>Applicable</p>
<p>Modifications of the CSP in the 90s (Decree No. 95-2680 of December 25, 1995)</p>	<p>Law No. 93-74 of July 12, 1993, Law No. 92-48 of May 04, 1992) then in the 2000s (Law No. 2008-20 of March 04, 2008, Law No. 2007-32 of May 14, 2007 Law no. 2006-10 of March 06, 2006 Law No. 2006-10 of March 06, 2006) allowed that women no longer have to obey their husbands, they have rights to pass on their citizenship to their children and they can receive alimony.</p>	<p>Applicable</p>
<p>Decision of January 31, 2014</p>	<p>Ordering the publication of the Tunisian Constitution (new) Article 21: "All male and female citizens have the same rights and obligations. They are equal before the law without discrimination." Article 46: "The State undertakes to protect the acquired rights of women and seeks to consolidate and promote them. The State shall guarantee equal opportunities for men and women to have access to diverse responsibilities in all fields. The State endeavours to ensure parity between women and men</p>	<p>Applicable</p>

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
	in elected assemblies. The State will take the necessary measures to eliminate violence against women".	
Withdrawal of reservations to the CEDAW Convention on April 17, 2014	Marriage: Women do not have the right to act as "the head of the family." However, as of September 2017, the provision of the Nationality Act of Tunisia by which women could not confer Tunisian nationality on a foreign spouse and could not marry non-Muslims, was repealed	Applicable
	Labour: Tunisian law does not specifically mandate equal pay for equal work, although there are generic non-discrimination provisions in the labour code and Tunisia ratified ILO Convention 100 on Equal Remuneration in 1968. Tunisia has also ratified ILO Convention No. 189 on Domestic Work (Decent Work for Domestic Workers) (need accurate data here and probably an expression explaining what this specifically commits Tunisia to undertake and its relationship to the domestic labour code).	Applicable
Government Decree No. 2016-626 of May 25, 2016	Establishing the Peer Council for Equality and Equivalence of Opportunities between Women and Men.	Applicable
Organic Law No. 2017-58 of August 11, 2017	On the elimination of violence against women. - The objective of this Act is to put in place the measures necessary to eliminate all forms of violence based on gender discrimination in order to ensure equality and respect for human dignity, according to a comprehensive approach focused on the fight against its different forms, through prevention, prosecution and repression of its perpetrators, and protection and care of victims.	Applicable
Article 12 of the Tunisian Constitution	Article 12 "the State acts to ensure social justice, sustainable development and balance between regions, taking into account development indicators and the principle of positive discrimination "	Applicable
<b>HEALTH/SAFETY AND WORKING CONDITIONS (LEGISLATIVE TEXTS RELATING TO LABOUR PROTECTION AND WORKING CONDITIONS)</b>		
Labour Code	Law no. 66-27 of April 30, 1966, promulgating the Labour Code and all the texts that have amended or supplemented it, in particular Law No. 96-62 of July 15, 1996 and Law No. 2007-19 of April 2, 2007.	Applicable to workers
Decree No. 75-240 of April 24, 1975, amending Decree No. 67-391 of November 6, 1967	Relating to the health, safety and employment of women and children in industrial and professional trade establishments.	Applicable to workers
Decree No. 68-328 of October 22, 1968	Establishing the general hygiene rules applicable in companies' subject to the Labour Code. Obligation to provide all employees with drinking water in easily accessible places, protected from all causes of pollution: - Obligation to post notices in plain view, when drinking water is intended for industrial operations or firefighting, near the supply stations, clearly	Applicable to workers

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
	indicating that the water in question is dangerous and must not be consumed. <ul style="list-style-type: none"> <li>- Requirement that all waste receptacles be covered and constructed to be leak-proof and easily cleaned and disinfected.</li> <li>- Obligation to keep the work premises well ventilated (the air cubage must not be less than 7 m3 per employee).</li> <li>- Obligation to install sanitary installations in special rooms, isolated from the workshops but preferably placed on the workers' exit passage. All these rooms must be well ventilated and lit.</li> <li>- Obligation to have at least 1 washbasin for every 10 users.</li> <li>- Obligation to have at least 1 shower for 20 users.</li> </ul>	
Decree No. 75-503 of July 28, 1975	Regulating measures for the protection of workers in establishments using electrical currents.	Applicable to workers
Law No. 87-31 of July 06, 1987	Ratifying the Arab Labour Convention No. 7 relating to occupational health and safety. The provisions relating to occupational safety and hygiene must include the technical rules necessary to ensure safety and protection, with regard to (i) the choice of the location of the establishment; (ii) design and construction; (iii) prevention against all occupational hazards; (iv) the legislation of each state determines the technical requirements necessary to comply with these rules.	Applicable to workers
Law No. 94-28 of February 21, 1994	On compensation for damages resulting from work accidents and occupational diseases) establishes a list of work-related diseases and the work and substances that may cause them (toxic substances, hydrocarbons, plastics, dust, infectious agents, etc.). It obliges the employer to declare the work processes likely to cause occupational diseases and the occupational physician to declare the occupational disease found, specifying the nature of the harmful agent. In this regard, Tunisia has also ratified most of the International Labour Organization (ILO) conventions (fundamental and technical).	Applicable to workers
Order of the Minister of Industry, Energy and SMEs of November 15, 2005	Establishing the nomenclature of dangerous, unhealthy, or inconvenient establishments as completed and amended by the Order of the Minister of Industry and Technology of February 23, 2010, and the Order of the Minister of Industry of October 24, 2012.	The project to build a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the opinion of the Safety Directorate
Decree No. 2006-2687 of October 09, 2006	Sets the conditions, terms and procedures for the opening and operation of dangerous, unhealthy, or inconvenient establishments.	The project to build a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the opinion of the Safety Directorate

LAWS, DECREES AND ORDERS		LEGISLATIF TEXT	Applicability
Law No. 2009-11 of March 02, 2009		Promulgating the code for safety and prevention of fire, explosion and panic hazards in buildings	Applicable
<b>CONSULTATION AND DISCLOSURE OF INFORMATION</b>			
Consultation and Access to Information in the National EIA System	Government Decree No. 328-2018 of March 29, 2018 on the organization of public consultation	In Tunisia, the terms and conditions of public consultation have been defined in Government Decree No. 328-2018 of March 29, 2018, on the organization of public consultation.	To date, there is no obligation to publish EIA reports. However, several public companies such as STEG have started to publish EIA reports of new projects on their sites in accordance with the requirements of international financial institutions.
	The 2005-1991 decree	Relating to EIAs (not ESIA). It remains very general on social impacts and social management plan. The analysis of the vulnerable population or the gender aspect is not also required by this Decree.	
	The Code of Land Use Planning, Urbanism and Construction (under preparation),	In its Article 22, provides for consultations of councils or commissions where the interested local populations and communities are represented, as well as the most representative socio-economic organizations and associations in the field under consideration in association with the State and local communities.	
Access to Information	Decree-Law No. 2011-41 of May 26, 2011	Relating to access to administrative documents of public bodies: which specifies that these documents mainly concern the organization, manuals, list of employees, programs, etc	
	Article 32 of the Tunisian Constitution (2014)	The State guarantees the right to information and the right of access to information.	
	Organic Law No. 2016-22 of 24 March 2016	On the right of access to information, which defines the right of access to information related to programs and projects, benefits, financial information, etc. of public administrations. The ESIA is not clearly mentioned in the law but can be requested through an access to information form but is subject to acceptance or refusal by the competent authority. However, an appeal is possible to the national body of access to information created the above-mentioned law and functional since August 2017 by Government Decree No. 2017-918 of August 17, 2017, appointing members of the body of access to information.	
	Constitution	Article 139 "Local governments shall adopt the mechanisms of participatory democracy and the principles of open governance in order to guarantee the broadest possible participation of citizens and civil society in the preparation of development and land use planning projects and the monitoring of their implementation, in accordance with the law". A public e-participation portal has been designed to respond to citizens' aspirations for greater involvement and commitment in the public decision-	

LAWS, DECREES AND ORDERS	LEGISLATIF TEXT	Applicability
	making process and the enshrinement of the principles of participatory democracy.	
<b>Corporate Social Responsibility (CSR)</b>		
Law no. 2018-35	Law No. 2018-35 on Corporate Social Responsibility (CSR). A regional commission is created to define the priorities of intervention	
<b>INCENTIVES FOR INVESTORS</b>		
Government Decree No. 2017-389 of March 9, 2017,	Decree on financial incentives for investments made under the investment law. With an investment cost greater than or equal to fifty (50) million dinars,	The Kairouan photovoltaic power plant project is considered as a project of national interest and thus benefits from the financial incentives provided for by Article 20 of Law No. 2016-71 of 30 September 2016, on the investment law.
Law No. 2019-47 of May 29, 2019,	Law on improving the investment climate. According to Article 8, the projects of electricity generation from renewable energy provided for by this section, are carried out on real estate owned by individuals. They can be authorized, if necessary, to be carried out on parts pertaining to the fields of the State or the local communities in case the opportunity of their realization is established, having regard to the national strategy fixed by the national plan of the electric energy produced starting from renewable energies. Notwithstanding the provisions of article 8 of the law n° 83-87 of November 11th, 1983 relating to the protection of agricultural lands as modified by the subsequent texts, the realization of the projects of electricity production from renewable energies provided for by the present section, does not require the change of vocation of agricultural lands.	Applicable

### 5.3 International conventions ratified by Tunisia

Tunisia has ratified more than 60 international conventions and agreements concerning environmental protection. It has developed information systems as part of the implementation of the three RIO conventions to facilitate reporting to various organizations, including: (i) the information system developed as part of the implementation of the Convention on Biological Diversity; and (ii) the information system on the Clean Development Mechanism.

**Table 5.2** - The main texts regulating these international ratifications

International Conventions	Ratification text
Stockholm Convention on Persistent Organic Pollutants (POPs)	Decree No. 2004-918 of April 13, 2004
Cartagena Protocol on Biosafety.	Law n°2002-58 of June 25, 2002
Kyoto Protocol and Law 93-46 of May 3, 1993, ratifying the United Nations Framework Convention on Climate Change.	Law 2002-55 of June 19, 2002
Agreement Relating to the Establishment and Operation of the Observatory of the Sahara and Sahel	Law n°2000- 12 of February 7, 2000
Bern Convention on the Conservation of European Wildlife and Natural Habitats.	Law n° 95-75 of 07/08/95
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.	Law 95-63 of July 10, 1995
United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought.	Law 95-52 of June 19, 1995
United Nations Convention on Biological Diversity.	Law 93-45 of May 3, 1993
United Nations Framework Convention on Climate Change.	Law 93-46 of May 3, 1993
Convention on the Conservation of Migratory Species of Wild Animals.	Law 86-63 of July 16, 1986
Convention on Wetlands of International Importance.	Law No. 80-9 of March 3, 1980
Protocol relating to the cooperation of North African States in the fight against desertification.	Law 71-1 of January 25, 1979
African Convention for the Conservation of Nature and Natural Resources.	Law 76-91 of November 4, 1976
Convention for the Protection of the World Cultural and Natural Heritage.	Law 74-89 of December 11, 1974
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Law 74-12 of March 11, 1974

#### 5.4 **Requirements for Project Financing**

The Project will be seeking financing from International Financing Institutions (IFIs), to include mainly the IFC and AfDB. Therefore, the Developer wishes to design and manage the project in accordance with good international industry practice, including the ESIA in particular.

For the purpose of the ESIA, it will be based on the International Finance Corporation (IFC) and African Development Bank (AfDB) E&S requirements both of which are discussed below.

##### **IFC Policy on E&S Sustainability (2012)**

The IFC E&S requirements are considered the most comprehensive. The IFC of the World Bank provides a range of guidance documents related to the assessment and management of E&S issues in project development. Not only does IFC guidance provide a generally accepted basis for good practice, but it also provides the technical cornerstone for the Equator Principles which set out the E&S requirements of banks for project finance. The IFC requirements have become the *de facto* international E&S performance benchmark for project financing.

The IFC policy on E&S Sustainability puts into practice IFC's overall commitments to E&S sustainability. The policy seeks to: (i) enhance the predictability, transparency, and accountability of IFC's actions and decision making; (ii) help clients manage their environmental and social risks and impacts and improve their performance; and (iii) enhance positive development outcomes on the ground. In addition, the Policy identifies IFC's commitments, its roles and responsibilities and other as applicable.

One of the key outputs of the Policy, is the E&S Categorization of projects, which are summarized as follows:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.

The IFC does not provide specific details on what solar PV projects should be classified. However, based on the outcomes of this Scoping report, it is highly likely that the Project will be classified as ‘Category B’.

**IFC Performance Standards (2012)**

The IFC Performance Standards (PS) on Social and Environmental Sustainability set out a framework for managing and improving project performance from planning and assessment, through construction and operations to closure. The Performance Standards requirements are summarized in the table below.

**Table 5.3 - IFC Performance Standard Requirements**

IFC PS	Key Points
<p><b>PS1: Assessment and Management of Environmental and Social Risks and Impacts</b></p>	<p>PS1 underscores the importance of managing social and environmental performance throughout the life of a project by using a dynamic social and environmental management system. Specific objectives of this Performance Standard are:</p> <ul style="list-style-type: none"> <li>▪ To identify and assess social and environment impacts, both adverse and beneficial, in the project’s area of influence;</li> <li>▪ To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment;</li> <li>▪ To ensure that affected communities are appropriately engaged on issues that could potentially affect them; and</li> <li>▪ To promote improved social and environment performance of companies through the effective use of management systems.</li> </ul>
<p><b>PS2: Labor and Working Conditions</b></p>	<p>The requirements set out in this PS have been in part guided by several international conventions negotiated through the International Labor Organization (ILO) and the United Nations (UN). Specific objectives of this Performance Standard are:</p> <ul style="list-style-type: none"> <li>▪ To establish, maintain and improve the worker-management relationship;</li> <li>▪ To promote the fair treatment, non-discrimination and equal opportunity of workers and compliance with national labor and employment laws;</li> <li>▪ To protect the workforce by addressing child labor and forced labor; and</li> <li>▪ To promote safe and healthy working conditions, and to protect and promote the health of workers.</li> </ul>
<p><b>PS 3: Resource Efficiency and Pollution Prevention</b></p>	<p>This Performance Standard outlines a project approach to pollution prevention and abatement in line with international available technologies and practices. It promotes the private sector’s ability to integrate such technologies and practices as far as their use is technically and financially feasible and cost-effective in the context of a project that relies on commercially available skills and resources. Specific objectives of this Performance Standard are:</p>

IFC PS	Key Points
	<ul style="list-style-type: none"> <li>▪ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and</li> <li>▪ To promote the reduction of emissions that contribute to climate change.</li> </ul>
<p><b>PS 4: Community Health, Safety and Security</b></p>	<p>This PS recognizes that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development. However, projects can also increase risks arising from accidents, releases of hazardous materials, exposure to diseases, and the use of security personnel. While acknowledging the public authorities' role in promoting the health, safety and security of the public, this PS addresses the project sponsor's responsibility in respect of community health, safety, and security.</p>
<p><b>PS 5: Land Acquisition and Involuntary Resettlement</b></p>	<p>Involuntary resettlement refers both to physical and economic displacement because of project-related land acquisition. Where involuntary resettlement is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.</p>
<p><b>PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources</b></p>	<p>This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote the use of renewable natural resources in a sustainable manner. This Performance Standard addresses how project sponsors can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources. Specific objectives of this Performance Standard are:</p> <ul style="list-style-type: none"> <li>▪ To protect and conserve biodiversity; and</li> <li>▪ To promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.</li> </ul>
<p><b>PS 8: Cultural Heritage</b></p>	<p>Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to protect irreplaceable cultural heritage and to guide project sponsors on protecting cultural heritage in the course of their business operations.</p>

Note: PS-7 (Indigenous People) is not applicable for the project. The only indigenous, Berber-speaking population identified in Tunisia is Amazigh. This population is located mainly in the south of Tunisia (desert). The Governorate of Kairouan is not recognized to have indigenous population. The absence of Amazigh within the project area is confirmed during stakeholder engagement activities undertaken by EAM October 19<sup>th</sup>, 2020.

**IFC EHS Guidelines**

In addition, to the Performance Standards, the IFC have sector-specific EHS guideline documents. With regards to the project the following are applicable:

- IFC General EHS Guidelines (2007): identifies detailed EHS management and technical recommendations which are applicable for all development projects
- IFC EHS Guidelines for Electric Power Transmission and Distribution (2007): this in particular could be applicable for the associated facilities of the Project (i.e. transmission line for connection with the grid). The Guideline identifies they key E&S



impacts that should be investigated and provides detailed management and technical recommendations with regards to Industry-Best Practice. The IFC EHS Guidelines identifies the following key issues:

- Biodiversity (to include birds and bats)
- Electric and magnetic fields
- Hazardous materials
- Occupational health and safety
- Community health and safety

IFC EHS Guidelines applicable to associated facilities include:

- IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets;
- IFC Good Practice Handbook on the Use of Security;
- Forces: Assessing and Managing Risks and Impacts;
- IFC Good Practice Note on Addressing the Social;
- Dimensions of Private Sector Projects;
- IFC and EBRD: Worker's Accommodation – Processes and Standards (2009).

### **African Development Bank (AfDB)**

The AfDB's has an Integrated Safeguards System (2015) to manage environmental and social risks. The Integrated Safeguards System (ISS) is a cornerstone of its strategy to promote growth that is socially inclusive and environmentally sustainable. The ISS is a powerful tool for identifying risks, reducing development costs and improving project sustainability, thus benefiting affected communities and helping to preserve the environment.

The Integrated Safeguards System not only promotes best practices in these areas but also encourages greater transparency and accountability. It upholds the voices of people who are affected by Bank-funded operations, especially the most vulnerable communities, by providing, for example, project-level grievance and redress mechanisms—a structured, systematic, and managed way of allowing the voices and concerns of affected people to be heard and addressed during project planning and implementation.

It promotes best practices and encourages transparency and accountability.

The Bank selected the Operational Safeguards (OSs) for inclusion in the ISS, which are intended to:

- Better integrate considerations of environmental and social impacts into Bank operations to promote sustainability and long-term development in Africa;

- Prevent projects from adversely affecting the environment and local communities or, where prevention is not possible, minimise, mitigate and/or compensate for adverse effects and maximise development benefits;
- Systematically consider the impact of climate change on the sustainability of investment projects and the contribution of projects to global greenhouse gas emissions;
- Delineate the roles and responsibilities of the Bank and its borrowers or clients in implementing projects, achieving sustainable outcomes, and promoting local participation; and
- Assist regional member countries and borrowers/ clients in strengthening their own safeguards systems and their capacity to manage environmental and social risks.

The following safeguards are particularly relevant:

**Table 5.4 - AfDB Integrated Safeguards System**

AfDB - OS	Key Points
<b>OS 1:</b> Environmental and social assessment	<p>OS1 includes the requirements for identifying, assessing, and managing the potential environmental and social risks and impacts of a project, including climate change issues. The safeguard document includes requirements for the different stages of the assessment process.</p> <p>The Integrated Environmental and Social Impact Assessment (ESIA) process guidelines are published in the Safeguards and Sustainability Series in three sets (Volume 2 issued in 2015).</p> <p>Based on OS1 states <i>'borrower or client shall be responsible for conducting and providing evidence of meaningful consultation'</i>. <i>Consultation should be based on stakeholder analysis and is preceded by disclosure of adequate project information and environmental and social information to ensure that participants are fully informed.</i></p>
<b>OS 2:</b> Involuntary resettlement, land acquisition, population displacement and compensation.	<p>Involuntary resettlement, land acquisition, population displacement and compensation.</p> <p>This SO is triggered for the preparation of an Abbreviated Resettlement Action Plan (ARAP) for people affected by the Project through land or economic losses</p>
<b>OS 3:</b> Biodiversity and ecosystem services	<p>Biodiversity and ecosystem services. Requires, inter alia, that as part of the environmental and social assessment, the borrower or client identifies and assesses the potential opportunities for, risks to, and impacts on biological diversity and ecosystem services, including direct, indirect, cumulative and pre-mitigation impacts. It also requires the borrower or client to apply the mitigation hierarchy.</p>
<b>OS 4:</b> Pollution prevention and control, hazardous materials, and resource efficiency	<p>Pollution prevention and control, hazardous materials, and resource efficiency. This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.</p>

AfDB - OS	Key Points
	AfDB states ‘ <i>the borrower or client shall apply pollution prevention and control measures consistent with national legislation and standards, applicable international conventions, and internationally recognized standards and good practice – particularly the World Bank Group Environmental, Health and Safety (EHS) Guidelines</i> ’.
<b>OS 5:</b> Labor conditions, health, and safety	This safeguard includes requirements relating to working conditions, such as management of worker relations, workers' organisations, non-discrimination, dismissals and grievance mechanism, as well as safeguards relating to labour rights, addressing, for example, child labour, forced labour, exploitation and modern slavery.

In specific, the following AfDB policies and standards have been adopted:

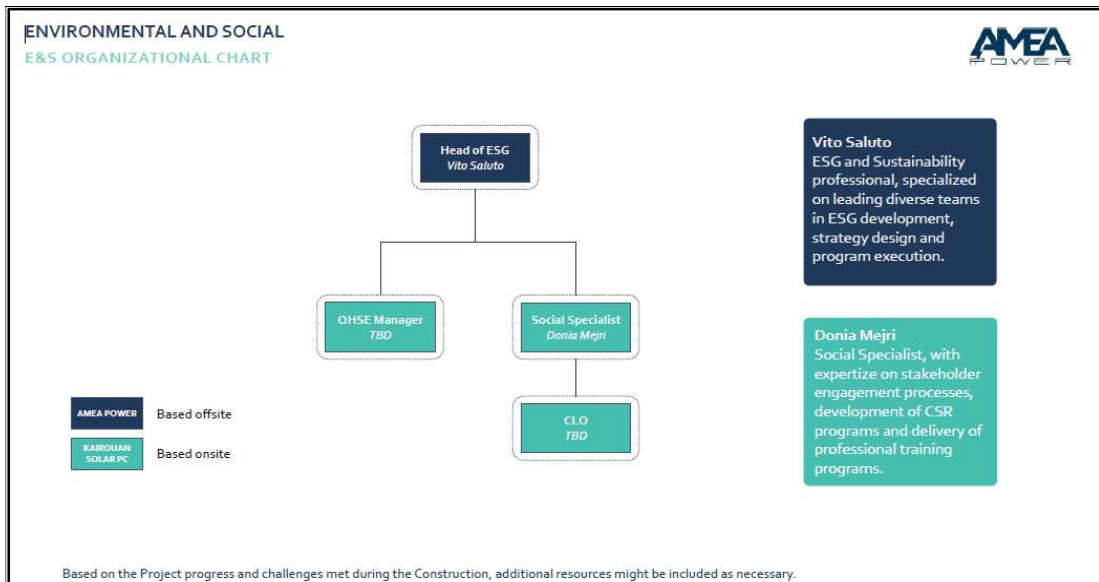
- The Integrated Safeguards System (ISS) Policy adopted in December 2015;
- The Gender Policy (2001) and Bank Group Gender Strategy (2013);
- AfDB Civil Society Engagement Framework (2012);
- Disclosure and Access to Information Policy (2012);
- Policy on Poverty Reduction (2001);
- Policy for Integrated Water Resources Management (2000);
- Environmental and Social Assessment Procedures (ESAP);
- AfDB ISS Guidance Materials;
- AfDB ISS Sector Keysheets;
- The Presidential Directive on Exploitation, Abuse and Sexual Harassment (PD. 2021.02).
- The project is classified as category 2.

### 5.5 Roles and responsibilities of actors in the implementation of the ESMS

The Project Management Unit is set up by the promoter and will be responsible for monitoring the implementation of the ESMP, the PARA and the preparation of periodic reports for the donors (IFC and AfDB).

The PMU should have within it an environmental safeguard specialist, a social safeguard specialist and a community liaison officer.

The Promoter has defined roles and responsibilities for the environmental and social management of the human resources involved in the implementation of the project, including contractors and other persons working on behalf of the company, in all phases of the project implementation (see E&S team organisation chart).



**Figure 5.1 - Organisation chart of the E&S team**

Periodic monitoring will be carried out by the Promoter's E&S safeguards specialists (1 social and 1 environmental specialist and a liaison officer) and the Regional Environmental Directorate or the ANPE (if applicable) as an external control.

The inspection and monitoring should include the following elements

- Daily HSE inspection and monitoring of the site and preparation of a daily observation report indicating corrective actions on observed safety deficiencies, unsafe acts and conditions.
- Weekly site inspections to be carried out using the weekly site inspection checklist template, based on the ESMP and ESMS requirements.
- HSE audits to be carried out monthly during the construction phase and quarterly during the operation phase.
- Quarterly reporting of ESMP implementation to donors according to donor reporting templates (no later than 15 days after the end of each quarter).
- Preparation of the annual environmental and social compliance audit by an independent E&S auditor each year and no later than 15 March and 6 months after completion of the works.

A general description of the entities responsible for the implementation of the ESMP, as well as their respective roles and responsibilities is in the following table:

**Table 5.5 - General description of the entities responsible for the implementation of the ESMP**

Entity	Responsibilities
<b>Project Manager</b>	<ul style="list-style-type: none"> <li>• He is the person who organizes and conducts the various phases of the project, for which he assumes full management responsibility.</li> <li>• The project manager is involved in both the upstream and downstream phases of the project, i.e. from the development to the evaluation of the results of the managed project. He is often in meetings and is always up to date with the latest trends in his field.</li> <li>• His main tasks consist of organizing and leading the project from start to finish, supervising the various phases, from the drafting of functional and technical specifications to the user acceptance test or even the launch of the project, as well as following up with the client.</li> <li>• As part of this monitoring, he will be required to check the quality of the work carried out by the project team and to ensure that deadlines and costs are met. He communicates a report to his hierarchy as well as to the client. His objective is to complete the project on time, within budget and to meet expectations.</li> <li>• He is responsible for ensuring the implementation of the ESMP and RAP, all other E&amp;S instruments prepared for the project, commitments in the loan agreement, national regulations and ensuring that contractors and sub-contractors do the same.</li> </ul>
<b>Site Manager</b>	<ul style="list-style-type: none"> <li>• The site manager is responsible for the reception, supervision, and maintenance of a site. With his teams, which he coordinates, he organizes technical interventions. He may also provide technical advice to the management in order to propose the implementation of modifications that he deems necessary.</li> </ul>
<b>Social Specialist</b>	<ul style="list-style-type: none"> <li>• The Social Specialist will lead and coordinate the planning, development, and implementation of social policies for projects initiated by the Promoter (AMEA Power) and the assessment and effective management of social risks related to project activities. This includes reviewing social safeguard frameworks and plans in collaboration with relevant government agencies and local beneficiary groups, processing compensation, monitoring ESMP and PARA implementation, and monitoring the project's compliance with safeguard policies throughout the project duration.</li> <li>• The Social Specialist will ensure compliance with the project's social risk and impact assessment in collaboration with the Environmental Specialist, in accordance with the requirements of the relevant donor policies (AfDB and IFC) and national or, failing that, international texts, and in particular the implementation of the ESMP and RAP, all other E&amp;S instruments prepared in the framework of this project, the commitments in the loan agreement, national regulations and ensure that contractors and sub-contractors do the same thing It is responsible for :</li> <li>• Monitor and audit social compliance throughout the project.</li> <li>• Analyze, monitor and manage the expected and unexpected social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects).</li> <li>• Carry out labor accommodation inspections and social audits.</li> <li>• Ensure proper implementation of grievance mechanisms at project level.</li> <li>• Engage, as appropriate, with civil society organizations and non-governmental organizations on social issues.</li> </ul>

Entity	Responsibilities
	<ul style="list-style-type: none"> <li>• Support and implement social development (CSR) activities and sustainable development initiatives in line with company and project specific strategies.</li> <li>• With the Environmental Specialist, prepare and submit quarterly monitoring reports on the implementation of ESMP, PARA and other E&amp;S instruments to the AfDB.</li> <li>• With the Environmental Specialist, coordinate the preparation of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>Environmental specialist</b>	<ul style="list-style-type: none"> <li>• The Environmental Specialist will lead and coordinate the planning, development and implementation of environmental policies for projects initiated by the Promoter (AMEA Power) and the assessment and effective management of environmental risks associated with project activities.</li> <li>• The Environmental Specialist will ensure compliance with the environmental risk and impact assessment, in accordance with the requirements of the relevant donor policies (AfDB and IFC) and national or, failing that, international instruments, including the implementation of the ESMP and the RAP, all other E&amp;S instruments prepared under this project, commitments in the loan agreement, national regulations and ensure that contractors and sub-contractors do the same.</li> <li>• With the Social Specialist, prepare and submit quarterly monitoring reports on the implementation of the ESMP, PARA and other E&amp;S instruments to the AfDB.</li> <li>• With the Social Specialist, coordinate the preparation of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>Community Liaison Officer (CLO)</b>	<ul style="list-style-type: none"> <li>• For PARA, the Community Liaison Officer ensures continuous communication and outreach with local communities to provide updates on the project and its progress through information channels such as public consultation, direct contact with the community via the CLO or the Promoter's local representative.</li> <li>• Assist in publicizing the grievance mechanism, and facilitate the registration, investigation and resolution of grievances.</li> <li>• Provide ongoing assistance in the implementation of the PARA</li> <li>• Report on the progress of the implementation of the PARA</li> <li>• Provide any other assistance that may be required for the successful implementation of the project where relevant and appropriate.</li> <li>• Together with the E&amp;S specialists, contribute to the preparation of the quarterly monitoring reports on the implementation of the ESMP, PARA and other E&amp;S instruments to the AfDB.</li> <li>• With the E&amp;S specialists, contribute to the supervision of the annual Environmental and Social Compliance Audit by an independent auditor.</li> </ul>
<b>QHSE Manager</b>	<ul style="list-style-type: none"> <li>• Monitor and audit QHSE compliance throughout the site.</li> <li>• Carry out on-site HSE inspections and audits.</li> <li>• Identify hazards, carry out risk assessments and ensure that subsequent corrective actions are implemented</li> </ul>
<b>Contractor EPC</b>	<ul style="list-style-type: none"> <li>• The EPC Contractor will be required to assign a suitably qualified full-time Site HSE Manager and a Social Specialist, both of whom will be responsible for the following</li> </ul>

Entity	Responsibilities
	<ul style="list-style-type: none"> <li>• Overall responsibility for the development and implementation of the EPC contractors' HSSE management system requirements</li> <li>• Ensures the availability of resources to properly implement HSSE plans and requirements</li> <li>• Provide HSSE reporting requirements, where applicable</li> <li>• Provide HSSE training requirements, if applicable Undertake HSSE inspection and monitoring requirements, if applicable</li> <li>• Organise and participate in HSSE meetings</li> <li>• HSSE incident reporting</li> <li>• Ensure that all subcontractors appoint sufficient HSE officers for the overall implementation of HSSE plans and requirements, where applicable.</li> <li>• The HSE Manager should be assisted by 2-3 (depending on the construction schedule) full-time, suitably qualified HSE Officers on site.</li> <li>• Prior to the commencement of any site work, for each of the key site HSSE personnel as indicated above, the EPC Contractor shall submit the following to the Developer for approval:               <ul style="list-style-type: none"> <li>• Curriculum Vitae (CV)</li> <li>• Certificate of Competence</li> <li>• Letter of appointment</li> </ul> </li> <li>• The Developer will review the submitted documents and may interview the candidates to determine their suitability for the intended roles.</li> </ul>
<b>The Service Providers</b>	<ul style="list-style-type: none"> <li>• Responsible for taking into account environmental, social, health and safety and gender mainstreaming aspects in the design and implementation of their services in accordance with ISS and NOS requirements.</li> </ul>
<b>The NGOs</b>	<ul style="list-style-type: none"> <li>• Environmental, social and development NGOs should play a role in raising awareness among affected people and local communities</li> </ul>

## 6.0 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is an integral part of ESIA good practice and is a requirement of both the International Finance Corporation's (IFC's) Policy on Environmental and Social Sustainability and Performance Standards; and the African Development Bank (AfDB) Integrated Safeguards System (ISS).

The Developer is committed to a technically and culturally appropriate approach to consultation and engagement with all stakeholders affected either directly or indirectly by the Project. The consultation program for the Project is based on Informed Consultation and Participation (ICP) with affected people and is designed to be both fair and inclusive. Consultation activities have been underway since the commencement of the ESIA study in October /November 2020.

A stakeholder is defined as any individual or group who is potentially affected by the proposed Project or can themselves affect/influence the proposed Project directly or indirectly. Stakeholder consultation is an inclusive process for sharing information that enables stakeholders to understand the risks, impacts, and opportunities of a development or project, allowing them to express their views and articulate their perceptions towards it.

### 6.1 Objectives

The objective of stakeholder consultation is to ensure that a participatory approach takes place, which in turn documents concerns of all stakeholder groups and makes sure that such concerns are considered, responded to, and incorporated into the decision-making process of the development. Stakeholder consultation needs to be a two-way communication process that imparts information to stakeholders, but also obtains additional and on-the-ground information from them. Stakeholder consultation and engagement must take place at the inception phase of the ESIA process and implemented all through the study period.

The specific objectives of this chapter are to:

- Summarize the national and international legal and policy requirements for stakeholder engagement;
- Describe and identify the stakeholders affected and/or with an interest in the Project;
- Summarize stakeholder engagement and consultation conducted to date;
- Describe how the views and issues raised have informed and influenced the development of the Project;
- Outline the future plans and approach to stakeholder engagement.

## **6.2 Requirements for Stakeholder Engagement**

### **6.2.1 Tunisian regulation**

There is a defined stakeholder engagement mechanism/framework (SEPP) in Tunisia in which environmental authorities request: (i) a stakeholder consultation report to be annexed as part of an EIA study; (ii) in addition, Decree No. 328-2018 of 29 March 2018 is very broad and general and provides requirements on methods of organizing public consultation in the case an EIA is required. However, there are no obligations to publish EIA reports or undertake disclosure sessions for EIA studies.

The above is not considered applicable to the Project in specific, given that based on local requirements no EIA study is required to obtain an environmental clearance.

### **6.2.2 Requirements in IFC Performance Standards on Environmental & Social Sustainability (2012)**

The IFC Performance Standards form part of their Sustainability Framework, where the “IFC Performance Standard 1” (IFC, 2012) sets out the following recommendations for stakeholder engagement:

- Stakeholder Engagement is an on-going process that may involve: stakeholder analysis & planning, disclosure & dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities;
- A Stakeholder Engagement Plan (SEP) will be developed and implemented that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities;
- Affected Communities will be provided with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism;
- When Affected Communities are subject to identified risks and adverse impacts from a project, a process of consultation will be undertaken in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them;
- The extent and degree of engagement should be commensurate with the project’s risks and adverse impacts and concerns raised by Affected Communities;

- The consultation process will be tailored to language preferences of Affected Communities, their decision-making process, and the needs of disadvantaged or vulnerable groups;
- For projects with potentially significant adverse impacts, the client will conduct an informed consultation and participation;
- A grievance mechanism will be established to receive and facilitate resolution of Affected Communities' concerns and grievances about the client's environmental and social performance;
- As it is considered that the Project is likely to be categorized as a Category B project under the IFC requirements, it will be disclosed on IFC external website for a minimum of 30 days.

### 6.2.3 Requirements in AfDB Integrated Safeguards System (2015)

The Integrated Safeguards Policy Statement sets out the basic tenets that guide and underpin the Bank's approach to environmental safeguards. In addition, the Bank has adopted the Operational Safeguard 2 on Involuntary resettlement land acquisition, population displacement and compensation, sets out the following recommendations:

- *Project design*: feasible alternative project designs, including re-siting and re-routing, to avoid or minimise physical or economic displacement, while balancing environmental, social, and financial costs and benefits.
- *Consultation, participation and broad community support*: including an appropriate notice to all potentially affected persons; effective advance dissemination by the authorities of relevant information, records and proposed comprehensive resettlement plans specifically addressing efforts to protect vulnerable groups; a reasonable time period for public review of, comments on, and/or objection to any options of the proposed plan; and public hearings that provide affected persons and/or their legally designated representatives with opportunities to challenge the resettlement design and process, and/or to present and discuss alternative proposals and articulate their views and development priorities
- *Resettlement planning*: a comprehensive socioeconomic survey including a population census and an inventory of assets (including natural assets upon which the affected people may depend for a portion of their livelihoods).
- *Resettlement Action Plan*: Full Resettlement Action Plan (FRAP) for any project that involves 200 or more persons, or any project that is likely to have adverse effects on vulnerable groups.

- Compensation procedures: The units that are entitled to compensation (e.g., family, household, and individual) decided through consultation with those to be displaced. Affected people are compensated for all their losses at full replacement costs before their actual move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase.
- Host communities: detailed analysis of host communities to identify potential problems associated with receiving displaced people, and to address these problems so that adverse impacts on host communities are minimised and the host communities are able to share in the development opportunities provided through the resettlement process.
- Vulnerable groups: Client is responsible for protecting the physical, social and economic integrity of vulnerable groups and for paying particular attention to health needs, particularly for women, including access to female health care providers and to such services as reproductive health care and appropriate counselling for sexual and other abuses. A Community Development Plan should be prepared for the project that have clear risks for affected communities, which need to be mitigated. Specific risks associated with land, resettlement or environmental damage are integrated in the Resettlement Action Plan or the ESMP, and support measures should be designed and managed in consultation with affected communities to respect their cultural preferences.
- Implementation, monitoring and evaluation: Client is responsible for the implementation, monitoring and evaluation of the activities set out in the Resettlement Action Plan, and it keeps the Bank informed of progress.

As per the AFDB's disclosure requirement, the Developer should grant the Bank a formal written to authorization to disclosure all ESA documents at least 30 days prior to its board approval date.

### **6.3 Stakeholder Identification and Analysis**

The Project has been identifying potential stakeholders ranging from national government and other bodies involved in the permitting and ESIA process in addition to communities within the Area of Influence of the Project. As such stakeholders have been identified at all geographic levels, including national, national, regional and local. The two principal categories of stakeholders are as follows:

- Affected Communities, defined as people and organizations directly affected by the

Project and/or those who have been identified as most vulnerable to change (see below);

- Other Interested Parties, defined as people and organizations that are interested in the Project and/or could affect the Project in some way.

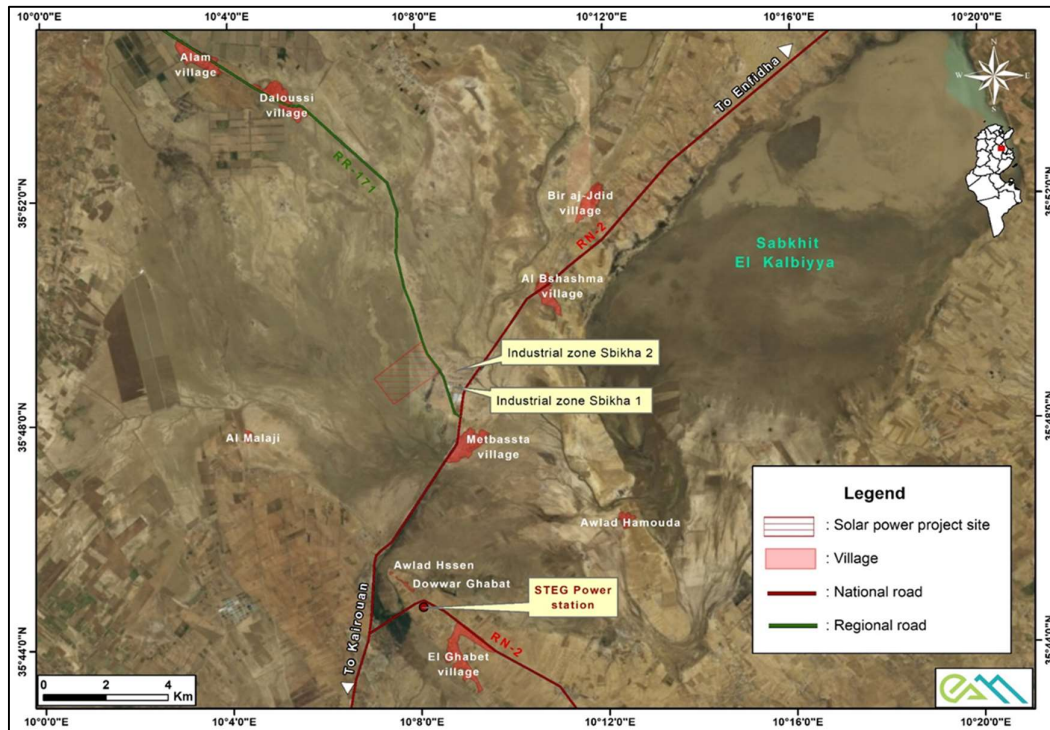
**6.4 Affected Communities**

The affected communities have been identified based on a detailed understanding of the Project site location and its administrative setup. The Project is located within Kairouan Governorate. More specifically, from an administrative perspective, the project site is a part of the El Alem sector relevant to the delegation of Sbikha.

Therefore, the affected communities include in particular: (i) El Alem sector, (ii) Dalloussi sector, (iii) Bir Jedid sector, (iv) El Bechechma sector and (v) Metbasta sector. It is these communities that are located within the Project Area of Influence and that are expected to be positively or negatively impacted from the project as explained through the ESIA through for example: (i) employment opportunities that are available during construction and operation, (ii) local procurement opportunities during construction and operation , (iii) potential for community health and safety risks such as Project’s use off vehicles on the public road network; (iv) land use impacts on grazing, and other.

**Table 6.1 - Administrative setup of sectors identified for local community consultation**

Sectors	Administrative setup		Distances (as the crow flies)
	Delegation	Governorate	
El Alem	Sbikha delegation	Kairouan	11000 m
Dalloussi	Sbikha delegation	Kairouan	8400 m
Metbasta	Kairouan Nord	Kairouan	2200 m
El Bechachma	Kondar	Sousse	4000 m
Bir Jdid	Kondar	Sousse	6500 m



**Figure 6.1** - Location of sectors identified for local community consultation

It's worth mentioning that Women groups within such affected communities in the study area are considered a vulnerable group – this is mainly due to cultural norms within such rural areas which limit the participation in the decision-making process.

**6.5 Other Interested Parties/Stakeholders**

Other interested parties and stakeholder groups were identified based on the understanding of the Project location, nature of activities which are to take place, type of development, and the potential environmental and social impacts and how they could potentially affect certain stakeholder groups.

**(i) Tunisian Governmental Stakeholders (National and Local)**

The national and local stakeholders identified include the ministries, directorates, boards and agencies involved in obtaining the necessary permits and authorisations for the development of the Project and the ESIA process.

In addition, these stakeholders are all capable of assisting in the implementation of the project. The table below provides a list of the main governmental stakeholders and gives a summary of their respective competencies, specifying for each of them the level of involvement in the project - "Interest" - as well as their capacity to influence the project process - "Influence".

**Table 6.2 - List of Key Governmental Stakeholders**

Governmental Entity		Interest in/influence on the Project
Regional & Local Governmental Entities	<i>National Agency for Energy Conservation (ANME)</i>	ANME designs and runs energy efficiency and renewable energy development programmes. Its mission is to implement the State's policy in the field of energy management through the study and promotion of energy efficiency, renewable energy and energy substitution. ANME's field of action includes all initiatives and actions aimed at improving the level of energy efficiency and diversifying energy sources.
	<i>Tunisian Company of Electricity and Gas (STEG)</i>	It is the power off-taker and the entity that signed the Power Purchase Agreement (PPA) with the Promoter. In addition, STEG is also responsible for the design, construction and operation of the associated interconnection facilities. This includes the high voltage overhead power line (HVOL) that will connect the project site to the existing national grid.
	<i>National Environmental Protection Agency (ANPE)</i>	The official governmental entity responsible for protection of the environment in Tunisia. The Agency is responsible for granting environmental clearance for the Project. To date, renewable energy projects in Tunisia (Solar and wind energy projects) with power less than 300 MW do not require an Environmental permit under the EIA Decree 2005-1991. Therefore, the project for the construction of a 100 MW photovoltaic power plant and a 225 kV overhead power line does not require the approval of the ANPE and does not require an environmental permit for its implementation.
	<i>National Heritage Institute (INP)</i>	In charge of Preserving, safeguarding and restoring the heritage. The INP could intervene in this project if necessary, to collect and follow up information on discoveries related to archaeology and properties of an archaeological nature or to note and control the state of the archaeological, historical and traditional heritage.
	<i>Directorate General of Forestry (DGF)</i>	Relevant to the Minister of Agriculture, Hydraulic Resources and Fisheries (MARHP), the DGF ensure the protection and management of the State's forest estate, including national parks and nature reserves. The DGF could be involved in this project through its role in the management and conservation of wetlands, Ramsar sites, IBA sites in the project area.
	<i>Kairouan Governorate</i>	Regional political authority (non-elected position). Principal leader at the regional level and representative of the governorate at the national level.
	<i>Sbikha Delegation</i>	Delegate of Sbikha (non-elected position). Head of the delegation and representative of the delegation at regional level. It ensures the functioning of local administrative services.
	<i>Municipality of Sbikha</i>	Mayor of Sbikha: President of Sbikha Municipal Council, responsible for business, management of municipal interests and contribution to the social, economic and cultural promotion of Sbikha.
	<i>Kairouan Nord Delegation</i>	Delegate of Kairouan Nord (non-elected position). Head of the delegation and representative of the delegation at regional level. It ensures the functioning of local administrative services.
	<i>El Alem Sector (Imada in Arabic)</i>	The head of the El Alem sector ( <i>Omda in Arabic</i> ) is placed under the authority of the delegate. He is in charge of providing assistance to the various administrations, as well as than to look after the interests of the citizens.

Governmental Entity		Interest in/influence on the Project
	<i>Regional Directorate of the STEG</i>	Representative of the Tunisian Company of Electricity and Gas (STEG) at regional level.
	<i>Regional Representative of the Environment (ME)</i>	Representative of the Ministry of the Environment (ME) at regional level.
	<i>Regional Commission for Agricultural Development (CRDA)</i>	Representative of Ministry of Agriculture, Hydraulic Resources and Fisheries (MARHP) at regional level.
	<i>Regional Directorate of Equipment, Housing and Territorial Development</i>	Representative of Ministry of Equipment, Housing and Territorial Development (MEHAT) at regional level.
	<i>Regional Directorate of Vocational Training and Employment</i>	Representative of the Ministry of Vocational Training and Employment (MFPE) at regional level.
	<i>Deputy for the governorate of Kairouan in the Assembly of People's Representatives</i>	Representative of the people of the Kairouan region (elected position) in the Assembly of People's Representatives (ARP).
	<i>Regional Directorate of the National Office for Civil Protection (ONPC)</i>	Regional director, representative of the National Office for Civil Protection (ONPC) at regional level.
<b>Regional Unions &amp; organizations</b>	<i>Regional Centre of Affairs</i>	Representative of the National Centre of Affairs at regional level. It offers the necessary services to promoters and investors for the launch or development of their projects.
	<i>Regional Union of Agriculture and Fisheries (URAP)</i>	President of URAP: representative of the Tunisian Union of Agriculture and Fisheries (UTAP) at regional level.
	<i>Regional Agency for Promotion of Industry and Innovation (API)</i>	Representative of the Agency for the Promotion of Industry and Innovation (API) at regional level.
	<i>Tunisian General Labor Union (UGTT)</i>	Regional Labor Union General Secretary, representative of Tunisian General Labor Union (UGTT) at regional level.
	<i>Confederation of Corporate Citizens of Tunisia (CONNECT)</i>	President of the regional office of the Confederation of Corporate Citizens of Tunisia (CONNECT).
	<i>Tunisian Union of Industry, Commerce and Handicrafts (UTICA)</i>	President of the Regional Union of Industry, Commerce and Handicrafts, representative of the Tunisian Union of Industry, Commerce and Handicrafts at regional level.

***(ii) Non-Governmental Organizations and nearby industrial area***

Other interested parties can also act in favour of the project and help in its realisation. These are mainly environmental and social non-governmental organisations (NGOs) and representatives of the neighbouring industrial area.

**Table 6.3 - List of Key NGOs and nearby industrial area**

Stakeholder		Interest in/influence on the Project
<b>Environmental and Social NGOs</b>	<i>The Association "Les Amis des Oiseaux" (AAO/BirdLife Tunisia)</i>	The AAO association has been working since 1977 for the study, monitoring and conservation of Tunisian avifauna and its habitats. The mission of AAO/BirdLife Tunisia has set itself the objective of facing the increasing pressure on birds by anthropic activities and the hazards of nature. Thus, it has mobilized to advocate for the establishment of a better legal and institutional framework for hunting, management of protected areas and wildlife. It fights against poaching and the destruction of habitats and key sites. It also contributes to a better knowledge of birds and their habitats through studies, monitoring programs, information actions, awareness campaigns and publications.
	<i>Association of Tunisia for the Protection of the Environment and Promotion of Employment (ATPEPT)</i>	Created in 2013 to support the national effort to protect the environment and to develop and promote employment.
	<i>Association for the Protection of Nature &amp; Environment, Kairouan (APNEK)</i>	Mission is to communication and awareness, ground projects (protection of the natural resources, promotion of woman, integration of youth, implication of the citizenship in the daily management of their trash and urban environment), participation in the national, regional and international conferences and working in network.
	<i>National Union of Tunisian Women, Kairouan (UNFTK)</i>	The UNFT is the first women's non-governmental organization to be created in independent Tunisia. The UNFTK has worked to improve women's status, in society and under the law. The Organization is interested in women education from kindergarten to university.
<b>Nearby industrial area</b>	<i>Industrial Land Agency (AFI)</i>	An industrial and commercial organization, created in 1973 and placed under the supervision of the Ministry of Industry, whose mission is the creation and development of industrial zones equipped with the necessary facilities for the implementation of industrial and commercial projects and the construction of modular industrial premises and making them available to Tunisian and foreign investors.
	<i>Sbikha Industrial Area</i>	Sbikha I Industrial Area: located approximately at 1 km from the site of the Kairouan photovoltaic power plant and comprises 10 functional industries including mainly textile activities. Sbikha II Industrial Area: under construction (Source API – 09/2020).

## **6.6 Stakeholder Consultation and Engagement to Date**

It's worth mentioning that national authorities' consultation, mainly with the Ministry of Energy, STEG and ANME was not completed. These consultations were pending upon Developer approval.

### **6.6.1 Affected Communities Consultations**

The affected community's consultation activities carried out on 19 October 2020 through with the informant interviews, focus group discussions and other meetings. A Community Liaison Officer (CLO) was identified by EAM from Metbasta to organize and contact stakeholder representatives to attend the meetings and focus group discussions.

The consultation took place in five localities: (i) El Alem, (ii) El Dalloussi, (iii) Bir Jedid, (iv) El Bechechma, and (v) Metbasta.

A series of questionnaires (see Annex VI) were administered to four focus groups under each sector: (i) the community, (ii) the land users, (iii) the representatives of educational institution, and (iv) the health facility representatives.

The consultations were carried out in accordance with existing laws, policies and new local social norms to mitigate the transmission of the COVID-19 virus. Measures to prevent transmission of COVID-19 were applied to EAM team and all the stakeholders consulted to include disinfection with alcohol-based hand sanitizer, physical distancing of at least 1 meter and wearing masks.

The tables below present summary for the outcomes of the stakeholder consultations undertaken by locality.

**El Alem sector :**
**Table 6.4 - Summary of Focus Group Discussion with El Alem sector**

E&S Attribute	Comment	Key Outcomes and Response
<b>Groups consulted: 13 men and 1 woman</b>		
<b>Landscape and Visual</b>	Proximity of the project area to adjacent agricultural areas.	Such impacts were studied and assessed as part of the ESIA and appropriate management measures to address this issue were identified.
<b>Land Use</b>	No pastoralism/livestock farming (cattle, sheep, goats); No land use in the project area is used, except for a few rabbit hunters (numbers are decreasing). <u>It was stressed that project site in specific has no additional or increased value for grazing and that is undertaken in wider and surrounding areas as well (Metbasta rangeland).</u>	Such impacts were studied and assessed as part of the ESIA and appropriate management measures to address this issue were identified. Refer to “Section 8”.
<b>Community Development</b>	<ul style="list-style-type: none"> <li>▪ Lack of transportation means.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Request for providing transportation;</li> <li>▪ Request for improvement of the regional road RR-171.</li> </ul> The Developer is committed to implementing a social responsibility program for local communities through a structured approach as discussed in further in “Section 8”.
<b>Employment</b>	Formal / waged employment (factory, coffee, etc.) and in commercial agriculture; Unemployed including young graduates.	<ul style="list-style-type: none"> <li>▪ Expressed the limited duration of employment during construction and employee's future projects coming to a halt;</li> <li>▪ Request for providing training to the local community for the benefit of being hired within the project if needed.</li> </ul> Such impacts were studied and assessed, and appropriate recommendations were identified. Refer to “Section 8” for additional details. In addition, it is worth mentioning that the Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.
	Women work in agriculture in difficult conditions and they don't express their opinions.	<ul style="list-style-type: none"> <li>▪ Request for giving loans to finance micro-projects (sewing projects, e.g. Raida program for women's financing of Small and Medium-sized Enterprises (SMEs) and Very Small Enterprises (VSEs)).</li> </ul> The Developer is committed to implementing a social responsibility

E&S Attribute	Comment	Key Outcomes and Response
		program for local communities through a structured approach as discussed in further in “Section 8”.
<b>Health</b>	<p><u>El Alem dispensary</u>            Open only from 7am to 1pm (Capacity: 20 - 35 patient / day)            No medical specialist/technician/lab assistant            No pharmacist/pharmacist            No community health worker            No security personnel            No out-patient / in-patient service / delivery service / 24-hour emergency services            No landline / No ambulance / No malaria, HIV and tuberculosis diagnostic tests            No treatment/management plans in place and no measures to deal with epidemics            Distance from the dispensary to Kairouan Hospital: about 30 km.</p>	<p>Priorities expressed:</p> <ul style="list-style-type: none"> <li>▪ Ambulance</li> <li>▪ On-call doctor</li> <li>▪ Opening 24 hours a day</li> <li>▪ Analytical laboratory (diabetes, cardio, etc.)</li> </ul> <p>The Developer is committed to implementing a social responsibility program for local communities through a structured approach as discussed in further in “Section 8”.</p>
<b>Education</b>	<p><u>El Maaraji Primary School - Part of Sisseb</u>            No library - No canteen - No developed road - No transportation means            No drinking water (water well under construction, 5 km from the school)            Distance from school to households (maximum 4 km -Sisseb)            Boys are absent more than girls (since they help their parents in agriculture).            Literacy rate is between 50% (similar to surrounding areas)</p>	<p>Request for:</p> <ul style="list-style-type: none"> <li>▪ Transportation</li> <li>▪ Sanitary Bloc</li> <li>▪ School supplies</li> <li>▪ Construction of a preparatory class</li> <li>▪ Creation of cultural clubs for children</li> <li>▪ Creation of sports associations (construction of football stadium)</li> </ul> <p>The Developer is committed to implementing a social responsibility program for local communities through a structured approach as discussed in further in “Section 8”.</p>
	<p><u>Mahmoud Messaadi Secondary School - Part of Sbikha</u>            Distance from high school to households varies from 1 to 25 km (Sbikha)            Boys are absented more than girls (since they help their parents in agriculture)            Literacy rate is between 7 - 10% (lower than surrounding areas)</p>	<p>Request for:</p> <ul style="list-style-type: none"> <li>▪ Transportation</li> <li>▪ School Supplies</li> </ul> <p>The Developer is committed to implementing a social responsibility program for local communities through a structured approach as discussed in further in “Section 8”.</p>

**El Dalloussi Sector**

**Table 6.5 - Summary of Focus Group Discussion with El Dalloussi sector**

&S Attribute	Comment	Key Outcomes and Response
<b>Group consulted: 10 men and 2 women</b>		
<b>Land Use</b>	<p>The majority of the inhabitants of Dalloussi are sedentary farmers raising livestock (cattle, goats and sheep - about 20 head/herd/household). The whole family takes care of the livestock: they move in group and settle in the proximity of their home within the project area during the spring and summer, and movement of men in autumn and winter when grazing is reduced (substitution by buying hay);</p> <p>Land users in the project area for natural pastoralism (state land) - Paid grazing: 4 to 5 TND /head/month + 0.8 TND/head/month for DGF in Sbikha.</p> <p>Land use for collecting firewood (collected by women)</p> <p>No hunting of animals/birds in the project area</p> <p>No camel hunting - the camels in the project area owned by the OTD (about 160 head), and grazing is done in areas with halomorphic vegetation, such as the project site, all year round and not seasonally.</p> <p>There are no sacred sites or cultural heritage sites within the project site and its near vicinity.</p> <p><u>It was stressed that project site in specific has no additional or increased value for grazing and that this is undertaken in wider and surrounding areas as well.</u></p>	<p>Such impacts were studied and assessed as part of the ESIA and appropriate management measures to address this issue were identified. Refer to “Section 8”.</p>
<b>Community Development</b>	<p>Lack of basic infrastructure: road development, lighting, and poor quality of SONEDE water (non-potable) used only for cleaning or washing / Water tanks (of good quality) transported on the project area (50 TND/ 5m<sup>3</sup> tank/day).</p> <p>Lack of transport means (decrease of the number of women collecting firewood due to this lack)</p> <p>Unavailability of hay for the Dalloussi region</p>	<p>Request for any aids possible to remediate the difficulties expressed (water supply for livestock and inhabitants).</p> <p>The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.</p>

&S Attribute	Comment	Key Outcomes and Response
	Lack of vaccines against livestock viral diseases such as typhoid fever and blue tongue disease) No veterinary service in Dalloussi (need to rent a car at 20 TND to travel to a veterinarian/consultation at 20 TND)	
	Poor households especially at "Frihina" community (vulnerable group) living with no developed roads, no lighting, and no transport means).	Cash help for poor families Need for food, social assistance, aids, etc.
<b>Employment</b>	Formal / waged employment (El Alem Agro-Industrial Complex, Industrial Zone, Shoe Factory); Subsistence agriculture and household livestock rearing (chicken, turkey, etc.); No income from the herd (sales, products, etc.), the animals are only used for domestic consumption, otherwise they are sold at 250 to 300 TND / head (during the Eid period); Unemployment/no household income for many families (with 4-5 children per family). Mrs. Ghada Bouzidi works in a children day nursery and holds a license in Renewable Energies / Photovoltaic (ISET Gabès) and a Master's degree.	Request for employment for community members (including financing micro-credits)  Such impacts were studied and assessed, and appropriate recommendations were identified. Refer to "Section 8" for additional details. In addition, it is worth mentioning that the Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in "Section 8".
<b>Health</b>	No dispensary in El Dalloussi and difficulty to go to the El Alem Dispensary because of the lack of transportation, and apart from collective taxis with 1.5 TND round trip/person with limited availability (depending on the number of passengers).	Need for a dispensary in El Dalloussi. The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in "Section 8".
	Children with visual disturbance Orphans' children	Request care/material aids. The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in "Section 8".
<b>Education</b>	<u>Dalloussi primary school:</u> No library - no canteen Alphabetism increasing compared to Sbikha and Kairouan	Request for the construction of club (the premises exist and are owned by the DGF but not exploited as it was burnt down during the revolution). The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in "Section 8".

▪ **Bir Jdid Sector**

**Table 6.6 - Summary of Focus Group Discussion with Bir Jdid sector**

E&S Attribute	Comment	Key Outcomes and Response
<b>Group consulted: 7 men</b>		
<b>Community Development</b>	Repeated water cuts lasting up to 15 days Power cuts especially in summer	Request for road lighting: repairing the power line breakdown in the region. The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.
<b>Employment</b>	Lack of employment Unemployed young people without qualifications, who work irregularly in the construction sector.	Request for employment. The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.

▪ **El Bchechma Sector**

**Table 6.7 - Summary of Focus Group Discussion with El Bchechma sector**

E&S Attribute	Comment	Key Outcomes and Response
<b>Groups consulted: 10 men and 3 women</b>		
<b>Land Use</b>	Use of land in the project area for hunting (rabbits and partridges) and collection of shells; No grazing in the project area (remote).	Such impacts were studied and assessed as part of the ESIA and appropriate management measures to address this issue were identified. Refer to “Section 8”.
<b>Community Development</b>	Lack of community development projects.	Request for investment in community development (Proposal of micro-credits for small projects). The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.
<b>Employment</b>	Formal/waged employment (supermarket/cafe) and subsistence agriculture (olive trees, almond trees, etc.); Number of farmers in El Bchechma is about 100; Waged employment for girls (electrical cable factory).	<ul style="list-style-type: none"> <li>▪ Request for employment (construction/guarding);</li> <li>▪ Request for micro-credits for small projects for young people.</li> </ul> The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.

▪ **Metbasta Sector**

**Table 6.8 - Summary of Focus Group Discussion with Metbasta sector**

E&S Attribute	Comment	Key Outcomes and Response
<b>Group consulted: 4 men and 3 women</b>		
<b>Land Use</b>	No use of land within the project area.	Such impacts were studied and assessed as part of the ESIA and appropriate management measures to address this issue were identified. Refer to “Section 8”.
<b>Community Development</b>	Lack of lighting (electrical poles broken down 3 years ago and construction of speed bumps); Roads not lit; No household sanitation (not connected to the ONAS network); Existence of a few plots of land not used (soil degradation following ONAS treated wastewater discharges). There are privately owned lands by some of those consulted within the project region, no conflicts over land/land ownership	<ul style="list-style-type: none"> <li>▪ Request for road improvements</li> <li>▪ Request for lighting</li> </ul> <p>The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.</p>
<b>Employment</b>	Mainly activities done in the all the Metbasta sector are livestock (sheep)/pastoralism (low, about 15 herders in Metbasta) and rabbit and common crane hunting (only 2 persons are allowed). Small routine job: the collection/transport of Saccharum by men (from the wadis in Bizerte; northern Tunisia), their cutting/cleaning and assembly by women (who work for this family (1 dinar/lot of 100 pieces)) then their sale for multiuse (roof covering/wind protection for the trees); Large number of unemployed (majority are graduates).	<ul style="list-style-type: none"> <li>▪ Request for employment</li> </ul> <p>The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.</p>
<b>Health</b>	Dispensary in bad state (e.g: risk of roof collapse).	<ul style="list-style-type: none"> <li>▪ Request for improvement of the state of the dispensary.</li> </ul> <p>The Developer is committed to implementing a social responsibility program and providing priority for employment for local communities through a structured approach as discussed in further in “Section 8”.</p>

### **Summary outcomes of Stakeholder Consultations**

During the community consultation sessions, no objections to the implementation of the solar power plant project were expressed by any of the stakeholders consulted. They encouraged the development of the project as it will not generate pollution, it will create jobs and will increase national electricity production.

In general, the key outcomes from such consultations include:

- Project area in general is used mainly for grazing activities, hunting and collection of firewood by some communities, but users consulted did not express any objection and stated that there are similar alternatives areas around the project site that can be used for the same purposes and that the Project does not have any specific different values.
- There are no sacred sites or cultural heritage sites in the vicinity of the project area except for the ancient French colonial farm located at 6 km northwest of the project site,
- There are privately owned lands by some of those consulted within the project region, no conflicts over land/land ownership.

However, certain expectations were raised by the local communities related to the Project development which include:

- the need to provide jobs for the local communities during construction and operation with focus on youth.
- implementation of a Social Responsibility Program (SRP) that focuses on community development projects (that addresses women groups as well) as well community needs (health, education, sanitation, water supply, transport, etc.).
- Ensure continuous communication and outreach with local communities to provide updates on the project and its progress through information means such as public consultation, direct contact with the community via the CLO or the local representative of the Developer, via the mayor (For Metbasta) or through the creation of a web page or Facebook.

Photos of the community's consultations undertaken are presented below.



**El Alem Stakeholder Consultation**



**Daloussi Stakeholder Consultation**





**Bir Jedid Stakeholder Consultation**



**Metbasta Stakeholder Consultation**



**El Bechchma Stakeholder Consultation**



## 6.7 *NGOs Consultation*

The consultation was organised with the identified NGO which is “Association Amies des Oiseaux” AAO. It was carried out through videoconference on the 11th of May 2021.

Following the presentation of the Project, the ESIA and the stakeholder engagement process, the main issues discussed were:

- The compensation for wildlife habitat that might be disturbed by the project must be part of Developer's approach to biodiversity protection.
- The request if the ESIA includes the OHTL.
- The recommendation to follow the same route of the proposed OHTL as the existing transmission line which extends along RR-171 to minimize habitat degradation. This alternative cannot be considered because the OHTL route crosses the Metbasta IBA. The impact of the OHTL will therefore be greater.
- The consideration of the interconnection between the three IBAs surrounding the project site.
- The need to include Sebkhet Sidi El Heni within the network of wetlands located in the vicinity of the project area given its importance for the movement of birds.
- The importance of proposing the bird monitoring program during the life cycle of the project.
- The need to consider the impacts of the project following the loss of habitat and biodiversity to implement the compensation mechanism of these habitats.
- The consideration of ongoing bird conservation programs and studies that focus on population declines of certain species.
- The need to take into consideration the 25 species of waterbirds in the Mediterranean that are threatened according to the Barcelona Convention. This is the case, for example, of the Turtle Dove which is present in Metbasta
- The performance of a site visit in January to collect data on wintering birds.
- The request to share the studies done at this stage for this project.

Clarifications at the technical level have also been made:

- The OHTL route meets certain technical criteria specific to High voltage lines and should not follow the route of existing medium voltage lines near the project site. In addition, it was mentioned that the route proposed by STEG was modified twice to avoid crossing the Metbasta IBA.
- Monitoring of bird mortality every two years at the solar plant site and along the associated power line has been proposed.

- A specific delimited study area within the project area was identified and considered for the bird survey. This study area includes the nearest wetlands namely the Kairouan plain, the Metbasta wetland and Sebkhet Kelbia.
- The Turtle Dove was identified during the bird survey and confirmed to be present within the project area.
- For the assessment of bird’s habitat disturbance caused by the project, the homogeneity character of the wider project area showed that there will be no lack of alternative habitat.
- The Environmental and Social Impact Assessment for Metbasta solar Plant Project will be published on the IFC and the AfDB websites once finalized.

**6.8 Other Interested Parties/Stakeholders Consultations**

A consultation session with the key regional governmental entities took place on 27 November 2020 in the governorate of Kairouan. The objective of such consultation was to:

- Introduce the project (objective, location, key components, etc.);
- Explain and discuss overall methodology for ESIA study;
- Explain and discuss key anticipated impacts as relevant;
- Identify and determine additional requirements or key issues of concern to be taken into account for the ESIA study.

Throughout the consultations a leaflet (see Annex VI) was prepared and distributed to such stakeholder groups with key information to include but not limited to project location and setting, key components, and activities of the Project and other as applicable.

Project presentation (PowerPoint), including details of Project, ESIA process, and stakeholder engagement activities, is provided in the Annex VI.

The table below presents summary for the outcomes of the stakeholder consultation undertaken, while the figure that follows presents sample photos.

**Table 6.9 - Key outcomes of Stakeholder Consultation**

Stakeholder	Key Outcome
<b>Kairouan Governorate</b>	<ul style="list-style-type: none"> <li>- He expressed his support for these investment projects, especially environmentally friendly projects such as solar energy developments;</li> <li>- It expressed its support and commitment to provide services and facilitate procedures as much as possible;</li> <li>- He recommended coordination with the regional authorities of the governorate to guide and implement the project's social responsibility plan.</li> <li>- He emphasised the high level of behaviour of the community in terms of stability and solvency of social problems in general;</li> </ul>

Stakeholder	Key Outcome
	<ul style="list-style-type: none"> <li>- He mentioned some examples of projects that will be implemented in the governorate of Kairouan:               <ol style="list-style-type: none"> <li>1.The Jelma highway that connects Sbikha - Kairouan.</li> <li>2.The Enfidha-Kairouan express road (financed by the EBRD) which leads to Sbikha and makes Kairouan a strategic location for investments.</li> </ol> </li> </ul>
<p style="text-align: center;"><b>Deputy for the governorate of Kairouan in the Assembly of People's Representatives</b></p>	<ul style="list-style-type: none"> <li>-The Deputy of Kairouan Governorate in the Assembly of the People's Representatives - The Deputy of Kairouan Governorate in the Assembly of the People's Representatives (ARP) expressed that the project is an investment in the region and declared its importance in the local context;</li> <li>-he offered his help/support to solve any problem or difficulty the Promoter may encounter;</li> <li>- he highlighted the problem of unemployment in the region;</li> <li>- he stated that the Promoter should consider social responsibility programmes because of the lack of many services and the important needs that should be met in different sectors (health, education, sanitation);</li> <li>- he stressed the importance for the Promoter to adhere to a clear and transparent process regarding employment, public procurement and a social responsibility programme, in order not to lose the trust of the community. To this end, the employment programme must be transparently disclosed to the various stakeholders, including all the Members of Parliament of the Kairouan region.</li> </ul> <p>An official recruitment campaign will take place before the start of the construction of the project according to the manpower needed for the different phases of the project.</p>
<p style="text-align: center;"><b>Directorate of Regional Development (DDR)</b></p>	<ul style="list-style-type: none"> <li>- Expressed that Metbasta's PV project is a state investment as the electricity will be fed into STEG's national grid;</li> <li>- Mentioned that the project is located close to the Sbikha Industrial Area (IA), which has electricity problems. It is proposed to supply this IA with electricity from the project in terms of availability of electricity in coordination with STEG;</li> <li>- Stated that the project will enable the development of an uncultivated plot of land in a marshy area;</li> <li>- Stressed the spill-over effects that will be induced as the project will help to generate other investments and thus increase production in the Kairouan region;</li> <li>- Proposed to cooperate for the launching of the specialties and the functional programme of the Engineering School project in the Kairouan region (Example: Specialty in Renewable Energies).</li> </ul>
<p style="text-align: center;"><b>Tunisian Company of Electricity and Gas (STEG)</b></p>	<ul style="list-style-type: none"> <li>- Explained that the project will ensure to increase in energy production and consequently reduce the trade and energy balance deficit (power grid stability and reduction of line voltage drops);</li> <li>- Stressed that the project will contribute to the production of electrical energy on a national scale. The injection of the produced electricity is done in the HV grid, therefore the proposal to supply the Sbikha Industrial Area with electricity produced from the site is not applicable;</li> <li>- Stressed that the project will increase the production of electricity from renewable energy sources;</li> <li>- Proposed to supply electricity by Developer to the Sbikha Industrial Area via the installation of solar panels;</li> <li>- Explained the low employability of RE projects but the employability remains high during construction considering scale.</li> </ul>

Stakeholder	Key Outcome
<b>Agency for the Promotion of Industry and Innovation (APII)</b>	<ul style="list-style-type: none"> <li>- Proposed for the Industrial Area of Sbikha: possibility of designing solar panel production units. It's to mention that cleaning and maintenance services can be developed locally to support the projects, as well as stores that sell PV plant-specific spares.</li> </ul>
<b>Tunisian Union of Agriculture and Fisheries (UTAP)</b>	<ul style="list-style-type: none"> <li>- The municipality has expressed its support for these investment projects, especially environmentally friendly projects such as solar energy developments;</li> <li>- The Municipality of Sbikha expressed its support and commitment to provide services and facilitate procedures - as much as possible;</li> <li>- The Municipality stressed the importance of a communicative and participatory community strategy: Proposal to invest in the project community in an appropriate way to overcome the capacity to build the relationship with the community in terms of community development in order to create stability and profitability for future investments in the area;</li> <li>- Proposed cooperation between the Promoter and the Municipality of Sbikha to provide street lighting in the municipality;</li> <li>- Proposal for a partnership with local farmers to help them obtain water at the lowest possible cost.</li> </ul> <p>Proposing joint strategies such as banners in common shops and community areas, and a website updating the community</p>
<b>Municipality of Sbikha</b>	<ul style="list-style-type: none"> <li>- Expressed the support for such investment projects, especially such environmentally friendly projects such as solar PV developments;</li> <li>- Expressed the support of Sbikha Municipality and their commitment to providing services and facilitating procedures as much as possible;</li> <li>- Stressed the importance of communicative and participatory community strategy: Proposal to invest in the project community appropriately to overcome the capacity to establish the relationship with the community in terms of community development to create stability and profitability for future investment in the area;</li> <li>- Proposed a cooperation between the Developer and the Municipality of Sbikha to provide street lighting for the municipality;</li> <li>- Proposed to partner with local farmers and help them to obtain water at the lowest possible cost.</li> <li>- Propose common strategies such as banners at common shops and community areas as well as a website updating the community.</li> </ul>
<b>Regional Directorate of State Domains &amp; Land Affairs (DRDEAF)</b>	<p>Land authorization for the project (completion of visits and plan).</p>
<b>Regional Commission for Agricultural Development (CRDA)</b>	<p>Priority of the medium-voltage electricity transmission project proposed in the region over the Developer project.</p>

Letter to Kairouan Governor, attendance list and minute of meeting with regional governmental entities are presented in the Annex VII.

Photos of the regional governmental entities' consultation are presented below.



**Overview of the participants in the consultation session**



**Kairouan Governorate & Representative of Parliament of the Kairouan region**



**AMEA POWER & EAM Representatives**



**Regional Governmental Entities Representatives**



In addition, the table below summarizes the results of the consultations with local entities undertaken during the Environmental and Social Due Diligence phase (August and September 2021).

**Table 6.10 - Key outcomes of local entities**

Local Entities	Key Outcome
<p><b>ANGED</b> Mr. Khaled Bouraoui Mr. Kheirallah El Hammami</p>	<ul style="list-style-type: none"> <li>- Agreements with specialized companies approved by the minister in charge of the environment must be established by the industrials.</li> <li>- Household and similar waste is transported to the controlled landfill of El Baten which has been in operation since 2008. The current solid waste reception capacity is 160 to 170 tons per day.</li> <li>- The storage of hazardous waste is controlled by the ANPE.</li> </ul>
<p><b>ANPE</b> Mr. Khaled Ben Khadija, Regional Director</p>	<ul style="list-style-type: none"> <li>- Solar energy projects with a capacity of less than 300 MW are not subject to environmental impact assessment (Decree 2005-1991).</li> <li>- The ANPE has an overview on the management of natural resources.</li> </ul>
<p><b>STEG</b> Mr. Mohamed Sakka, Head of the STEG Kairouan District Design Office</p>	<ul style="list-style-type: none"> <li>- The cost of connecting the STEG El Ghabet substation to Metbasta is estimated at \$1.7 million</li> <li>- STEG plans to build a HV/MV substation on an area of 4 ha in the industrial zone of Sbikha in Metbasta.</li> </ul>
<p><b>SONEDE</b> Mrs. Naila Saïhi, Chief District SONEDÉ Kairouan</p>	<ul style="list-style-type: none"> <li>- SONEDE can meet the drinking and industrial water needs of the Project.</li> <li>- SONEDE has planned in 2021 the drilling of a well and the construction of a water tank in El Alem (next to the OTD) to meet the water needs of the industrial zone Sbikha-2.</li> <li>- Applications for drinking water supply are processed within two months.</li> </ul>
<p><b>ONAS</b></p>	<ul style="list-style-type: none"> <li>- The industrial units of the industrial zone of Sbikha-1 collect wastewater in watertight pits. This water is transported by authorized companies to the treatment plant (STEP) of Kairouan. The WWTP of Kairouan currently treats 16,000 m<sup>3</sup>/day for a nominal capacity of 20,000 m<sup>3</sup>/day.</li> <li>- The city of Sbikha is equipped with a tertiary urban wastewater treatment plant with a nominal capacity of 1,200 m<sup>3</sup>/day. Currently, it treats 700 m<sup>3</sup>/day. The treated water is used for the irrigation of the state-owned agricultural lands of the Sbikha region.</li> </ul>
<p><b>CRDA</b></p>	<ul style="list-style-type: none"> <li>- For the management of the pastoral activity, the CRDA will identify a compensation ground.</li> <li>- Socio-economic studies have been conducted to address the problem of unemployed young graduates. The government grants land following these studies.</li> <li>- The reed used in the handicraft activities of the people of Metbasta come mainly from the regions of Korba and Nabeul.</li> </ul>

**6.9 Grievance Mechanism (GM) at project level**

The grievance mechanism aims to resolve problems quickly, using a procedure that is understandable and transparent, culturally appropriate and easily accessible, at no cost and without reprisals to the grieving party. The mechanism has been designed in such a way as not to impede access to future judicial or administrative proceedings and to guarantee

the confidentiality of the person or group that has filed the grievance.

Any group/individual can submit a grievance/complaint to the Promoter/STEG. All complaints will be considered and acknowledged as an opportunity for improvement or a recommendation.

A complaint can be submitted in one of the following ways:

- Governorate of Kairouan

o Address: Avenue de l'Environnement 3100, Kairouan, Tunisia

o Tel: (+216) 77 226 777 / Fax: (+216) 77 228 450

o E-mail Address: [gouv.gouvkairouan@planet.tn](mailto:gouv.gouvkairouan@planet.tn)

- Municipality of Sbikha

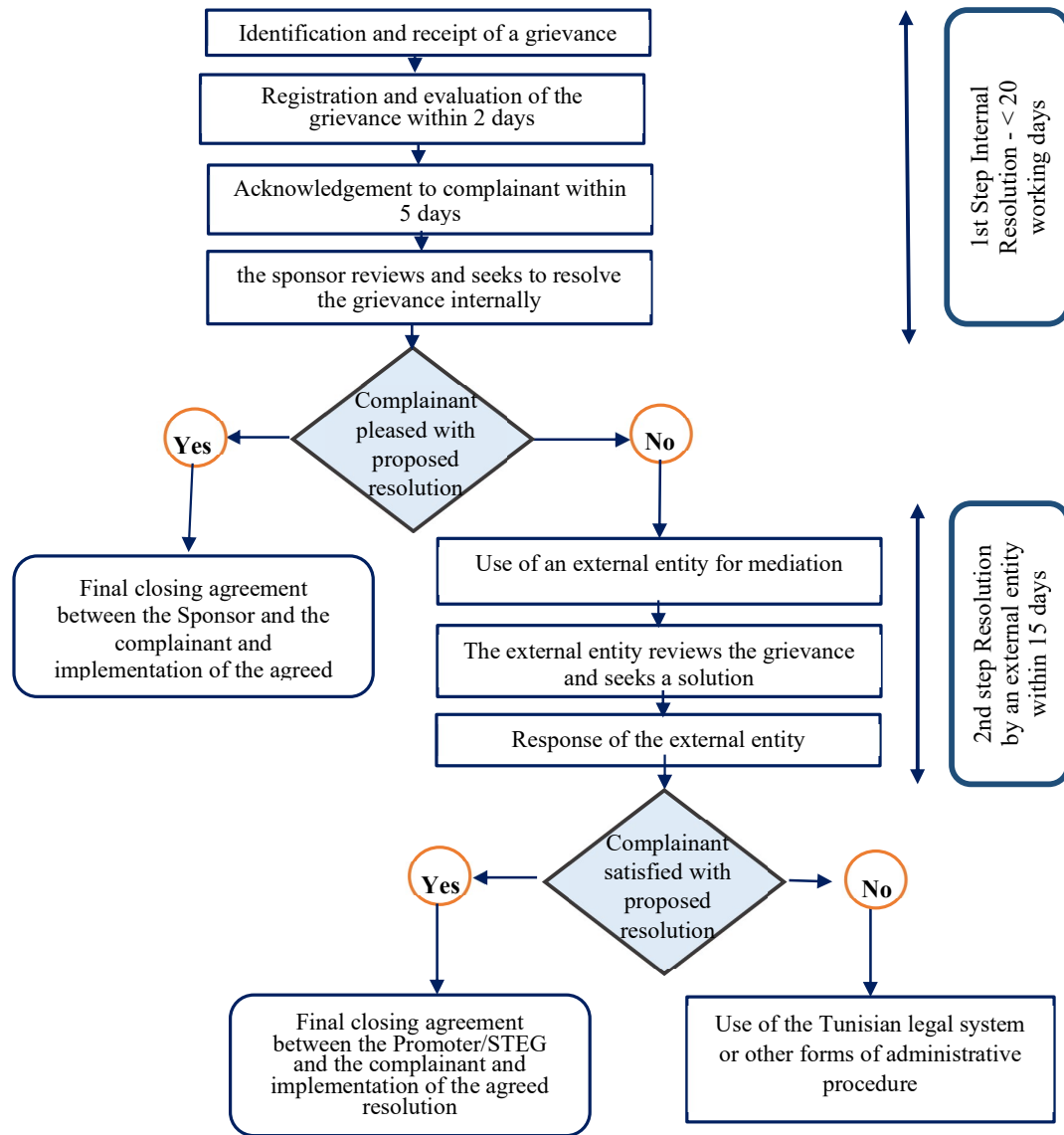
o Address: Rue 18 janvier 1952 Sbikha, Kairouan, Tunisie

o Tel: (+216) 77 365 517 / Fax: (+216) 77 365 517

o E-mail Address: [contact@commune-sbikha.gov.tn](mailto:contact@commune-sbikha.gov.tn)

- By sending a message through the social manager hired by the Promoter to liaise with complaints and all social issues: Donia MEJRI: email: [Donia.Mejri@ameapower.com](mailto:Donia.Mejri@ameapower.com);

In case of conflict, amicable resolution through mediation following the methods stipulated below is the preferred method:



Grievance Mechanism Procedure

**6.10 Future stakeholder engagement and consultation**

Future stakeholder engagement and consultations include the disclosure of the ESIA, ESMP and the implementation of the Stakeholder Engagement Plan (SEP) will be implemented by the Developer. Both are discussed in additional details below.

In addition, the national authorities’ consultation mainly with the Ministry of Energy, STEG and ANME must be completed. The objective of these consultations is to explain the project, components, activities, schedule, and to discuss the key anticipated Environmental and Social (E&S) impacts, to understand thoughts, views, and any key issues of concern so that they are taken into account throughout project development. These consultations were pending upon Developer approval.

**6.10.1 Additional stakeholder consultations**

In order to cover lenders’ comments outlined within the Environmental and Social Due Diligence report (ESDD) conducted in October 2021 by RAMBOLL, specific consultation / focus groups with vulnerable groups (women, youth, unemployed people) were performed on 04 and 06 February 2022.

This section includes the main results of additional consultation sessions with groups of people in the community of Metbasta.

**(i) Metbasta Community**

Metbasta community consultations were carried out on 04 and 06 February 2022. Three groups were consulted: a group of men, a group of young men and a group of young women.

Consulted Group	Key Outcomes and Response
<p>Group of men (15 persons) Location of the meeting: Metbasta Date : February 4<sup>th</sup>, 2022</p>	<p>Questions raised during the consultation: (i) Profiles required for recruitment of the labour force (age range and educational level) (ii) Project lifetime; (iii) work regime adopted (permanent or temporary job); (iv) Salaries allocated to employees; (v) Becoming of those recruited at the end of construction phase; (vi) Will the project cause any adverse effects on human health; (vii) benefits to be brought to Metbasta in terms of community development. Unemployed young graduates have made relevant claims: - They claim that the recruitment of qualified people, especially for several projects in Metbasta, did not consider local labour force and that most of the people recruited (especially during exploitation phase of the project) are not from Metbasta region, on the contrary, they belong to El Alem, Dalloussi... - The required workforce during the operation phase is very limited compared to the high number of unemployed people in the region. - Discontent of some of young people present, given that several factories have been set up in the industrial zone of Sbikha I and that the promoters have not kept their promises in terms of employment, creation of micro-projects, social development, improvement of basic infrastructure, etc.</p>
<p>Group of young men (8 persons) Location of the meeting: Metbasta Youth Center Date : February 4<sup>th</sup>, 2022</p>	<p>- Most of young people interviewed had an idea about the Solar Project. Nevertheless, they asked for some information about the number of employees required along phases of the project. - Young people expressed motivation and interest, especially in renewable energy projects, as some of them were employed in similar projects. - Only one opposition was reported by a young unemployed person, and it concerned preference of hiring women over men, especially in the shoe factory</p>
<p>Group of young women (8 persons) Location of the meeting: Metbasta Youth Center</p>	<p>All women interviewed had an idea about the Solar Project and had already heard about it. They were motivated and interested, and had certain expectations, namely: - Employment of local labour - Rehabilitation of road infrastructure (roads, pavements) - Request to improve the condition of a primary school - Equip the locality with a police station</p>

Consulted Group	Key Outcomes and Response
Date : February 6 <sup>th</sup> , 2022	<ul style="list-style-type: none"> <li>- Equip the locality with a tax office</li> <li>- Connect the locality to ONAS sewage network.</li> <li>- Development of social and community status of Metbasta.</li> </ul>



**Consultation with local population of Metbasta**



**Consultation of young graduates and non-graduates**



**Women's group consultation**

***(ii) Survey of herders currently using the Project site***

Four herders were met and interviewed at the Project site including the OHTL route. Some of them had an idea about the project. The main information provided is as follows:

- Grazing activities could take place during autumn, winter, and spring seasons. During the summer season (June-August), herders move to the southern area of Tunisia for grazing.
- Grazing fees are as follows: (i) in the project area 0.8 TND/ per head per month for sheep and goats and 1.5 TND/ per head per month for camels.
- In case of reduction of grazing land following the project construction, herders move to Essaidia land of the Office of Livestock and Grazing in Sbikha. Grazing fees are charged 1.5 TND per head of camel per month.



Receipt for payment of grazing fees in Metbasta

It should be noted that the grazing rates mentioned above were provided by the herders who were consulted in

February 2022. These rates are partially like the values provided by the CRDA in 2021 (refer to table 7.13 – Grazing rates by type of livestock, by head and type of range (in TD)).



**Consultation with herders – February 2022** (A: an 80-year-old man keeping 10 camels, B: a young shepherd keeping about 20 sheep, C: a young shepherd keeping a herd of 60 sheep and goats)

During consultation with herders, EAM team met with the forest ranger who provided us with some instructions applied in the case of infraction (non- payment of grazing fees).

The procedure is as follows:

- In the case of a first offence: the forest ranger simply warns the offender verbally without imposing a fine.
- In the event of a repeat offence, the forest ranger draws up an official report against the offender, specifying the name of the shepherd, herd size and offence nature, which will be sent to Forestry District in Sbikha to punish him.



**Consultation with herders in the presence of forest ranger**

### **6.10.2 Disclosure of Documentation**

The ESIA, the Non-Technical Summary (NTS), the ESMP and the PEPP will be disclosed on the Promoter's website. In addition, hard copies of these documents will also be distributed to the appropriate local community platforms to be identified in coordination with the Governorate of Kairouan, the Delegation of Sbikha, the Delegation of Kairouan Nord, etc. The ESIA, NTR, ESMP, PEPP and PARA will be disclosed for a minimum period of 30 days.

In addition, a disclosure meeting was held on March 3, 2022, with local entities in the governorate of Kairouan. The objective of this meeting is to inform the stakeholders about the content of the ESIA and to present the results of the study to gather their opinions on the proposed measures.

Letter to Kairouan Governor, ESIA disclosure presentation, attendance list and minute of

meeting with regional governmental entities are presented in the Annex VIII.

### **6.10.3 Future Stakeholder Engagement**

Stakeholder Engagement is an on-going process that involves stakeholder analysis & planning, disclosure & dissemination of information, consultation & participation, grievance mechanism, and on-going reporting to Affected Communities. A Stakeholder Engagement Plan (SEP) is developed and implemented that is scaled to the Project risks and impacts and development stage and be tailored to the characteristics and interests of the Affected Communities and key stakeholders.

The SEP for the Project (see Annex IX) describes the planned stakeholder consultation activities and engagement process and includes the following:

- Define the Project's approach to future stakeholder engagement;
- Identify stakeholders within the area influenced by the Project;
- Profile identified stakeholders to understand their priorities;
- Propose an action plan for future engagement with identified stakeholders; and
- Define the mechanism for resolving grievances/complaints relating to the project.

## 7.0 ENVIRONMENTAL, ECOLOGY AND SOCIAL BASELINE

The description of the Environmental and Social Baseline conditions in the project site is based on the bibliographic synthesis of documents relevant to the study area, supplemented by field data.

For the purposes of environmental analyses, all environmental and socio-economic sensitivities were integrated in their geographical context by means of Geographic Information System (GIS).

### 7.1 Geographic Location

The solar plant will be constructed on a leased land of 200 hectares. The project site is located in the North-East of the governorate of Kairouan, in central-eastern Tunisia. Geographically, the Kairouan region is part of the eastern termination of the central atlas, falling within the natural domain of the low steppes that links the Sahel and the high steppes of Tunisia (see Figure 7.1 - Natural Areas Map).

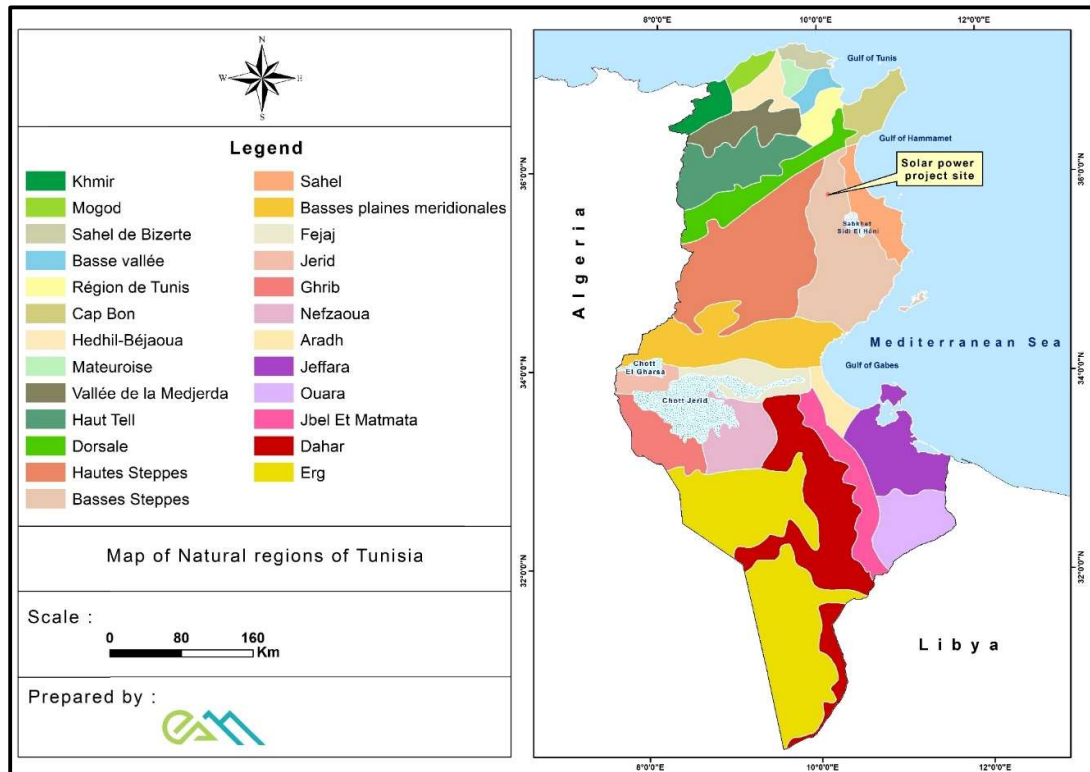


Figure 7.1 - Natural Areas Map

## 7.2 *Physical Environment*

Assessment of baseline conditions in relation to the physical environment was based on a site visit undertaken by the 'ESIA Team' to the Project site and surrounding areas. In addition, desktop review as well as collection of secondary data was undertaken on key characteristics related to the physical environment. Additional details are provided below as relevant.

### 7.2.1 **Geomorphology**

The project site is a vast, virtually flat area with no geomorphologic features. It is an area of saline depression, with a gentle general slope towards the south and east, where at that point elevation in general is about 1 m than the nearby road level that runs to the eastern border of the Project site. On a larger and wider scale, the project area is mainly surrounded by:

- **The mountain range to the west and north:** which includes hills of high steppes reaching 700 m in altitude except for Jebel Serj which reaches 1300 m in altitude; and
- The eastern plains of the Governorate at an altitude of 100 m: This is the basin where the wadis of Zéroud, Nebhana and Merguellil flow. Sebkheth Kelbia, located about 5 km from the project site, and further south Sebkheth Sidi El Héni and Sebkheth Chraïta.

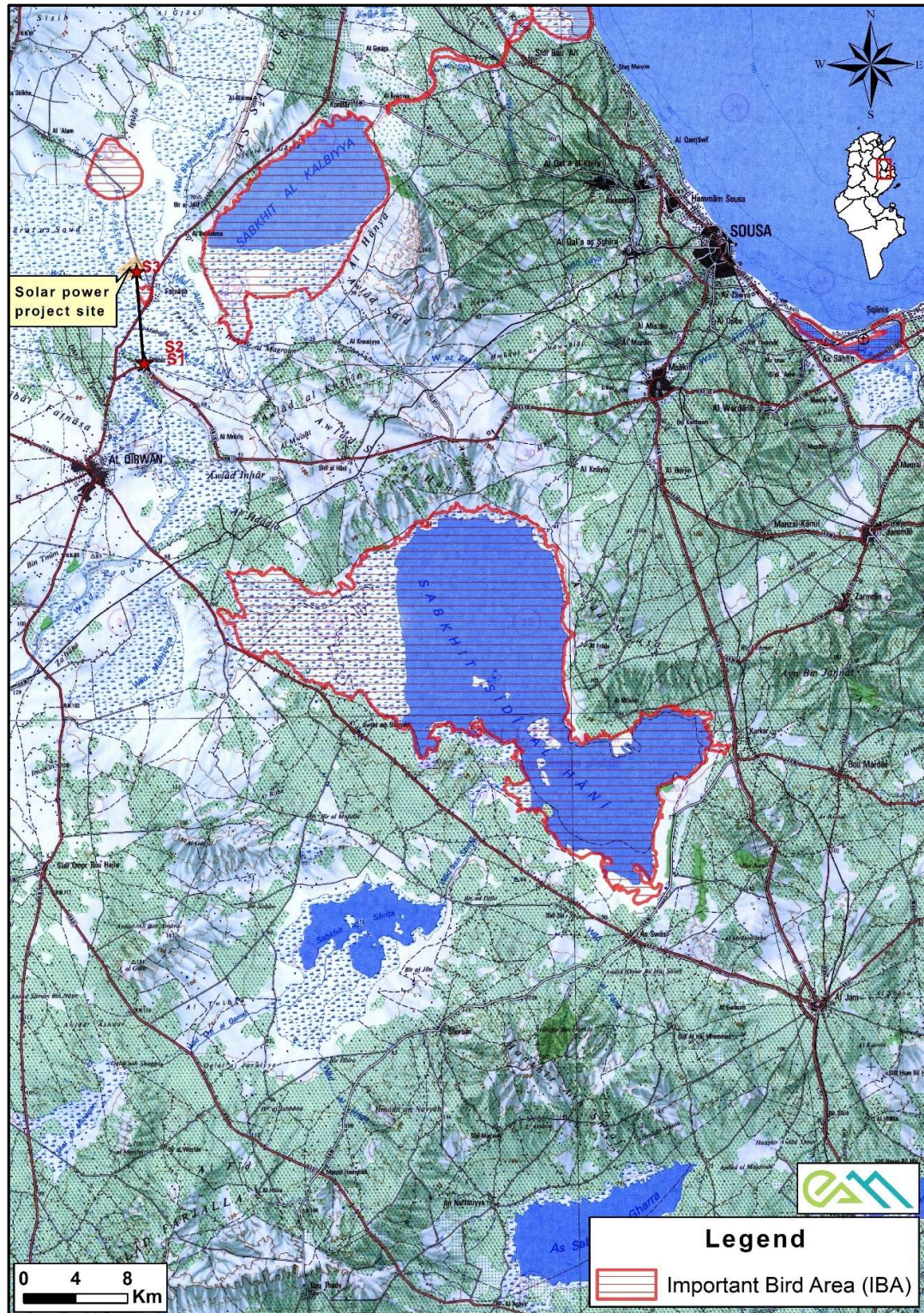


Figure 7.2 - Topographic Map of the Project Area

Figure 7.3 below shows the general topography and landscape of the project site.

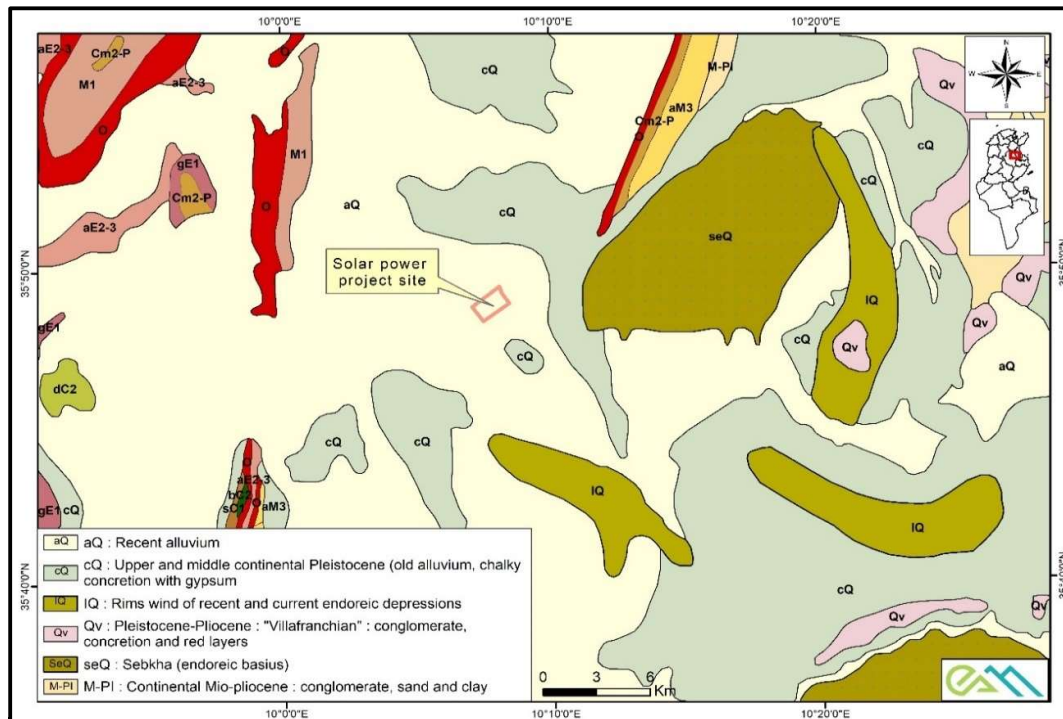


**Figure 7.3 - General Topography and Landscape of the Project Site**

### 7.2.2 Geology

The project site is not marked by any geological manifestation.

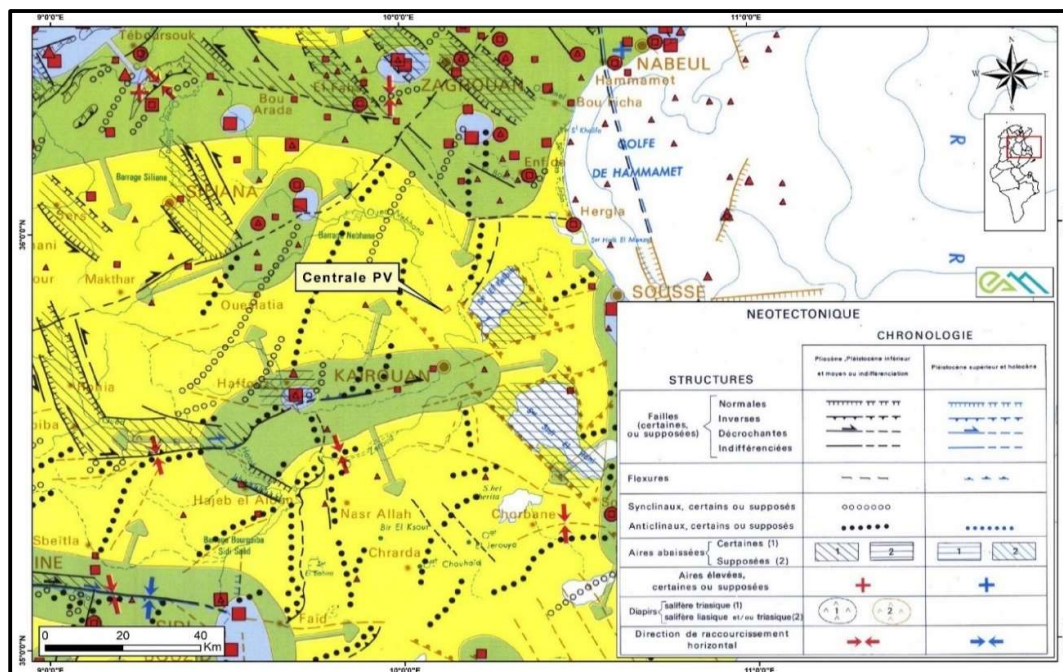
Based on the geological map, the project site is located within recent alluvium compositions which include substratum dating from the Quaternary period covered by deep heavy soil. The type of soil within the site causes a limited deep development of plant roots, making it unsuitable for agricultural activities.



**Figure 7.4 - Geological Map of the Study Area**

With regards to tectonics, the project area is part of the Sisseb-El Alem basin affected by anomalies close to the eastern and northern trend. The closest geological anomaly to the project area is the Ktifa Anticline (filling of the Ktifa Guelta syncline) masked by the quaternary continental sedimentary cover (clay and sand) as presented in the tectonic map within figure 7.5 below (S. Khomsi et al., 2004).

It's worth mentioning that the project site of the solar plant remains far away of the main anomalies existing within the area and thus, no seismic risk is expected (see Figure 7.5).



Source: Seismic-tectonic Map of Tunisia, 1990

Figure 7.5 - Tectonics within the Project Area

### 7.2.3 Pedology

The soil within the project site has a clay-silt texture, where a layer of hardpan formed on the surface of the soil makes difficult for seeds of plant species to germinate. The soil is therefore characterized by:

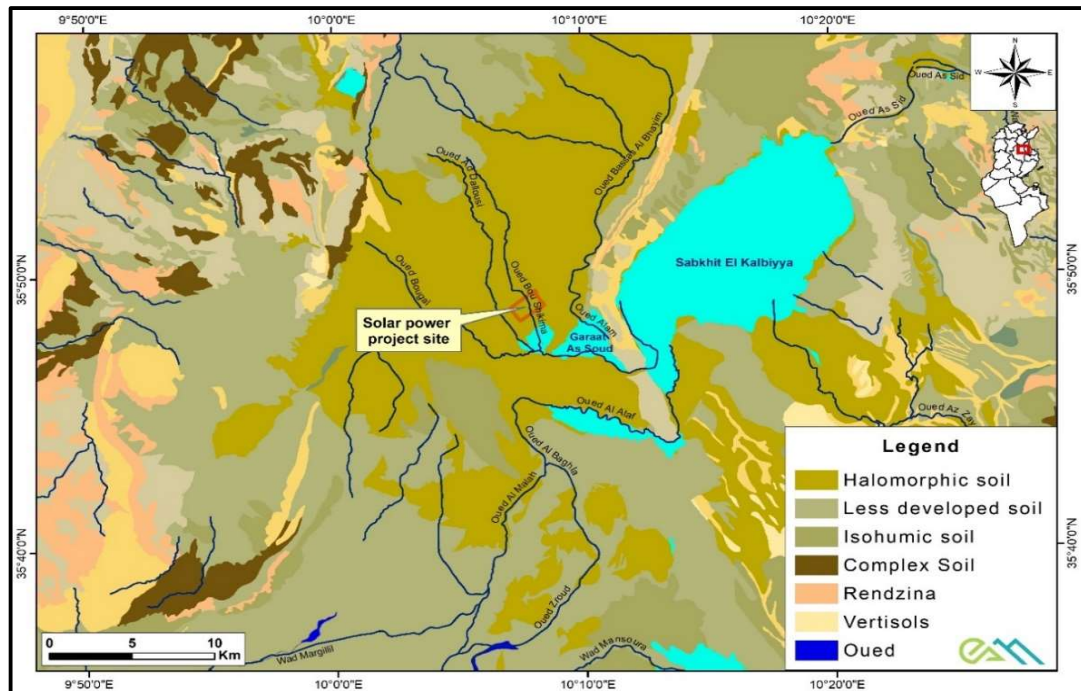
- Hydromorphy: This characteristic is generally related to heavy soils with poor internal drainage. The phenomena of rising water table especially during the rainy season are not to be neglected. Indeed, after rainfall, there is usually a phenomenon of submersion, where the water could remain stagnant for several weeks. The soil hyper-saturated in water, becomes very asphyxiating, where all species of fauna, can no longer survive. In addition, the phenomenon of hydromorphy is affecting the soil seed bank, causing the rotting of most of the seeds of the plant species. The very clayey soil of this biotope, in turn, is not favorable to the evaporation of stagnant water. The photo

below, illustrates the phenomenon of hydromorphy, observed in this site after the rainfall that took place during the month of September 2020.



**Figure 7.6** - Importance of the phenomenon of hydromorphy within the project site (photo taken after rainfall occurred during September 2020)

- Salinity: Salt soils usually have heavy textures and high electrical conductivity. They are therefore unsuitable for agriculture, and most often colonized by halophilic vegetation salty (see Figure 7.7 - Soil Map of the Study Area).



**Figure 7.7** - Soil Map of the Study Area

Based on the site visit to the project site carried out during late summer and before the first winter rains, abundance of shrinkage cracks was observed, which attest to the destruction of the soil structure. Similarly, these cracks are very harmful to vegetation, due to their penetration by solar radiation, and thus their influence on the evaporation of water from the soil to the detriment of plant production (see Figure 7.8).



**Figure 7.8** - Soil Structure within the Project Site (Shrinkage cracks)

#### 7.2.4 Hydrology

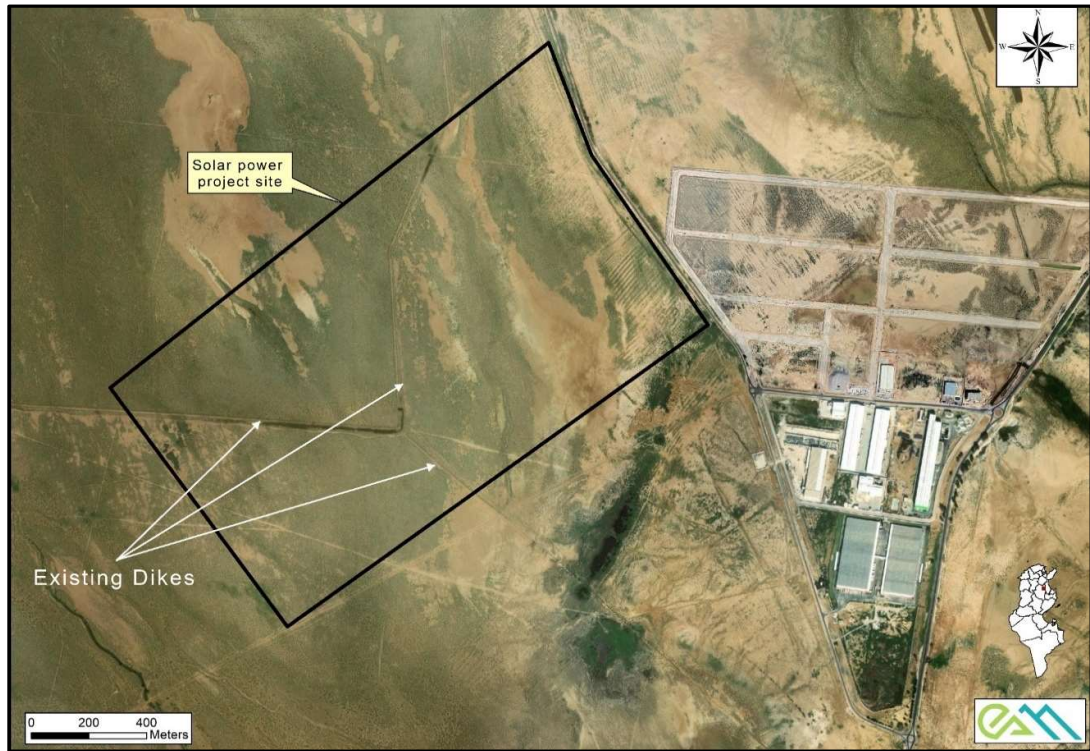
The study area is part of the low steppes of Tunisia.

The hydrographic network consists of three temporary streams with endorheic flow towards Sebket Kelbia. They are:

- Wadi Boushkima, 15 km long, which crosses the project site from north to south;
- Wadi Dalloussi, 17 km long, which is located further west of Wadi Boushkima;
- Wadi Boughal, 15 km long, which intercepts the Boushkima and Dalloussi wadis and flows into Sebket Kelbia.

The floods of these wadis that come from the heights of the relief (from the west) spread over large areas before concentrating and flowing downstream through Wadi Boughal into Sebket Kelbia.

With regards to the hydraulic facilities on the site of the solar power plant, we note the presence of dikes (see location and photos below) built by the CRDA a little more than 20 years ago to create a water retention to alleviate the risk of flooding of the wadi Boughal.

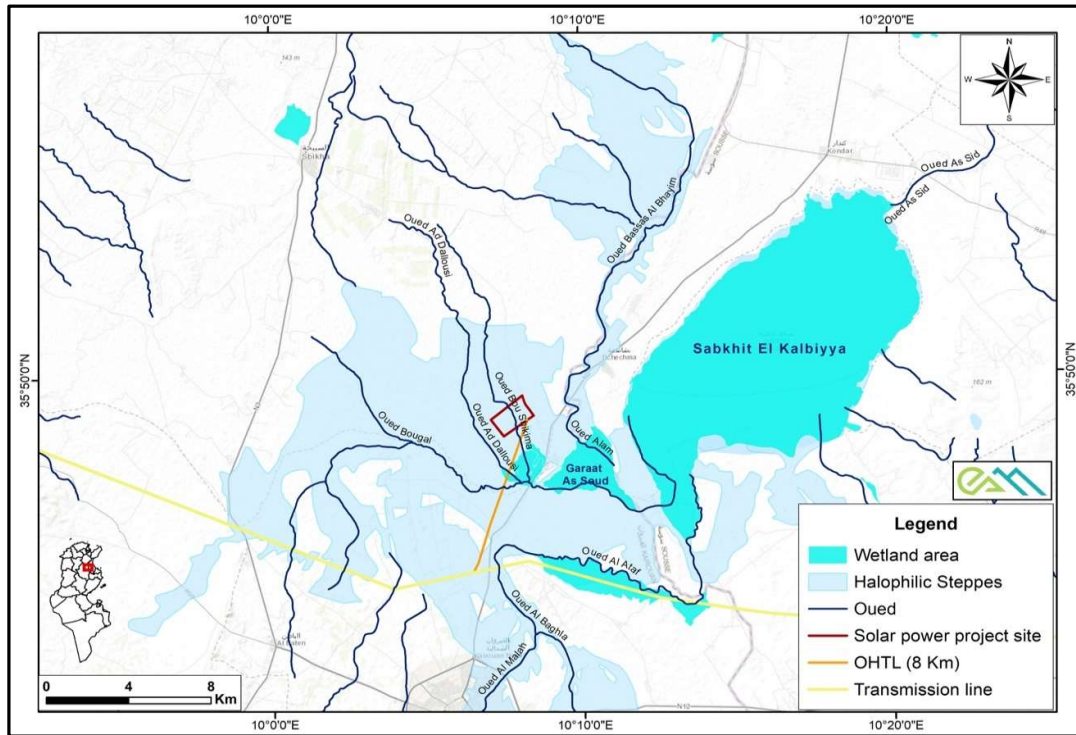


**Figure 7.9 - Location of existing dikes within the solar plant site**



**Photos of existing dikes within the solar plant site**

It's worth mentioning the presence of a culvert is almost 100 m out of the project site and installed beneath the road RR-171 along the project site.



**Figure 7.10 - Hydrographic Network in the Study Area**

The site of Metbasta photovoltaic power plant is flat with a gentle general slope (<1%) towards the South and the East. The low surface runoffs are due to the morphometric and physiographic characteristics of the catchment area, which are not favorable to runoff (low slope downstream, scattered, and halophytic vegetation cover, etc.). The nature of the vegetation cover and the insufficient slopes result in runoff being lost in depressions. The project site is neither a wetland nor a Sabkha.



**Flooded Area within the Project Site**

Approximately 1 km south of the site is the natural depression of Metbasta which is a wetland classified as an Important Bird and Biodiversity Area (IBA) as discussed in further sections. The occasional heavy rainfall causes the water to stagnate for several days to several weeks. This was the case after the heavy rainfall of 05 and 06 September 2020 which exceeded 95 mm in two days (46.7 mm and 49.7 mm).



**Metbasta IBA Area**

Road infrastructures in the Study Area such as RR-171 regional road and Sbikha industrial zone are elevated at least 1 meter above the natural terrain.



**Bridge over Wadi Boughal**



**Culvert installed beneath the road along the project site**



**Elevated infrastructure within Sbikha industrial area**

It is worth noting that during the first quarter of 2021, important agricultural and hydraulic projects were carried out upstream of the power plant site. Considering the area affected (400 ha) and the dikes built, these changes will significantly modify the flow regime within the project area.



**Agricultural project and dikes upstream of the project site (1)**

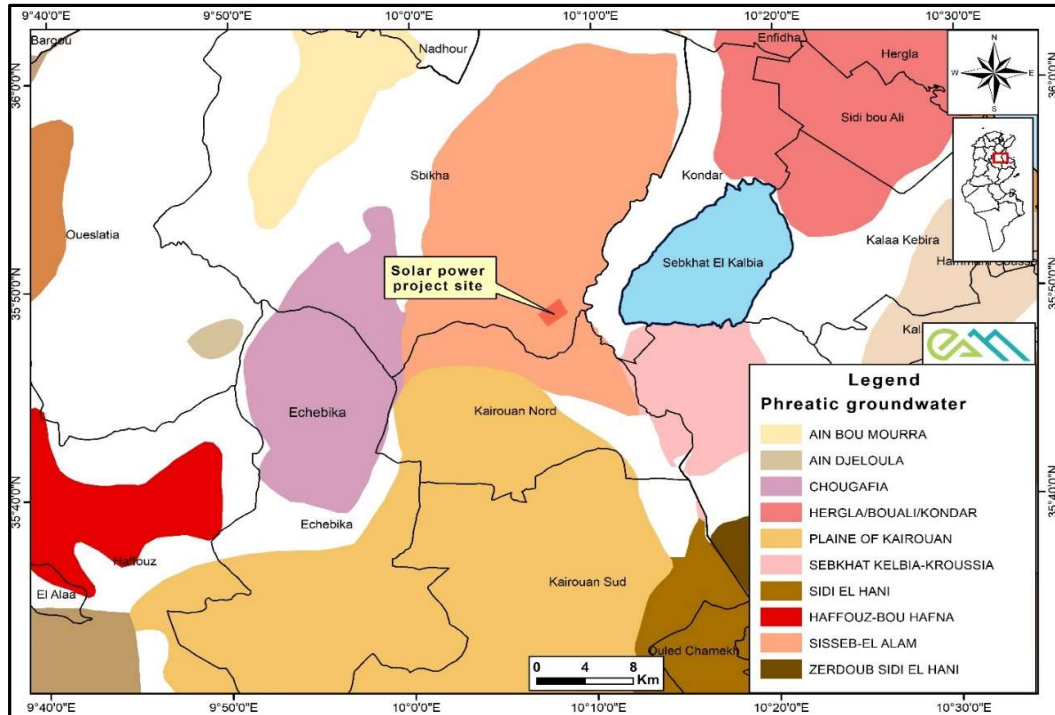


**Agricultural project and dikes upstream of the project site (2)**

The data collected from the CRDA of Kairouan confirm that plots of land located in the hydraulic upstream of the project area will be granted to young graduates for agricultural development projects to reduce unemployment in the Kairouan region.

### 7.2.5 Hydrogeology

The study area is part of the Sisseb-El Alem plain north of the Kairouan Plain. It is a plio-quaternary collapse basin formed by continental sedimentation comprising a detrital series of alternating sandy and clayey deposits over several hundred meters, within which there is a superficial permeable level where the water table flows and one or more permeable levels containing the deep groundwater. The groundwater resources of this plain consist of the phreatic groundwater and the deep groundwater of Sisseb-El Alem.



**Figure 7.11 - Phreatic Groundwater Map in the Study Area**

#### *(i) Phreatic Groundwater of Sisseb - El Alem*

The phreatic groundwater of Sisseb - El Alem is housed in lenses of sand and gravel. The resources and exploitation of this water table are estimated at 11 and 11.2 million m<sup>3</sup> per year respectively (DGRE, 2015). The capture of this aquifer whose salinity varies from 1.5 to 3 g per liter is done by 1536 surface wells including 927 equipped wells (with pumps). The overexploitation of this water table and the random fluctuations in rainfall have caused the drying up of several wells in the region.

Based on the geotechnical campaign results performed during May 2019 at the project site, the surface water level is 3 m deep.

#### *(ii) Deep Groundwater of Sisseb-El Alem*

The deep groundwater of Sisseb-El Alem is constituted by the Plio-Quaternary filling of

Sisseb, the Miocene sands of Sisseb and the Oligocene sandstone of El Alem.

The filling bedrock deepens from north to south. As a result, water wells at Bled Sisseb generally capture levels between 50 and 150 m deep, while at El Alem, the catchments are already between 200 and 360 m.

The extension of the deep groundwater zone is estimated at 200 km<sup>2</sup>, that of the recharge zone at 400 km<sup>2</sup>, the whole reservoir totals 600 km<sup>2</sup>.

The system is fed mainly in the North, from the sandstone syncline of Saouaf at depth, by rain infiltration on the permeable alluvium north of Nadhour and by flood infiltration from the wadis Khrioua, Sahel, Khetem.

In the west of the plain, the inflow of the Nebhana floods has decreased since the construction of the dam, but since 1969 the base flow of the dam at the Roman Bridge has become important again, about 3 million m<sup>3</sup> per year. Another source of inflow to the West is the sandstone monoclinical of Sbikha whose permeability makes it the drain of the surrounding formations located upstream. Finally, from the East, the effective infiltration on the Draâ Souatir contributes to recharge the system. Similarly, the concentration of surface wells in the alluvial deposits at the foot of the Fadheloun mountains seems to indicate a significant supply from this sector: local inputs or a zone of favorable permeability draining flows from further away.

The exploitation of the Sisseb-El Alem aquifer system is estimated at 18 million m<sup>3</sup> per year for renewable resources of 16.27 million m<sup>3</sup> per year, i.e. an overexploitation of 110%.

The salinity of the groundwater varies from north to south from 1.5 to 2 g per litre. The main uses of this water are agriculture (90%) and drinking water supply by SONEDE (7%). Water will be supplied exclusively by SONEDE. No groundwater wells will be foreseen for the PV project during the construction and operation phases.

It should be noted that no treatment is required for the water supplied by SONEDE.

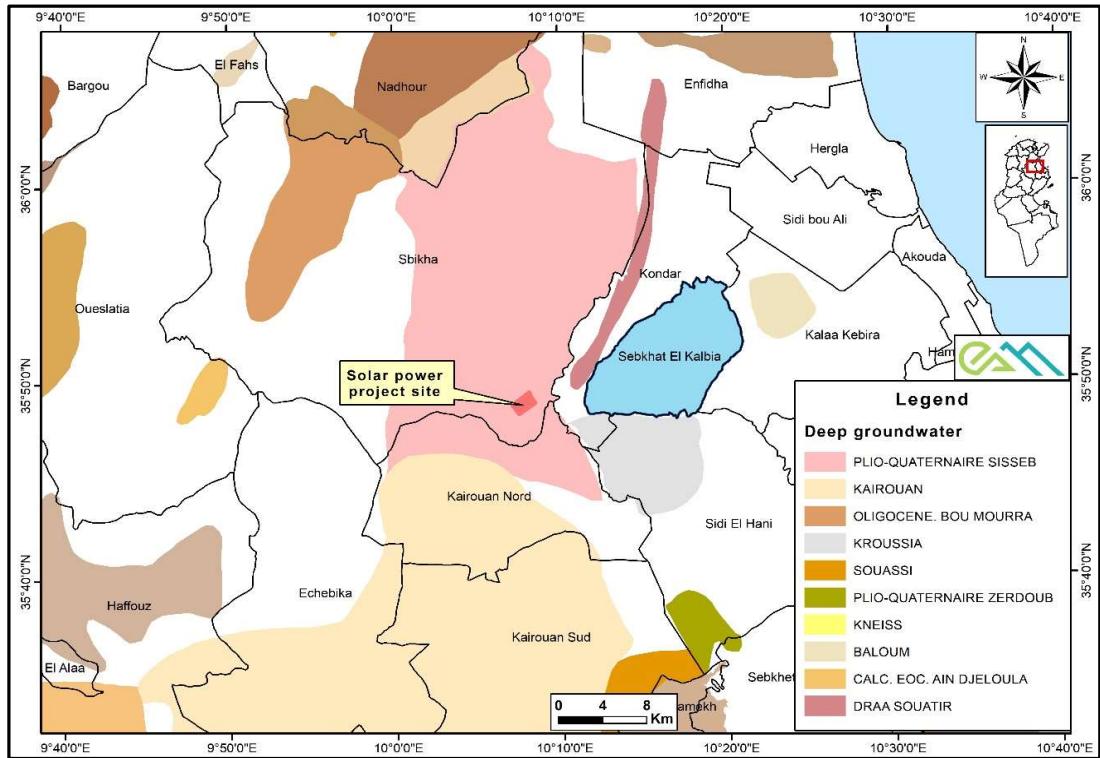


Figure 7.12 - Deep Groundwater Map in the Study Area

### 7.2.6 Climatology

The Kairouan region belongs to the upper arid bioclimatic stage with a temperate winter (see Figure 7.13 - Bioclimatic Map of the Study Area).

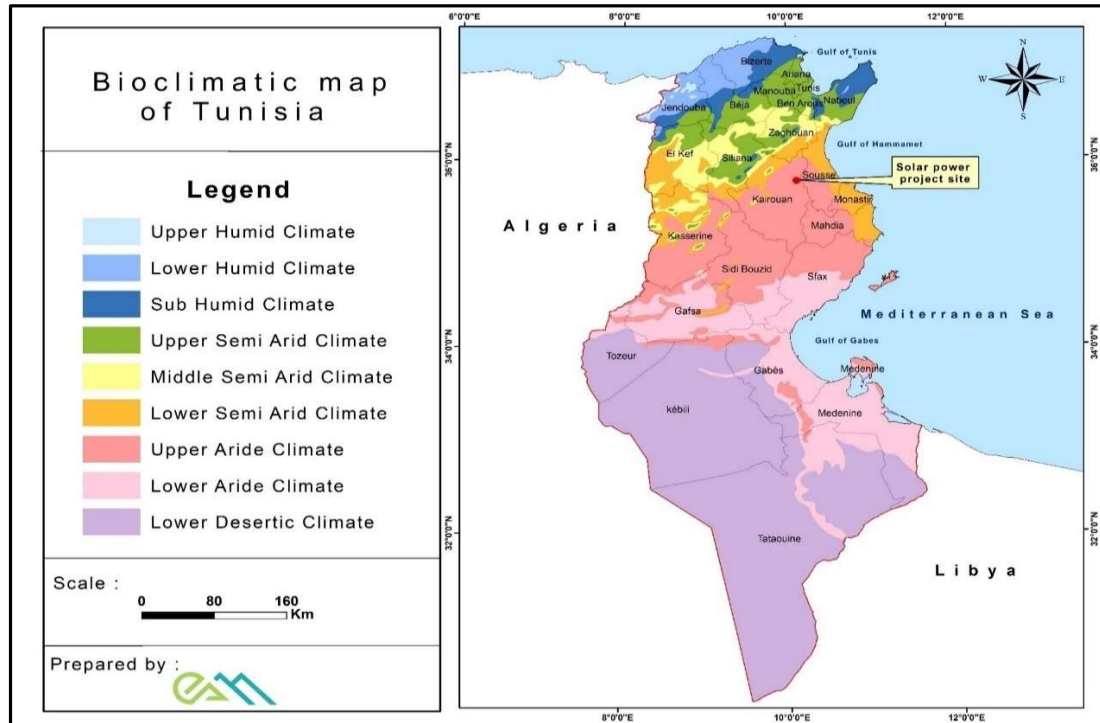
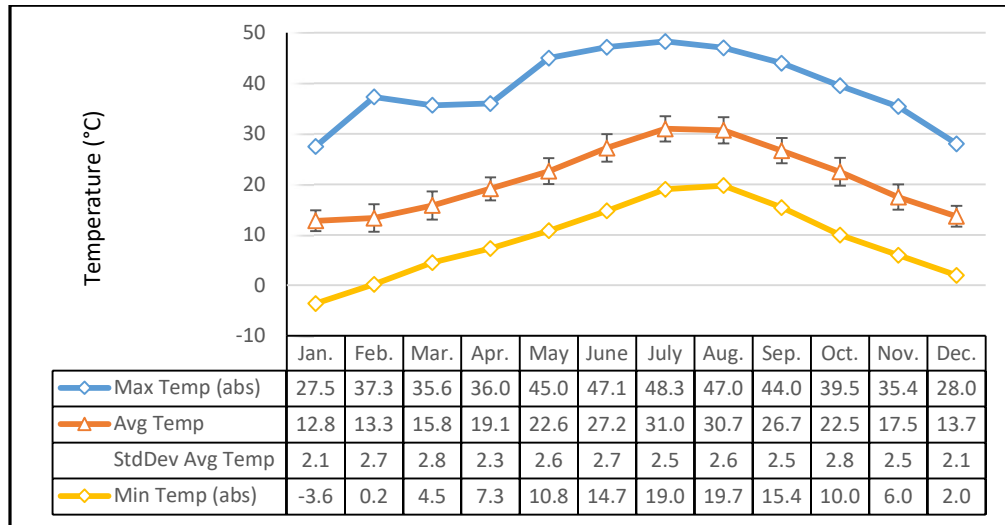


Figure 7.13 - Bioclimatic Map of the Study Area

**(i) Temperature**

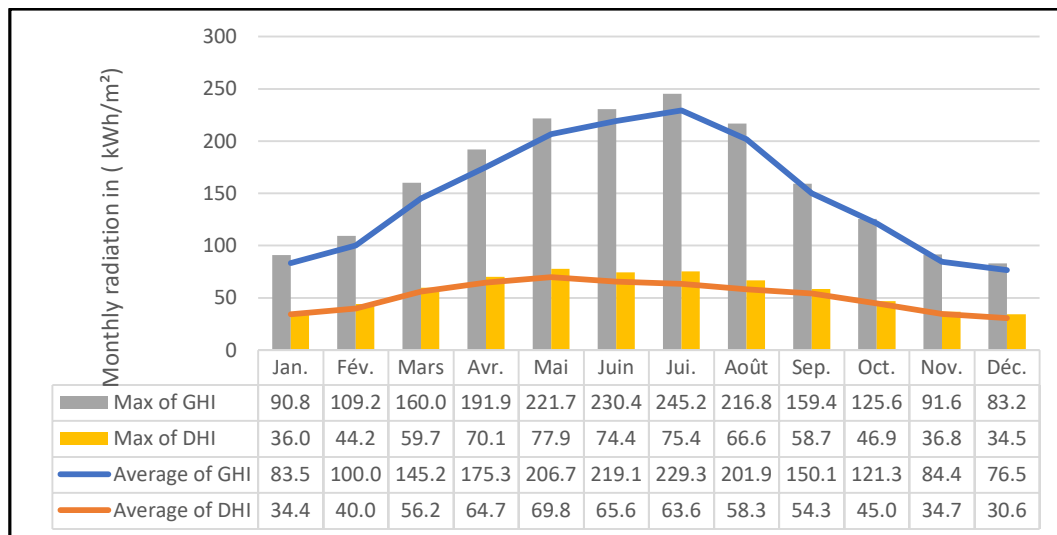
Average annual temperatures in the study area are around 21.1°C with variations of 7 to 9°C depending on the season. However, some minima of around -3.6°C and maxima of around 48.3°C are recorded. The figure below summarizes the monthly temperatures recorded in the study area during the period from 2010 to 2019.



**Figure 7.14** - Minimum, average and maximum monthly temperatures recorded in the study area

**(ii) Irradiance**

The monthly variation of Global Horizontal Irradiance (GHI) and Diffuse Horizontal Irradiance (DHI) in the Kairouan region over the 2010-2019 period are shown in Figure 7.15.

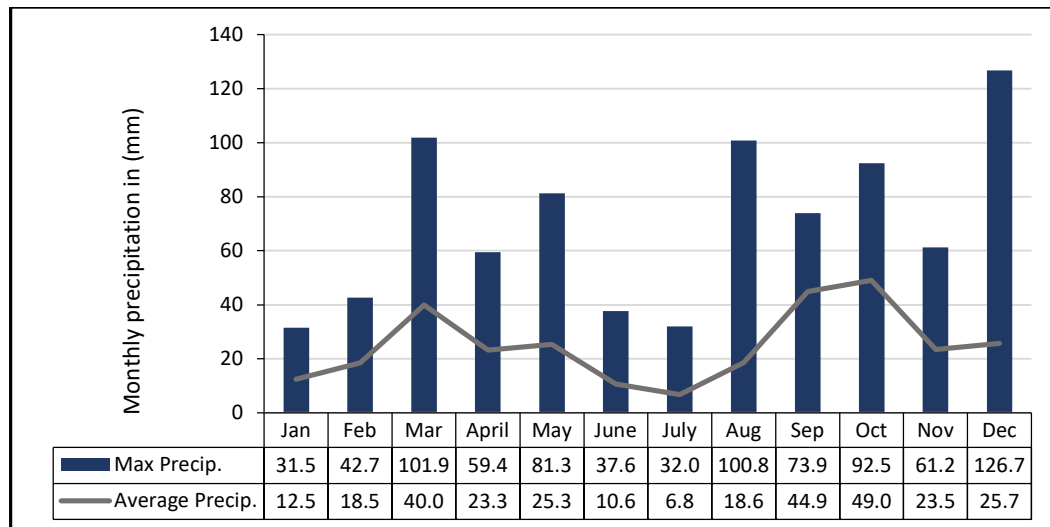


**Figure 7.15** - Monthly average of GHI (Global Horizontal Irradiance) and DHI (Diffuse Horizontal Irradiance)

The monthly average GHI (Global Solar Radiation) between 2010 and 2019 ranges from 76.5 kWh/m<sup>2</sup> for the month of December to 229.3 kWh/m<sup>2</sup> in July, with an annual average of 1,793 kWh/m<sup>2</sup> per year.

**(iii) Pluviometry**

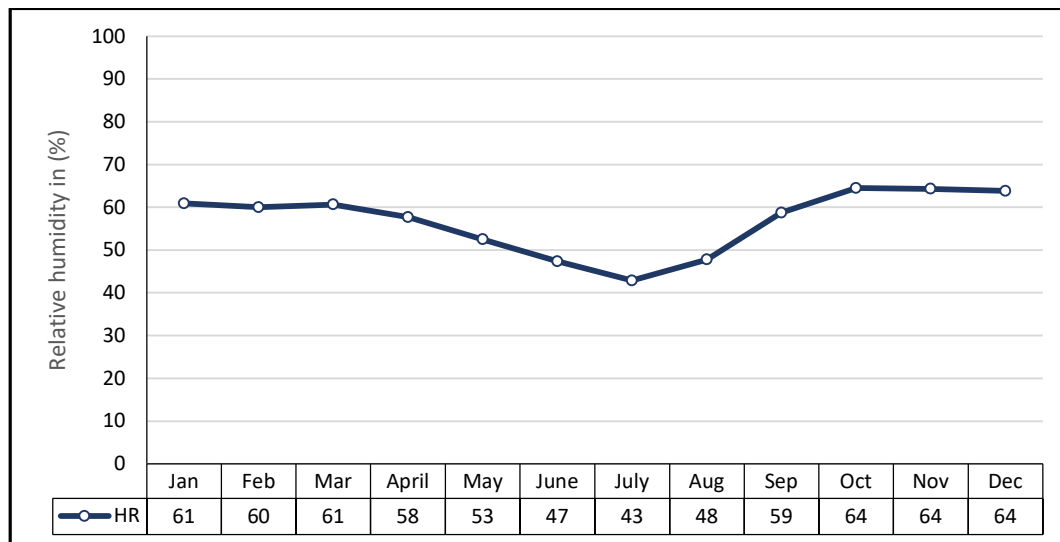
The average annual rainfall recorded in the study area over the last few years (2010 - 2019) is 298.7 mm. The following figure shows the monthly rainfall recorded in the study area.



**Figure 7.16** - Average and maximum monthly rainfall recorded in the study area

**(iv) Relative Humidity**

Relative humidity in the study area varies from 43% to 64%. Details of the monthly averages recorded during the 2010 to 2019 period are shown in the following figure.



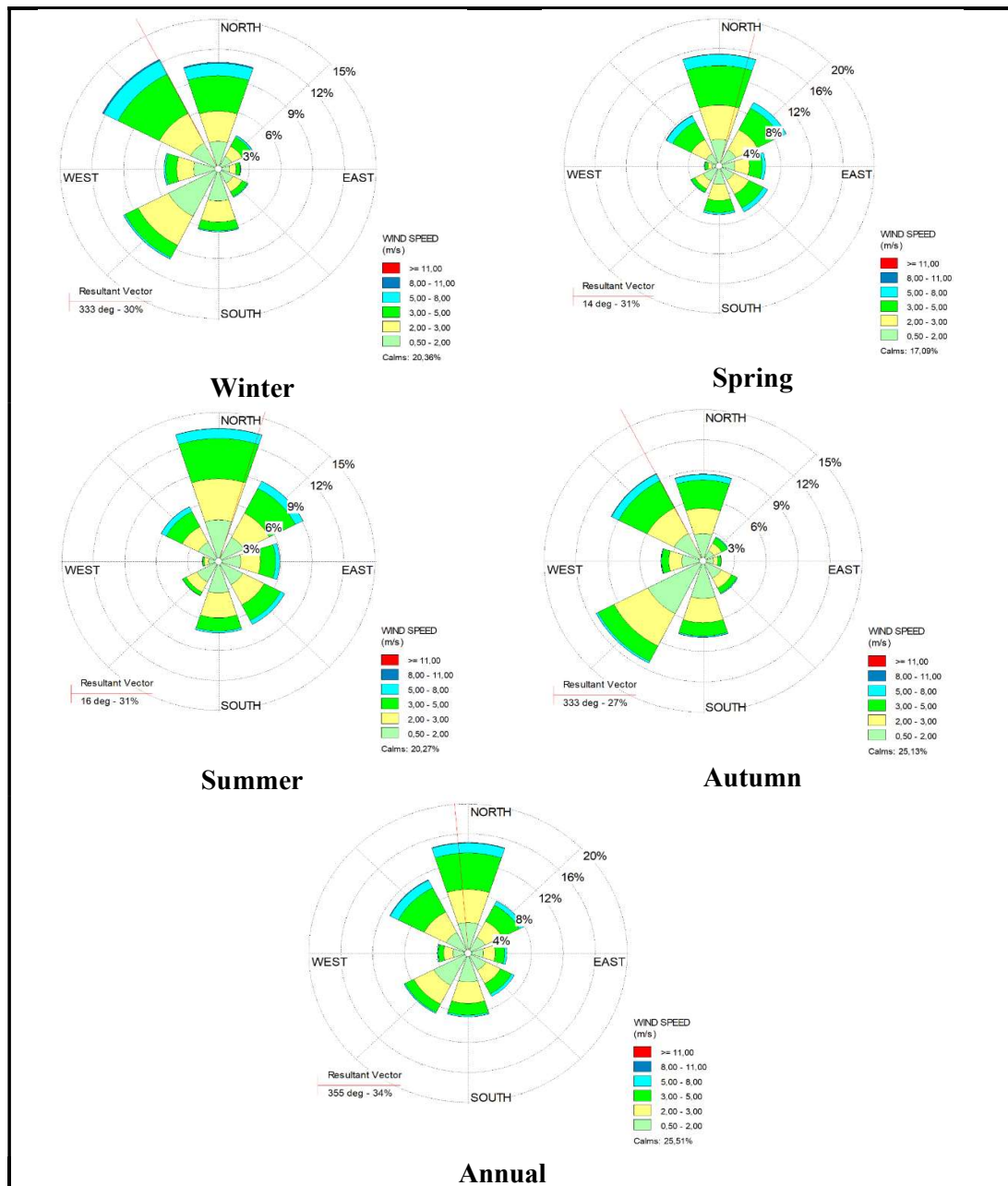
**Figure 7.17** - Average relative humidity recorded in the study area

**(v) Winds**

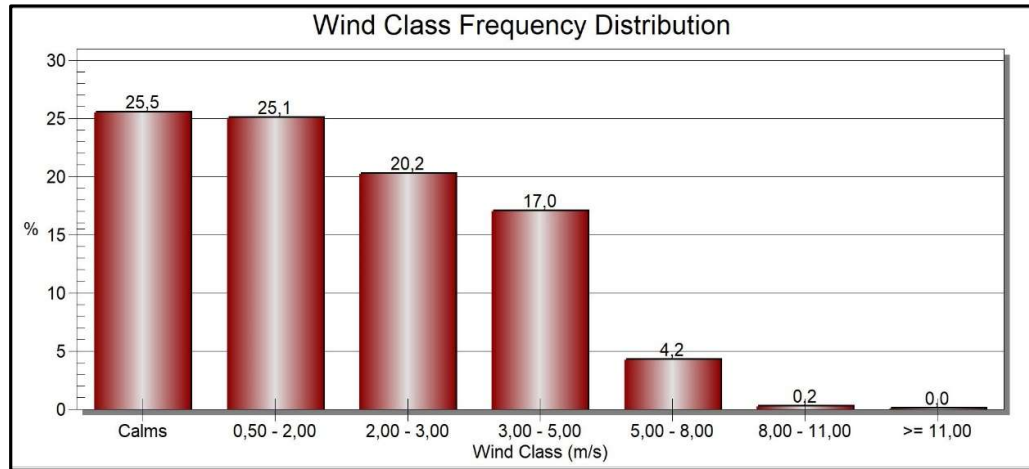
Roses of seasonal and annual wind frequencies at the Kairouan station during the 1990-2020 period are reported in figure 7.18.

The dominant winds are generally from the North and Southwest sectors, distributed by season as follows:

- In winter, dominant winds are from the northwest sector with southwest trends;
- In spring and summer, these winds are from the North sector;
- In autumn, they are from the Southwest and Northwest sectors.



**Figure 7.18 - Seasonal and Annual Wind Frequency Roses at the Kairouan Station**



**Figure 7.19** - Frequency Distribution of Winds recorded in the Study Area (1990-2020)

**Table 7.1** - Annual and seasonal wind direction in (%) at the Kairouan station (1990-2020)

N°	Directions	Winter	Spring	Summer	Autumn	Annual
1	N	10.7	15.2	13.4	8.6	14.8
2	NE	3.8	9.7	9.1	2.7	7.9
3	E	2.2	6	5.9	1.8	4.9
4	SE	3.2	7.1	7.1	3.7	6.6
5	S	6.3	6.6	7.2	7.6	8.6
6	SW	10.1	4.2	3.9	11.3	9.1
7	W	5.1	1.9	1.6	4	3.9
8	NW	12.3	7.7	6.2	9.7	11
9	Sub-Total	53.8	58.4	54.4	49.5	66.7
10	Calms	20.4	17.1	20.3	25.1	25.5
11	Missing/Incomplete	25.8	24.5	25.3	25.4	7.8
12	Total	100	100	100	100	100

**(vi) Seismicity**

Based on the seismotectonic map of Tunisia, the study area is characterized by a seismic activity with low frequency of occurrence since it is located in a zone of seismic intensity between II and IV according to the Medvedev-Sponheuer-Karnik "MSK" scale (see Figure 7.20 - Seismicity Map of the Study Area). This classification leads to mention that the project site presents a low risk of occurrence of seismic activity.

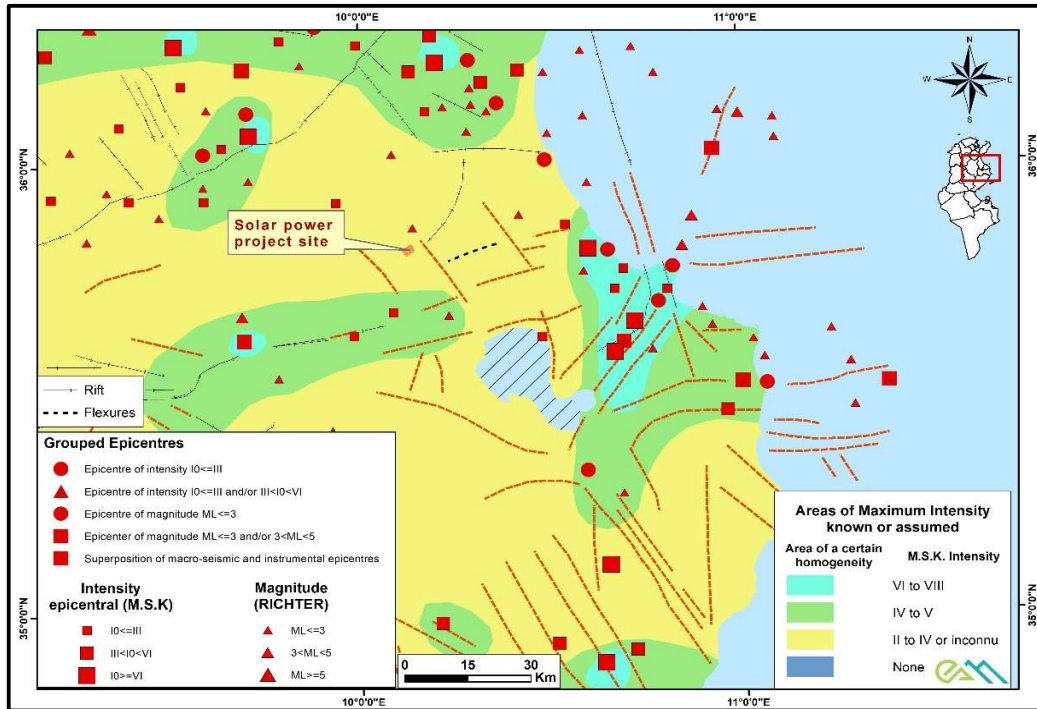


Figure 7.20 - Seismicity Map of the Study Area

**(vii) Lightning**

The site is in an area that can be impacted by thunderstorms. With an average of six (6) atmospheric discharges per km<sup>2</sup> and per year, the risk of lightning strikes at the photovoltaic installations is therefore medium.

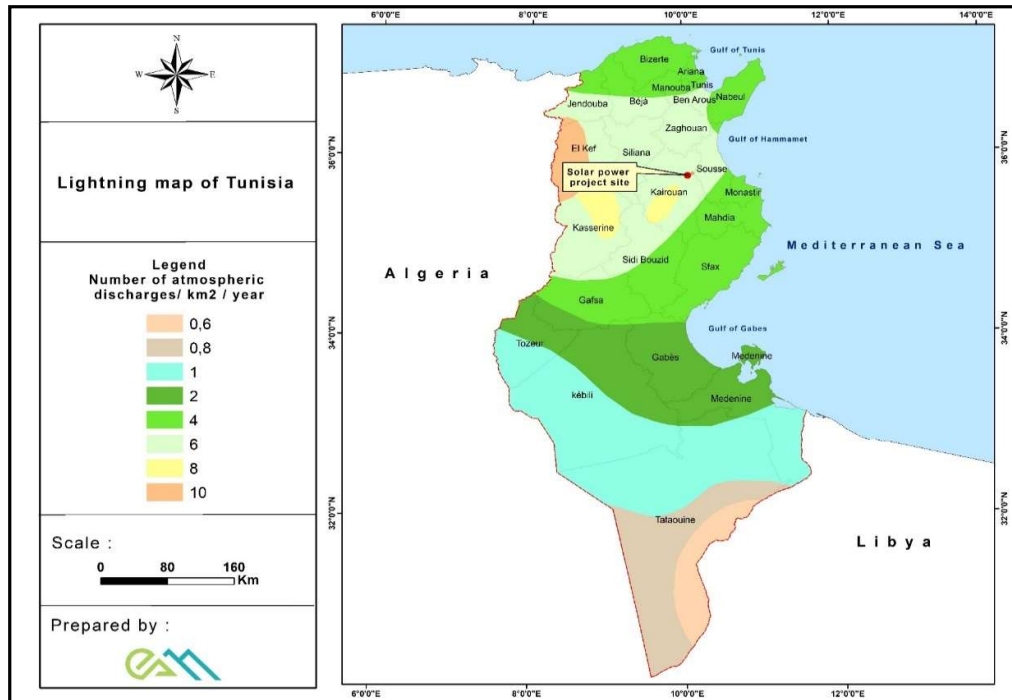
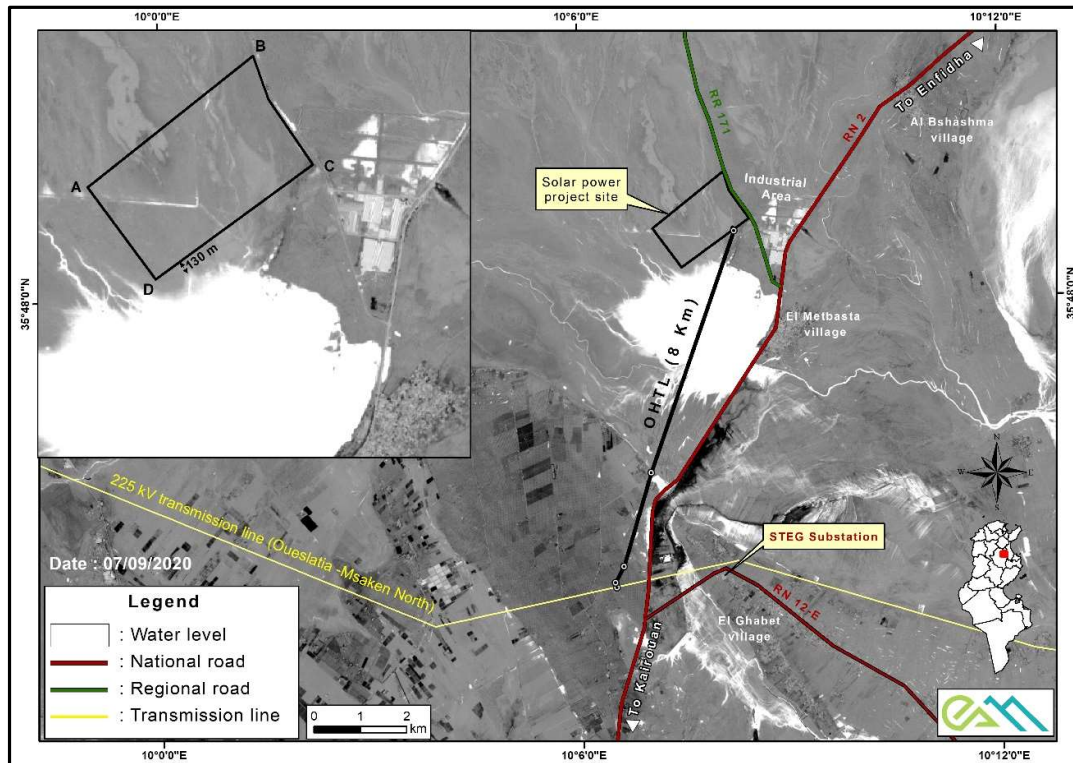


Figure 7.21 - Distribution of Atmospheric Discharges

**(viii) Climate change / Flooding risk**

Many factors can go into the making of a flood in the project area including weather events such as heavy or prolonged rains previously observed in the area. More and more, flooding factors are also linked to climate change. These quick-rising floods are most often caused by heavy rains over a short period (usually six hours or less). In the project area, low-lying areas with poor drainage are particularly vulnerable to flash floods causing the risks to increase. The sudden overflow of water due to a debris obstructing the unique natural rainwater outfall at the bridge over Oued Boughal downstream the project area may cause water level to increase at the southern part of the site. The NDWI: Normalized Difference Water Index was calculated for the extraction of water features based on Sentinel 2 multi-spectral high-resolution satellite imagery dated 7 September 2020. The imagery was taken following the heavy rainfall episode of 05 and 06 September 2020 which exceeded 95 mm in two days (46.7 mm and 49.7 mm). The water level was recorded at less than 130 m of the southern project area. (see. Figure 7.22 - NDWI index dated 07 September 2020).



**Figure 7.22 - NDWI index dated 07 September 2020**

It is recommended to perform a climate change risk assessment over the project area and implement flood scenario to predict and quantify future flood risk changes. Projected flood hazard (extent and water level rise) in addition to potential affected areas can be modeled under current and for future these scenarios. The major challenge in flood hazard and risk

assessment is to understand the uncertainties that exist at the solar plant, and to decide how to incorporate these uncertainties into subsequent risk management decisions.

***(ix) Climate risk***

Tunisia is highly vulnerable to natural hazards and climate change, the effects of which are felt in key sectors of the economy. Preliminary findings from a World Bank National Disaster Risk Profile show that floods result in an average annual loss (AAL) of \$40 million (or 0.1 percent of Tunisia's GDP in 2018), while the maximum probable loss (MPL) due to earthquakes over a 250-year return period is estimated at \$882 million (or 2.2 percent of Tunisia's GDP in 2018). Losses from 2011 to 2018 due to floods, droughts, and fires were estimated at \$541.3 million, and floods and earthquakes are estimated to account for 94% of natural disaster-related deaths.

The 20th century saw an increase in the number of hot days and an increase in the average annual temperature of nearly 1.4°C. The average annual temperature is expected to continue to rise by 2050, with the formation of a sensitive area at the border with Algeria where the change in local summer temperature can be as much as +5.3 °C. This same time horizon will see the average annual number of hot days increase (especially in July, August and September), heat waves become longer and the annual number of cool days decrease (increase in the number of hot nights).

Over the last few decades, Tunisia has experienced a significant decrease in the amount of rainfall collected in winter and early spring. Records of observations made between 1997 and 2008 indicate more than 330 dry days per year (rainfall less than 1 mm). Since 1950, there has been a 5% decrease in annual rainfall per decade in the north of the country, while heavy rainfall has become more frequent. By 2050, a greater reduction in rainfall and an increase in the frequency of heavy rainfall is expected, particularly in the north. Somewhat less is known about rainfall in the south.

Nearly two-thirds of the country's regions are semi-arid to arid and subject to frequent drought. Since 1907, the country has experienced more than 25 dry years, with the most significant being between 1999 and 2002. Increasingly high temperatures combined with declining rainfall will likely reduce water resources by 2050. Projections show a dry trend across the region, particularly along the Mediterranean coast, due to decreases in summer rainfall. North Africa (including Tunisia) is particularly prone to flooding, which is expected to become more frequent, more intense and longer lasting. Droughts are more frequent in summer than in winter.

Each year since 1992, the Mediterranean Sea level has risen by an average of 3.1 mm, although older records show significant local variability. The sea level could rise by 3 cm to 61 cm by 2050 depending on thermal expansion and water salinity. Given the particularities of coastal areas, 1% to 3% of the land would be affected by a one-meter rise in sea level.

Climate change is at the top of the political and economic priorities of the country. Tunisia submitted its Nationally Determined Contribution (NDC) to the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) on September 16, 2015.

Following Tunisia's ratification of the Paris Agreement on October 17, 2016, and the entry into force of the Agreement on November 4, 2016, the NDC had become the Nationally Determined Contribution (NDC). In its 2021 version, the updated NDC raises Tunisia's greenhouse gas mitigation ambitions, through an increase in the national carbon intensity reduction target to 45% by 2030, compared to its 2010 level.

Furthermore, it is expected that the limited national energy resources will favor the development of renewable energy sources and make their use more efficient, in line with the new employment strategy to reduce youth unemployment. Tunisia is also the first country in the North Africa and Middle East (MENA) region to recognize climate change in its new Constitution: "The State guarantees the right to a healthy and balanced environment and participation in climate security. The Ministry of Agriculture, Hydraulic Resources and Fisheries (MARHP), in coordination with the Ministry of Environment (ME) and with the support of the Food and Agriculture Organization of the United Nations (FAO), started in 2018 the preparation of the second chapter of the National Adaptation Plan, related to food security, applying the nexus approach (BPEH, 2019).

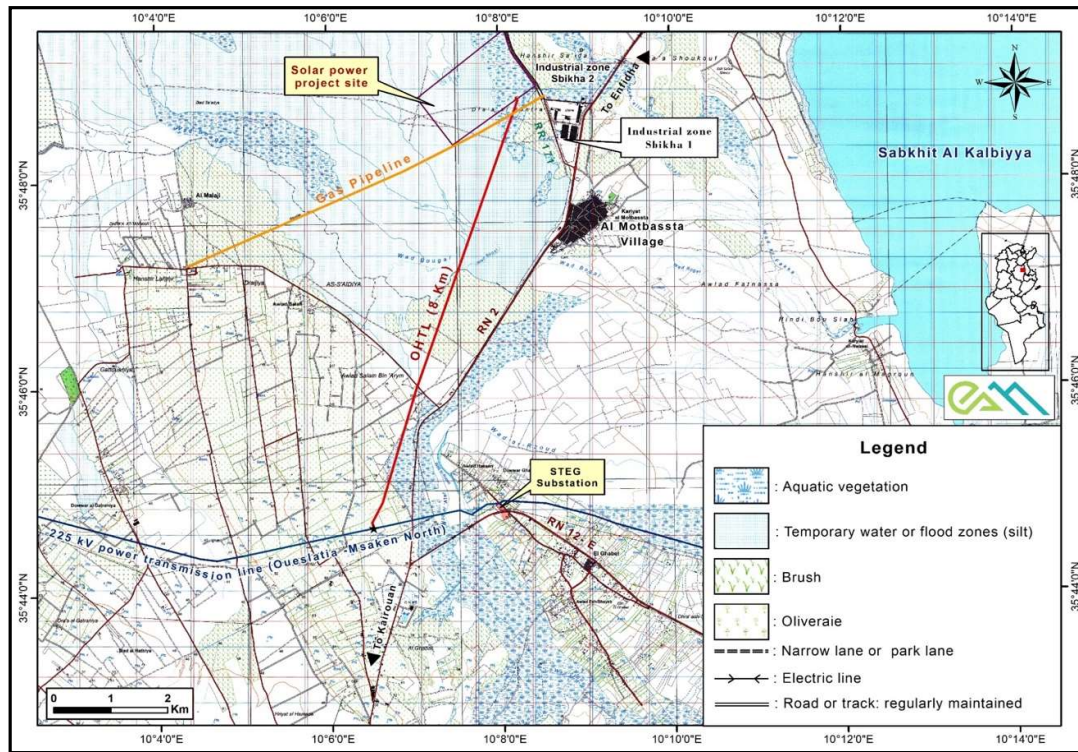
***(ix) Fire risk***

The risks of fire of natural origin are very low due to the low level of vegetation around the site.

***(x) Technological risk***

The gas pipeline allows the connection of the industrial zones to the natural gas distribution network of the STEG. This gas pipeline is marked on the surface of the ground by flags to identify the existing underground network. The gas pipeline (diameter of 8 inch) is in steel with natural gas under a pressure of 20 bars.

The solar power plant will be located close to a gas pipeline. The closest point is 20 m on the south-east side of the site boundary (see. Figure 7.23 - Location map of the gas pipeline).



**Figure 7.23 - Location map of the gas pipeline**

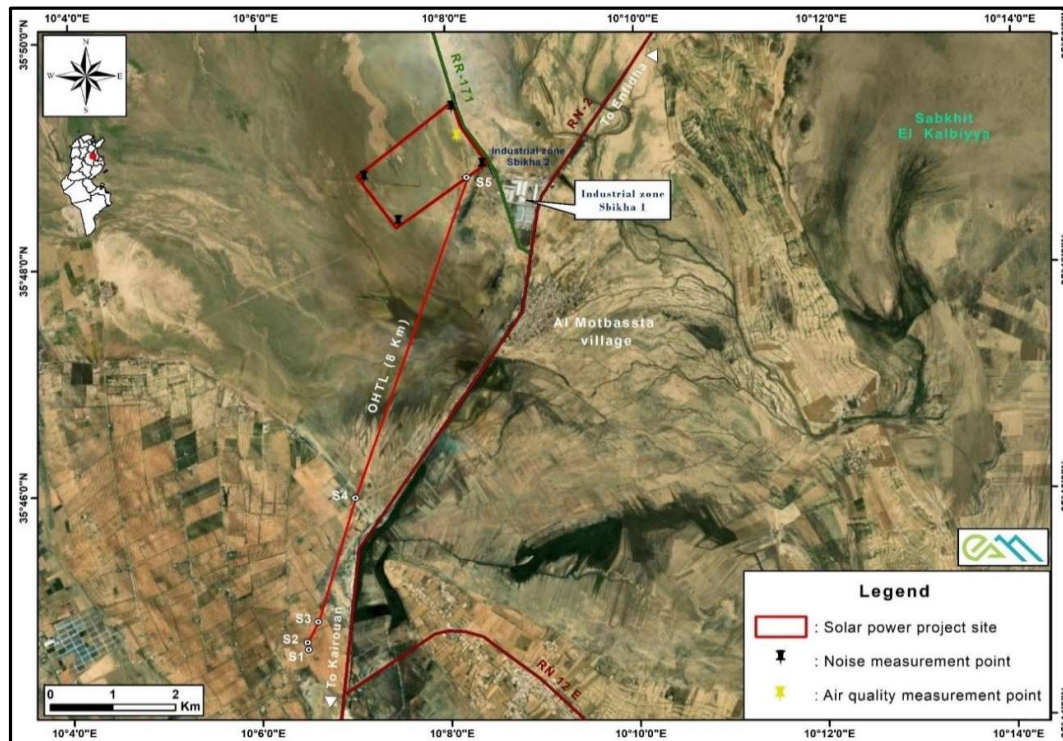
### 7.2.7 Ambient air quality and noise level

Ambient air quality and noise baseline was assessed based on available secondary data in the area and an air quality and noise measurements program.

Secondary data was mainly based on the "IQair" platform which provides images recorded by the AirVisual Map, the only real-time worldwide air quality map available online. Using artificial intelligence (AI), AirVisual Map combines data from public government air monitoring stations, satellite data and non-governmental community contributors, presenting a live model of pollution airflows across the world. Parameters modeled are PM<sub>10</sub> and PM<sub>2.5</sub>, which are considered a good gauge of air quality. The pollution is represented by vivid colors representing the different categories on the U.S. Air Quality Index. (Source: <https://www.iqair.com/>).

The monitoring program included 1 point for air quality and 4 points for noise measurements within the Project site).

Locations of these points are mentioned in the figure below.



**Figure 7.24 - Air quality and noise measurement point locations**

The key factors for selection of the air quality measurement point is mainly the direction of the dominant wind blowing from Northwest (based on wind direction during measurement period (October 12, 2020)).

For the selection of noise measurement points, four (4) points were considered which are located within the summits of the project site boundaries. Two points on the eastern limit of the project site are closest to both the regional road RR-171 and the industrial area of Sbkha where emissions can be recorded. The two other points were selected within the western limit of the project site to have an idea about the background noise level within the project site boundaries.

The parameters monitored are those that are expected to be affected by the project’s development to include Total Suspended Particulates PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub>, NO<sub>x</sub> and noise pressure levels.

The air quality and noise report is presented in Annex X. (1st campaign 10/2020: one air quality measurement point 2nd campaign 12/2020: four noise level measurements).

**(i) Ambient air quality**

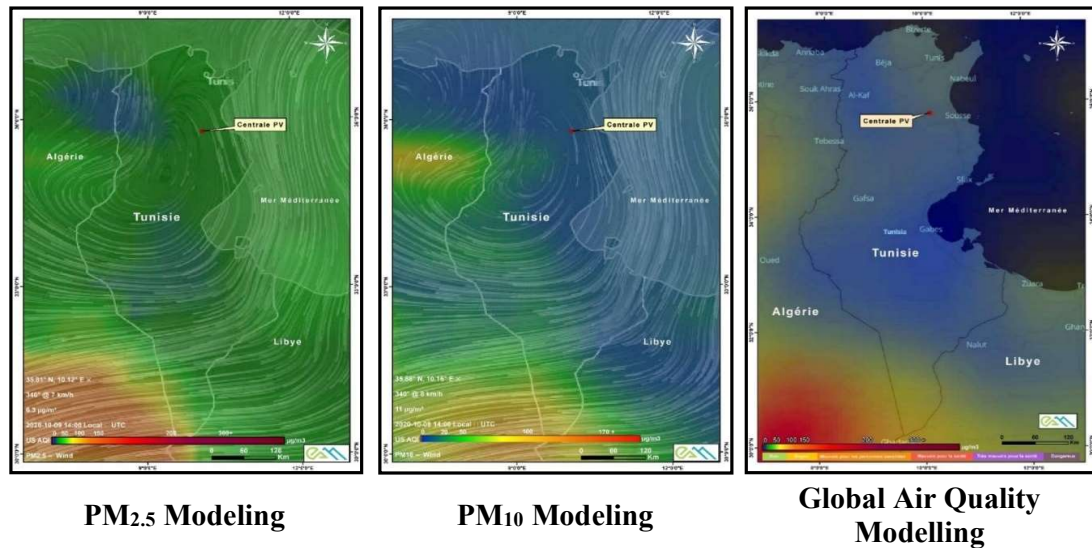
This section presents the ambient air quality at the project site and its surroundings.

The surroundings of the site are largely agricultural/rural with the presence of two industrial areas (i) Industrial zone Sbkha 1 located at 500 m from the project site and (ii)

Industrial zone Sbukha 2 (planned development) located at 100 m from the project site. There are no significant air emission source as industrial activities mainly include food, shoe and metal industries (source: <http://gmsgbukha.tn/fr/societes/>). Industrial activities are not expected to be generated pollutants such as NO<sub>x</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>, SO<sub>2</sub>, CO and heavy metals.

Regarding the atmospheric pollution from the road transport, the mainly pollutants released are NO<sub>x</sub>, CO, Benzene, VOC, PM<sub>10</sub> and SO<sub>2</sub>.

According to the data available on the "IQair" platform, the air quality around the project area is considered good (Source IQair site date 10/10/2020).



**Figure 7.25 - Global air quality around the project area**

On site air quality measurement was carried out on October 12<sup>th</sup>, 2020. The sampling methods used for this campaign are listed below:

- PM<sub>2.5</sub> and PM<sub>10</sub>: Omnidirectional sampling (under all wind directions) and precise counting of the desired particles;
- NO<sub>2</sub> and SO<sub>2</sub>:
  - Passive sampling by "Radiello" tubes;
  - Microporous polyethylene tube impregnated with triethanolamine (TEA)
  - Pollutants are adsorbed by the TEA in the form of ions, respectively nitrite and sulphate;
  - Nitrite ions are measured by visible spectrometry;
  - Sulphate ions are measured by ion chromatography.



**Figure 7.26** - Air quality measurement PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub>

The tables below show the analytical results of the air quality measurement campaign.

**Table 7.2** - PM<sub>2.5</sub> and PM<sub>10</sub> Measurements

Designation	Unit		PM10	PM 2.5
On-site measuring point	µg/m <sup>3</sup>	Medium	4.42	1.83
		Min	1	0
		Max	11	3
Guide values according to decree n°2018-447 of May 18, 2018	µg/m <sup>3</sup>		50	35
Margin of tolerance (2020)			10	5
Overall guide value (2020)			60	40
IFC Guidelines values (24 hours)	µg/m <sup>3</sup>		50	25

**Table 7.3** - NO<sub>2</sub> and SO<sub>2</sub> Measurements

Designation	Unit	NO <sub>2</sub>	SO <sub>2</sub>
On-site measuring point	µg/m <sup>3</sup>	1.07	1.40
Guide values according to decree n°2018-447 of May 18, 2018, Hourly Average	µg/m <sup>3</sup>	200	350
Margin of tolerance (2020)	µg/m <sup>3</sup>	30	30
IFC Guidelines values (1 h for NO <sub>2</sub> ; 10 min. for SO <sub>2</sub> )	µg/m <sup>3</sup>	200	500

The measurements for air quality monitoring are within the limits specified in the decree n°2018-447 of May 18, 2018, none of the monitored parameters exceeded the maximum allowable limits, this could be explained by the absence of heavy industries within Sbikha industrial zone. It should be noted that these standards are the more stringent with compared to IFC guidelines values and so are the ones applicable to the project.

Geographically, the measurement point is located N-NW/NW of the industrial area of Metbasta-1.

The prevailing winds in the region of Kairouan are from the North and North-West sectors with frequencies of occurrence of 14.8% and 11%, respectively.

For N-NW/NW winds, the downwind analysis at this station represents the air quality exiting the site and upwind of the Metbasta-1 industrial area.

For S-SE/SE winds, the analysis at this station, which is downwind of the Metbasta-1 industrial area, provides an idea of the air quality at the site entrance.

It should be pointed out that under normal operations there will be no continuous gaseous emissions from the operating areas.

**(ii) Noise**

Noise measurements were conducted in 4 stations, during the field mission of December 18<sup>th</sup>, 2020. The measurements were taken by means of sound level meter mounted on a tripod.



**Measurement station locations**

**Table 7.4 - Noise Measurements Results**

Designation	Average level Leq in dB(1)	Minimal level Lmin in dB(A)	Maximum level Lmax en dB(A)	Day thresholds* in dB(A)	Night thresholds* in dB(A)
Point n°1	49.68	39.70	67.80	65	55
Point n°2	50.09	39.40	70.70		
Point n°3	39.81	37.1	44.20		
Point n°4	41.26	37.6	49.7		

\*Day and Night thresholds are considered for predominantly commercial, industrial or agricultural zones according to Decree 22/08/2000 (the project site is considered as an industrial zone).

The results of noise measurement recorded at the four measurement points are in compliance with the levels specified within the Decree 22/08/2000 from the President of the Municipality and the Mayor of Tunis which prohibits (i) noise that may disturb the tranquility of citizens between 10 pm and 8 am throughout the year and from 1:00 pm to 5:00 pm in the summer; and ii) whether during the day or at night, noise disturbances resulting from motor vehicles within the entire municipal perimeter of Tunis.

It should be noted that these standards are the more stringent with compared to IFC Noise Level guidelines (One Hour  $L_{Aeq} = 70$  dBA) and so are the ones applicable to the project.

### 7.2.8 Landscape and Visual

As discussed earlier, the Project area in general can be characterized as being dominantly of wide and flat surfaces with no changes in topography. Typical views from the Project site towards the north, south, east and west are mainly limited to the open landscape and topography that is similar in classification as the Project sites. The only visible views from the Project site include the nearby highway and industrial Park located to the east. More importantly, there are no key and visible visual receptors to/from the Project site such as recreational activities, environmental reserves, remarkable historical or cultural sites, water courses or other natural structures normally seen as valuable by the human perception.

### 7.3 *Biological Environment*

The purpose of this section is to describe the biological conditions existing within the Project area. This baseline has been prepared through a combination of desk and field investigations.

In addition to the general descriptions, the baseline includes the results of the fieldwork observations from the various sections, with special focus on the Project site of Metbasta. The field surveys were carried out the 4<sup>th</sup> of September 2020 and the 9<sup>th</sup> of April 2021. During the field visits, a biologist, a bird expert, and an insect specialist identified and recorded the species present (flora and fauna including birds and invertebrates) and their status conservation, evaluated and defined the habitats and identified any areas of special significance or relevant environmental features.

The summary of survey observations and results of the ecological findings are presented within this section. The detailed reports on biodiversity, birds including autumn and spring surveys, and invertebrates were provided within Annex XI.

Also, the current section provides a summary of the habitats, flora, and fauna findings from The Project site and its surrounding, including an evaluation of the ecological sensitivity of each site. This section is supported by detailed habitat map.

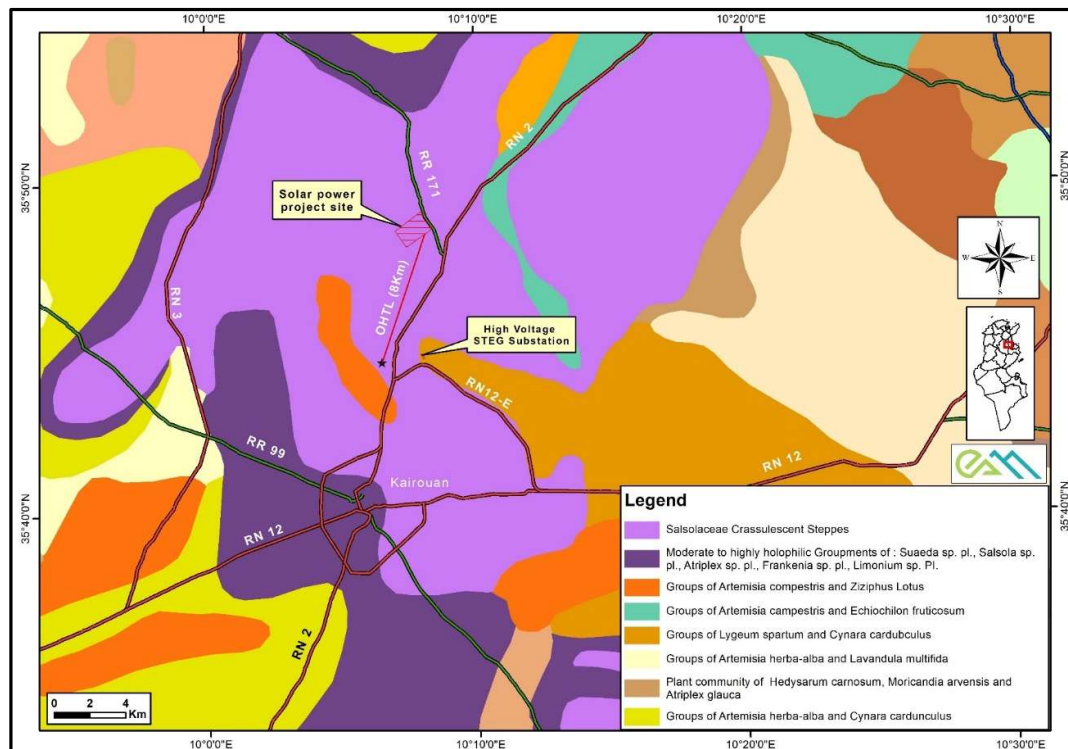
#### 7.3.1 Flora

The vegetation of the project site is colonized by the flora of the arid steppe of Tunisia. This is a steppe based on halophilic to salsolaceous species (Figure 7.27 - hytoecological Map of the Study Area), whose seasonal distribution is illustrated as follows:

- *During the dry season*, the vegetation is exclusively composed of woody halophytes that are not eaten;
- *With the autumn rainfall*, we see therophytes germinating especially in and near the

woody halophyte tufts;

- *In winter*, the development of the annual vegetation, where the plant cover reaches very high values during the spring season;
- *In summer*, and after the drying up of the therophytes, the biological spectrum will once again include only the chamephytes, or low woody halophytes, which are only valued by the camel.



**Figure 7.27 - Phytocological Map in the Study area (source: EAM, 2021)**

Note (\*): This figure is indicative of the overall habitat type distribution based on the main geomorphological units. This figure is not intended as an exhaustive /detailed habitat distribution map.

Furthermore, based on the phytocological map of Tunisia (Le Houérou 1969), the vegetation of Metbasta PV plant site corresponds to association N° 130, composed of four species: *Arthrocnemum macrostachyum*, *Salsola tetrandra*, *Halocnemum strobilaceum* & *Halopeplis amplexicaulis*.

The presence of these species was confirmed by the site visit and the biological report provided. Below are presented the main plant species identified (i) at the project site, (ii) at its edge (road linking Sbikha to Kairouan) and (iii) at the nearby (IBA) sites.

**At the Project site**

In accordance with the above, the biological report identified perennial plant species common to several locations in Tunisia. These are presented in the following table.

**Table 7.5** - List of the main perennial plant species encountered on the study site

Scientific name	Plant family	Conservation Status (IUCN 2022)*	Abundance in Tunisia
<i>Salsola tetrandra</i>	<i>Chenopodiaceae</i>	According to the list of protected species, none of these species has a special conservation status.	Very Abundant
<i>Arthrocnemum acrostachyum</i>	<i>Chenopodiaceae</i>		
<i>Halocnemum strobilaceum</i>	<i>Chenopodiaceae</i>		
<i>Halopeplis amlexicaulis</i>	<i>Chenopodiaceae</i>		
<i>Atriplex halimus</i>	<i>Chenopodiaceae</i>		
<i>Suaeda logifolia</i>	<i>Chenopodiaceae</i>		
<i>Tamaris africana</i>	<i>Tamaricaceae</i>		
<i>Aeluropus littoralis</i>	<i>Poaceae</i>		
<i>Casuarina glauca</i> (introduite)	<i>Casuarinaceae</i>		

\*The same status as 2019 because the review period (between 2019 and 2022) is very short.

### At the edge of the site

At the edge of the site, near the adjacent road linking Sbikha to Kairouan, a diverse range of species has been identified. As this biotope bordering the road is highly disturbed, the plant species present have a variable ecology. Introduced taxa, nitratophilic taxa, invasive taxa, perennial taxa, and annuals can be found there.

The list of the main species identified is presented in the following table.

**Table 7.6** - List of the main plant species encountered at the edge of the site

Scientific name	Plant family	Conservation Status (IUCN 2022)*	Abundance in Tunisia
<i>Salsola tetrandra</i>	<i>Chenopodiaceae</i>	Not endangered	Very Abundant
<i>Suaeda longifolia</i>	<i>Chenopodiaceae</i>	Not endangered	Very Abundant
<i>Aeluropus littoralis</i>	<i>Poaceae</i>	Not endangered	Very Abundant
<i>Cynodon dactylon</i>	<i>Poaceae</i>	Not endangered	Very Abundant
<i>Asteriscus maritimus</i>	<i>Asteraceae</i>	Not endangered	Very Abundant
<i>Atractylis carduus</i>	<i>Asteraceae</i>	Not endangered	Very Abundant
<i>Eryngium tricuspdatum</i>	<i>Apiaceae</i>	Not endangered	Very Abundant
<i>Polygonum equisetiforme</i>	<i>Polygonaceae</i>	-	Very Abundant
<i>Solanum elagnifolium</i>	<i>Solanaceae</i>	Invasive specie	Invasive species**
<i>Scilla carnosa</i>	<i>Fabaceae</i>	Not endangered	Abundant
<i>Eucalyptus camaldulensis</i>	<i>Tamaricaceae</i>	Introduced specie	Very Abundant

\*The same status as 2019 because the review period (between 2019 and 2022) is very short.

\*\* *Solanum elagnifolium* is classified as invasive species but very abundant in the whole territory of Tunisia and no national regulation for invasive species is in force.

Photos taken of some plant species encountered at the project site and its surroundings are presented below:



*Salsola tetrandra*



*Salsola tetrandra*



*Arthrocnemum macrostachyum*



*Halocnemum strobilaceum*



*Suaeda longifolia*



*Lycium europaeum*

**Photos of some plant species encountered at the project site and its surroundings**

It's worth mentioning that *Stipa tenacissima* which is classified as Vulnerable in the IUCN Red List, is known to be present within mountain environment and no species was observed within the project site during the site surveys.

Parallel to this floristic procession of Chamephytes, other shrub species exist in this site, some of which are rather introduced or equally invasive. Among these shrubs, we quote :

- Native species: *Nitraria retusa*, *Atriplex halimus*, *Limoniastrum monopetalum*;
- Introduced species: *Casuarina glauca*, which is present per plantation with a very small number of individuals;
- Non-native species: *Eucalyptus camaldulensis*, of Australian origin, but introduced in this site as an alignment tree on Metbasta-Sbikha road;
- Invasive species: *Solanum elagnifolium*, abundant, especially near the road, where salt is present in small quantities.

Below some pictures illustrating the above-mentioned species.



*Nitraria retusa*



*Atriplex halimus*



*Limoniastrum monopetalum*



*Casuarina flauca*



*Eucalyptus camaldulensis*



*Solanum elagnifolium*

**Photos of some shrub species encountered at the project site and its surroundings**

It's to mention that according to the national regulation, the law n°2001-119 of 6 December 2001 is prohibiting the felling and uprooting of olive trees, unless authorized by the territorially competent governor, within two months from the date of submission of the application.

Also, the complete list of rare and endangered plant species is within the Order of the Minister of Agriculture and Water Resources of 19 July 2006. According to this order, none of the species identified within the project site and its surroundings are considered rare or endangered and all the species are considered common to their habitats.

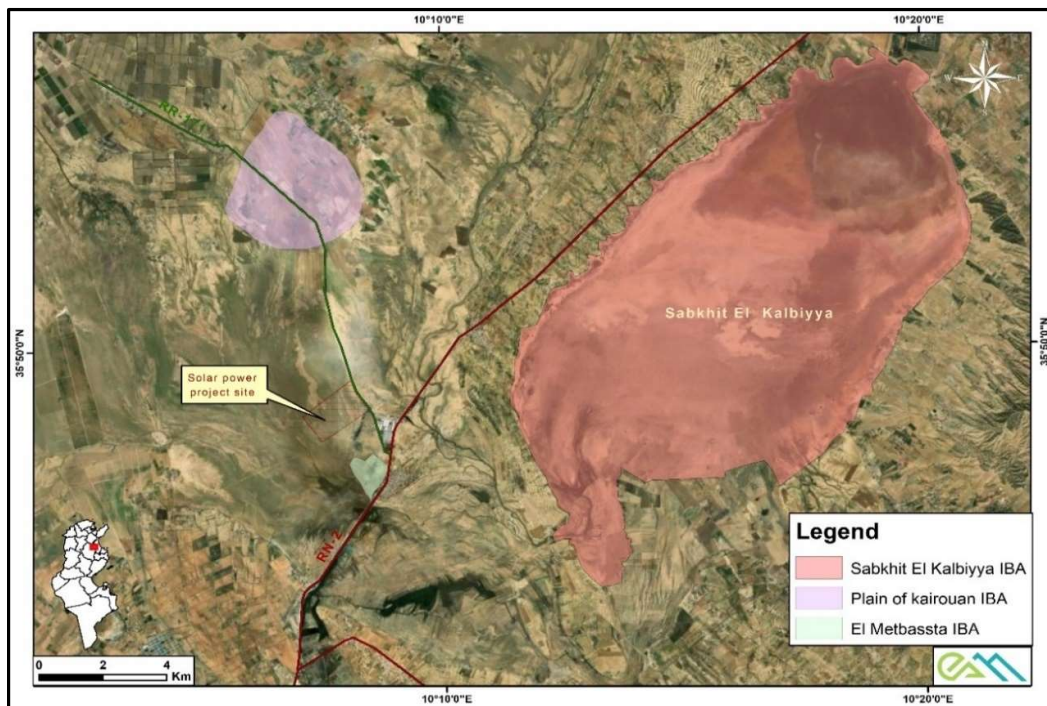
**IBA Sites**

Important Bird and Biodiversity Areas (IBAs) are sites of major interest that host wild bird populations considered to be of Community or European importance. IBAs were designated under the Directive 79/409/EEC of 2 April 1979.

The investigation of digital and cartographic data published by IUCN (<http://www.keybiodiversityareas.org/kba-data>), BirdLife International (<http://datazone.birdlife.org/site/search>) and those carried out by national authorities (General directorate of forestry and Ministry of environment) has allowed us to locate, within a radius of 10 km from the site, three wetlands of national and international importance for the reception and conservation of birds which are: plains of Kairouan, Sebkhet Kelbia and Metbasta.

The "**Kairouan Plain**" site classified as an IBA (Important Bird and Biodiversity Area) is located about 5.4 km from the project site. It is considered to be a freshwater ecosystem. However, this characteristic probably remains weak and dependent on very wet years. At the floristic level, this IBA site occasionally includes (only in wet years) three plant species with a conservation status according to the IUCN's KBA (Key Biodiversity Areas) selection criteria. These species are: *Bellis prostrata*, *Convolvulus durandoi* and *Serapias stenopetala*. and they have not been recorded within the project site. However, these species were reported in the "Flore de Tunisie" (Pottier-Alapetite, 1979 & 1981 and Cuénod, 1954), as being encountered mainly in the North of the country, may a priori have a very occasional appearance in the Kairouan Plain IBA site.

On the other hand, the project site is also located about 1 km from **Metbasta IBA site (TN022)** and about 5 km from the **Sebkhet Kelbia IBA site (TN020)**. Both have the same characteristic of the **Kairouan Plain IBA site (TN019)**: abundant and halophilic vegetation.



**Figure 7.28 - Location of IBA Sites**

### 7.3.2 Natural Habitat Mapping

The objective of this mapping is to better understand the structure of the natural vegetation within the project site, and identify its productive potential, as well as the potential ecosystem services which are likely to be provided. That said, this site corresponds to a hydro-halomorphic ecosystem, characterized by a halophilic vegetation.

However, from an objective of providing good data and indicators on this vegetation, performing this mapping activity is required.

#### 7.3.2.1 Methodology

The preparation of the vegetation map was carried out in two stages, which are:

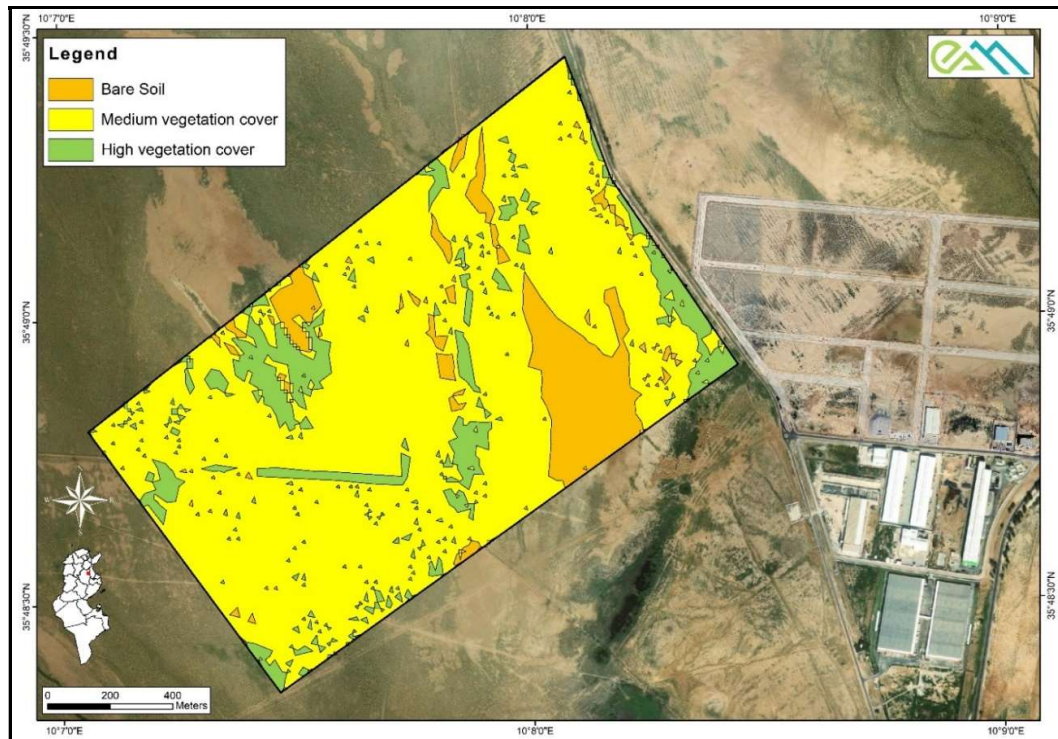
- Satellite imagery-interpretation and identification of isophenous units, carried out in the office, based on recent images from Google Earth, and multispectral Landsat 8 and Sentinel 2A (The photographic interpretation was carried out on recent multispectral images dated 3 April 2021) This step allowed to identify the different units of vegetation corresponding probably to differences in the nature based on the differences of colors. Ideally, this preliminary work of satellite imagery-interpretation should be carried out on higher resolution satellite images, allowing to visualize the different vegetation units according to the spectral signatures, or also on high resolution aerial photography. However, considering the relatively limited time and also the reduced site area, latest images from Google Earth and multispectral Sentinel 2A are satisfying and allow us to perform the work envisaged with good rendering quality.
- Validation of the results of the satellite imagery-interpretation by field data, and especially to measure the vegetation cover of each unit, in order to have an idea on the coefficient of abundance-dominance of the principal characteristic species of each unit, and especially to appreciate approximately the production in phytomass.

#### 7.3.2.2 Satellite imagery interpretation

It's worth mentioning that the first step of our approach consisted of satellite imagery-interpretation and delineation of the vegetation units of the site. The satellite imagery-interpretation was carried out on recent multispectral images from Sentinel 2A dated 3<sup>rd</sup> April 2021.

Knowing that the vegetation of the site corresponds to a vegetation of the saline environments, we underline the homogeneous character of this vegetation, also known as azonal vegetation, dependent on particular conditions determined by the soil. It is the saline character of the soil.

The results of the detailed satellite imagery-interpretation work resulted in the following map:



Source: The Normalized Difference Vegetation Index (NDVI) was computed based on a high-resolution, multi-spectral satellite image dated 3<sup>rd</sup> April 2021, from the Copernicus Sentinel-2 mission.

**Figure 7.29** - Identification of different site vegetation units using satellite imagery-interpretation

### 7.3.2.3 On site Field observations

Once the identification of the different units was done, the field activities were carried out the 9<sup>th</sup> of April 2021. Thus, all the units identified by satellite imagery-interpretation were located with precision with GPS.

Then, the vegetation cover (in %), as well as the indicator species of each unit were determined using the Transect method. The method used for the woody vegetation survey is the quadrat points method described by Godron et al. This method, adapted and used for the study of Sahelian pastures by Poisson et al. (1985), allows for sampling followed by a determination of the vegetation cover, a floristic analysis, and an estimation of the herbaceous biomass.

This is a non-destructive method. It consists in counting the presence of species at vertical points regularly placed (every 10 cm) along a 20 m graduated tape, stretched over the vegetation carpet. The line of reading of the hundred measurements crosses the vegetation unit in all its length and is carried out at the level of each vegetation unit identified on the site (see Figure below).

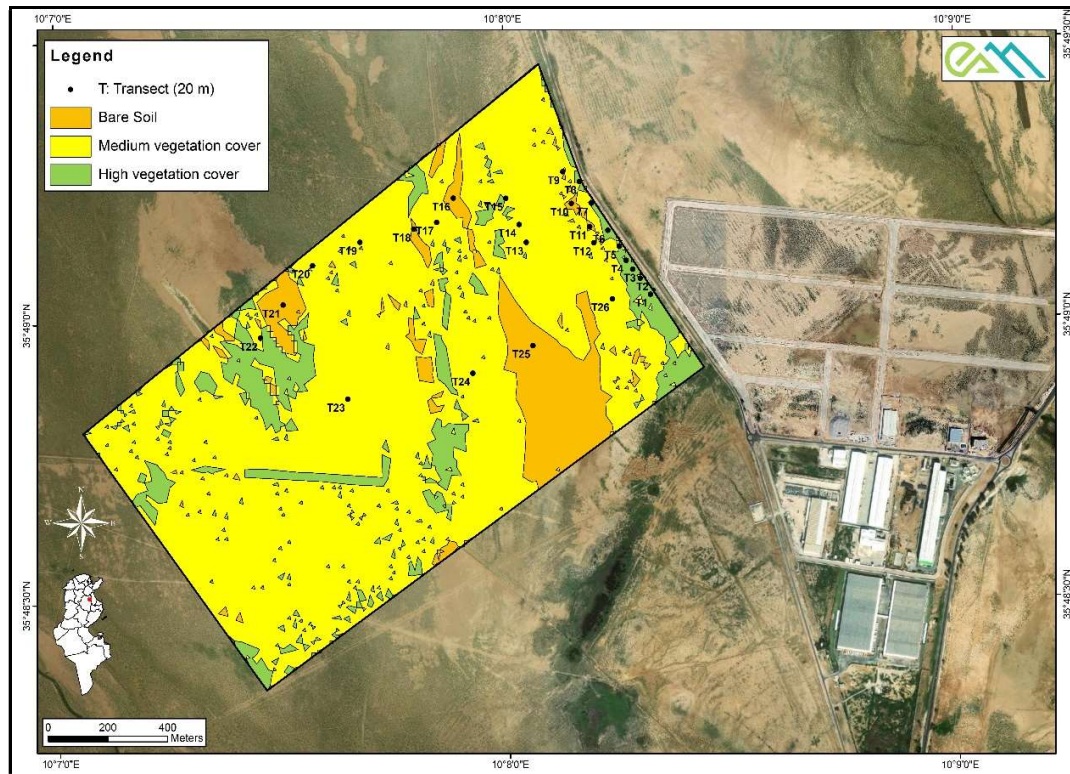
It should be noted that the quadrat point method can also be used to study natural vegetation. This method corresponds to the total number of individuals of each species in a given area unit. This method is excellent for vegetation formations, which are characterized by a high species richness. In the case of the project site, since it is characterized by a very low species richness, where there is practically only *Salsola tetrandra* (other species are very rare), we were content to observe the dominance of this species by measuring the vegetation cover, using the transect method.



**Figure 7.30** - Observed Vegetation cover within Identified Units

Considering the small number of units, identified by satellite imagery interpretation, several transects were installed in each unit. Thus, the total number of transects installed is 26 transects. The length of each transect is 20 m. Knowing that the observations were made every 10 cm, the number of points observed by each transect is 200 points. The total number of points observed on all transects is 200 points x 26 lines = 5,200 observation points. The GPS coordinates of each transect were also recorded.

The figure 7.31 below shows the location of the transects installed at the project site.



**Figure 7.31** - Location of Transects within the Project Site

7.3.2.4 On Site Field Observations

The results of the site observations are shown in Table 7.7 below:

**Table 7.7** - Coordinates and Description of Transects

Transect	Start	End	Description	Vegetation cover %
<b>T1</b>	Lat = 35° 49' 2.576" N Long = 10° 8' 19.218" E	Lat= 35° 49' 3.091" N Long = 10° 8' 19.703" E	<i>Annual vegetation</i>	100
<b>T2</b>	Lat= 35° 49' 4.369" N Long = 10° 8' 18.446" E	Lat= 35° 49' 4.861" N Long = 10° 8' 17.935" E	- <i>Arthrocnemum macrostachyum</i> - <i>Annual vegetation</i> - <i>Salsola tetrandra</i> - <i>Suaeda mollis</i>	100
<b>T3</b>	Lat= 35° 49' 5.287" N Long = 10° 8' 17.423" E	Lat= 35° 49' 5.651" N Long = 10° 8' 16.751" E	- <i>Arthrocnemum macrostachyum</i> - <i>Annual vegetation</i> - <i>Salsola tetrandra</i> - <i>Suaeda mollis</i>	100
<b>T4</b>	Lat= 35° 49' 6.270" N Long = 10° 8' 16.481" E	Lat= 35° 49' 6.761" N Long = 10° 8' 16.010" E	- <i>Annual vegetation</i> - <i>Salsola tetrandra</i> - <i>Suaeda mollis</i> - <i>Hedysarum spinosissimum</i>	90
<b>T5</b>	Lat= 35° 49' 7.806" N Long = 10° 8' 15.347" E	Lat= 35° 49' 8.361" N Long = 10° 8' 14.997" E	- <i>Annual vegetation</i> - <i>Salsola tetrandra</i>	85.5

Transect	Start	End	Description	Vegetation cover %
			<i>-Suaeda mollis</i>	
<b>T6</b>	Lat= 35° 49' 10.032" N Long = 10° 8' 13.387" E	Lat= 35° 49' 10.523" N Long = 10° 8' 12.915" E	<i>- Annual vegetation</i>	100
<b>T7</b>	Lat= 35° 49' 12.158" N Long = 10° 8' 11.624" E	Lat= 35° 49' 12.713" N Long = 10° 8' 11.273" E	<i>-Annual vegetation</i>	91.5
<b>T8</b>	Lat= 35° 49' 14.477" N Long = 10° 8' 10.102" E	Lat= 35° 49' 15.065" N Long = 10° 8' 9.712" E	<i>Annual vegetation Salsola tetrandra -Suaeda mollis</i>	100
<b>T9</b>	Lat= 35° 49' 16.156" N Long = 10° 8' 7.536" E	Lat= 35° 49' 15.569" N Long = 10° 8' 7.847" E	<i>Bare soil</i>	0%
<b>T10</b>	Lat= 35° 49' 13.154" N Long = 10° 8' 9.287" E	Lat= 35° 49' 13.741" N Long = 10° 8' 8.976" E	<i>Bare soil</i>	0%
<b>T11</b>	Lat= 35° 49' 10.216" N Long = 10° 8' 11.078" E	Lat= 35° 49' 9.596" N Long = 10° 8' 11.388" E	<i>Bare soil</i>	0%
<b>T12</b>	Lat = 35° 49' 8.912" N Long = 10° 8' 11.657" E	Lat = 35° 49' 8.357" N Long = 10° 8' 12.048" E	<i>Salsola tetrandra</i>	21.5
<b>T13</b>	Lat = 35° 49' 8.022" N Long = 10° 8' 2.837" E	Lat = 35° 49' 8.608" N Long = 10° 8' 2.607" E	<i>Salsola tetrandra</i>	47.5
<b>T14</b>	Lat = 35° 49' 9.977" N Long = 10° 8' 1.989" E	Lat = 35° 49' 10.533" N Long = 10° 8' 1.598" E	<i>Salsola tetrandra</i>	66.5
<b>T15</b>	Lat = 35° 49' 12.720" N Long = 10° 8' 0.194" E	Lat = 35° 49' 13.307" N Long = 10° 7' 59. " E	<i>Salsola tetrandra</i>	38
<b>T16</b>	Lat = 35° 49' 12.591" N Long = 10° 7' 53.259" E	Lat = 35° 49' 13.275" N Long = 10° 7' 52" E	<i>Annual vegetation</i>	0
<b>T17</b>	Lat = 35° 49' 10.635" N Long = 10° 7' 50.680" E	Lat = 35° 49' 10.112" N Long = 10° 7' 51.072" E	<i>Salsola tetrandra</i>	61
<b>T18</b>	Lat = 35° 49' 10.014" N Long = 10° 7' 47.723" E	Lat = 35° 49' 9.396" N Long = 10° 7' 47 " E	<i>Annual vegetation</i>	0
<b>T19</b>	Lat = 35° 49' 8.067" N Long = 10° 7' 40.761" E	Lat = 35° 49' 8.687" N Long = 10° 7' 40" E	<i>Salsola tetrandra</i>	66
<b>T20</b>	Lat = 35° 49' 5.596" N Long = 10° 7' 34.350" E	Lat = 35° 49' 6.248" N Long = 10° 7' 34.041" E	<i>Salsola tetrandra</i>	47.5
<b>T21</b>	Lat = 35° 49' 1.841" N Long = 10° 7' 29.794" E	Lat = 35° 49' 1.898" N Long = 10° 7' 30 E	<i>Annual vegetation</i>	0
<b>T22</b>	Lat = 35° 48' 58.066" N Long = 10° 7' 27.350" E	Lat = 35° 48' 58.622" N Long = 10° 7' 26.920" E	<i>Salsola tetrandra</i>	86.5
<b>T23</b>	Lat = 35° 48' 51.991" N Long = 10° 7' 38.382" E	Lat = 35° 48' 51.499" N Long = 10° 7' 38" E	<i>Salsola tetrandra</i>	60.5
<b>T24</b>	Lat = 35° 48' 54.624" N Long = 10° 7' 55.195" E	Lat = 35° 48' 54.101" N Long = 10° 7' 55.626" E	<i>Salsola tetrandra</i>	64
<b>T25</b>	Lat = 35° 48' 57.048" N Long = 10° 8' 3.160" E	Lat = 35° 48' 57.431" N Long = 10° 8' 3.842" E	<i>Annual vegetation</i>	0
<b>T26</b>	Lat = 35° 49' 1.909" N Long= 10° 8' 14.347" E	Lat = 35° 49' 2.465" N Long = 10° 8' 13.876" E	<i>Salsola tetrandra</i>	60.5

The vegetation composition within the observed transects, as well as the calculation of the corresponding vegetation cover were provided within table 7.6. In fact, this table brings the following comments:

- Transects 1 to 8: were carried out along the road from Sbikha to Kairouan. This unit is the result of a strong disturbance, linked to grazing, and an abundance of nitrogen, coming from the excrements of the herds. The disturbance is the reason for the high vegetation cover, which averages 95.8% across the transects. The vegetation in these transects is mainly composed of annual species, whose occurrence is related to runoff from the roadside. Among the annual species present are: *Koeleria pubescens*, *Schismus barbatus*, *Erodium triangulare*, *Hedysarum spinosissimum*, *Asteriscus maritimus*, *Scorpiurus muricatus*, etc

The high density of species within these transects indicates good pastoral production, which is present during a short period of the year. According to Floret & Pontanier (1982), this area produces between 500 and 600 kg of dry matter/ha/year. If we consider the pastoral value of 1 kg DM = 0.33 FU (Feed Unit), the pastoral production of this zone would be 165 to 198 FU/ha/year. This represents 50% of the annual fodder needs (350 to 400 FU/year) for a 45 kg sheep.



**Figure 7.32** - Type of vegetation units along Sbikha to Kairouan road

The flowering species is *Hedysarum spinosissimum*, a very palatable species for cattle

In addition to the annual vegetation of good pastoral value, there are also some clumps of halophilic species. These are *Salsola tetrandra*, *Suaeda mollis* and *Arthrocnemum macrostachyum*. However, contrarily to the annual species, these halophilic species, have no nutritional value for sheep and goats, since they are not palatable by livestock.



**Figure 7.33** - Linear Transect method used for the Characterization of the Vegetation within the Project Site

- Transects 9, 10, 11, 16, 18, 21 and 25 were conducted in an area completely devoid of vegetation. No plant species were observed. The habitat is strictly constituted by a clay soil, very dry, strongly dominated by shrinkage cracks. During the rainy period, this area is submerged, and this flooding lasts for a long period of time during the year. In the absence of vegetation, this land has no pastoral value. It covers an area of 13% of the total area of the site (26 ha).



**Figure 7.34** - Bare Soil within the Project Site

- Transects 12, 13, 14, 15, 17, 23, 24 and 26: This is a halophilic vegetation unit, structured mainly by *Salsola tetrandra*. The average vegetation cover of this unit is 52.43%. The biomass produced by this unit exceeds 1500 Kg of M.S./ha/year. However, considering the high salinity of these two species, the pastoral value for sheep and goats is almost zero (species not palatable, due to their high content of sodium chloride (NaCl)). This unit occupies the maximum area of the site, with 147 ha, or 73.5%. However, in rainy periods, annual species were observed appearing inside the clumps of *Salsola tetrandra*, which offer during a short period of the year (2 to 3 months at most), a low pastoral value to sheep and goats. This pastoral production is weak.

Thus, according to the cartographic and floristic data, the ecosystem services provided by this monospecific unit concern only the permanent cover of the soil. Its role in maintaining biodiversity is marginal. Similarly, at the pastoral level, this unit is of limited to pastoralists, due to the unpalatability of most existing plant species.



**Figure 7.35** - Type of Vegetation, Characteristic of the above Identified Unit

It's to note the Dominance of *Salsola tetrandra* Clumps, with total Absence of Annual Species

- Transects N° 19, 20 & 22: These transects present the same vegetation physiognomy as the previous transects with the dominance of *Salsola tetrandra*. The only difference is in the vegetation cover, which averages 66.66%. The biomass produced is estimated at more than 2000 kg DM/ha/year. As for the previous unit, the pastoral value of this unit is also very low, due to the salt content of the species characterizing this unit.

During the mapping work, the absence of annual species was emphasized, due to the high salinity of the soil. This justifies the low pastoral value of this unit.

Table below summarizes the area of the different units mapped within the site, as well as their proportion of the total site area. The units with high vegetation cover are dominant within the site. This average vegetation cover varies from 0 to 87.9%. This is the case for all ecosystems of saline soils in Tunisia.

**Table 7.8 - Area and Type of Vegetation cover within the Site of Metbasta**

Type of vegetation cover	Area (ha)	% in proportion to the total area of the site	Transects	Vegetation cover %
Vegetation with important cover	27	13.5	T1, T2, T3, T4, T5, T6, T7, T8, T19, T20 et T22	87.9
Vegetation with medium cover	147	73.5	T12, T13, T14, T15, T17, T23 et T24	52.4
Bare soil	26	13	T9, T10, T11, T16, T18, T21 et T25	0

*7.3.2.5 Characterization of the Abundance Dominance of the Main Plant Species*

It's to remind that the notion of abundance-dominance are parameters that are used to improve the ecological characterization of a vegetation units. These parameters are closely related to each other and to the vegetation cover. Their definition is the following:

- Abundance: is the total number of individuals of each species in the total sample.
- Dominance: the area occupied (using cover) by a species in a community, per unit area.
- Cover: the area occupied by individuals of a species. It is estimated from the projection of the leaf cover on the ground (NIANG-DIOP, 2010).

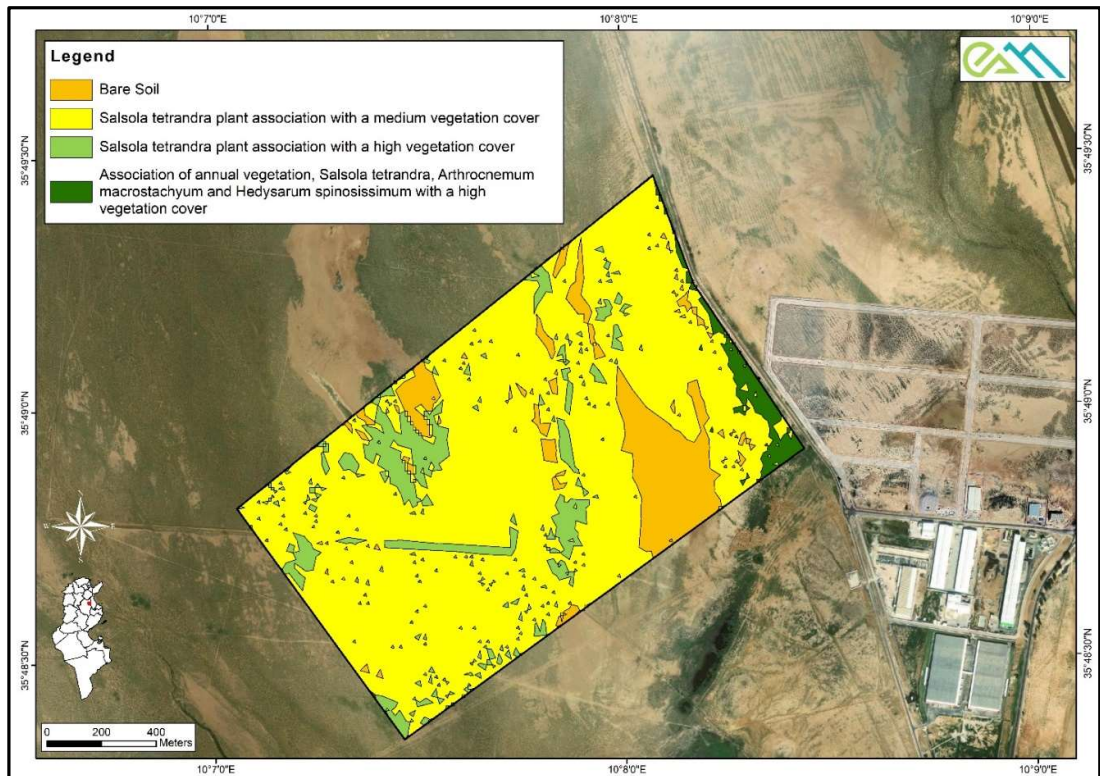
The Abundance - Dominance is the scale below, presented by BRAUN BLANQUET in 1934:

- 5 : Any number of individuals - coverage > 3/4 of the reference area.
- 4 : Number of cover between 1/2 and 3/4 (50-75%) of the reference surface.
- 3 : Number of coverings between 1/4 and 1/2 (25-50%) of the reference surface.
- 2 : Number of overlaps between 1/20 and 1/4 (5-25%) of the reference area.
- 1: Cover < 1/20, or scattered individuals with cover up to 1/20 (5%).

+: Few individuals, with very low cover (Jean-Michel, 2006).

On the other hand, considering the values of the vegetation cover within the identified units, it is estimated that the species of *Salsola tetrandra* and *Suaeda mollis*, are the most dominant species within this ecosystem. According to the cover, the scale of their dominance corresponds to 4 and 5. This is a very high scale. This scale corresponds to dense plant formations under semi-arid and arid climate. This is the case of all halophilic plant formations in Tunisia. Although the area is commonly grazed by livestock, the importance of the plant cover observed, justifies the non-acceptability of these halophilic taxa by the herds.

The figure 7.36 below was prepared to inform the composition and the density of the vegetation cover within the project site.



**Figure 7.36 - Vegetation Composition and cover within the Project Site**

### 7.3.2.6 Conclusion

The detailed observation of the vegetation of the site based on cartography work, reveals the dominance of units with high density of vegetation. Indeed, except for the unit along the road Sbikha-Kairouan, which is of pastoral interest, because of the high density of annual species, the other units either have none or a limited a pastoral interest, because of the nature of species that structure them (annual species eaten by livestock). In this site, the

dominance of the two species *Salsola tetrandra* and *Suaeda mollis*, which are very rich in salts, and do not offer any palatability for sheep and goats, have a high vegetation cover, is highlighted. The ecosystem services provided by the very dominant units of *Salsola tetrandra* and *Suaeda mollis* within the site are almost negligible. In addition, the frequent hydromorphy of the site is unfavorable to the settlement of fauna in the site.

Nevertheless, the good coverage of the soil by these two species, contributes to mitigate the effect of evapotranspiration, and especially promotes the storage of CO<sub>2</sub> by photosynthesis, thus contributing to mitigate the carbon balance in Tunisia.

### 7.3.3 Fauna

#### 7.3.3.1 Land Fauna

The project site is of hydro-halomorphic character and disturbed (proximity of the road linking Sbikha to Kairouan, grazing, the activity of Metbasta Industrial Zone, etc.). These factors make the site an unsuitable biotope for diversified wildlife. Thus, according to field surveys carried out in late summer (early September 2020), the species of fauna recorded during the site visit are insects considered very common throughout Tunisia, namely:

- *Calosoma nigrata* (black calosome): a beetle of variable ecological amplitude;
- *Hemilepsitus reaumurii*: a species of woodlouse in the family Agnaridae;
- *Scolopendra cingulata*: with a wide ecological amplitude and is most often found in open and rocky landscapes.

According to the IUCN classification, these three species have no special conservation status due to their abundance in the wild.



*Calosoma nigrata*



*Hemilepsitus reaumurii*



*Scolopendra cingulata*

#### Photos of Insect Species encountered within the Project Site

Based on the desktop research, some species of fauna very common to all central and southern Tunisia, generally live within areas of similar habitat and may possibly frequent this site. These include various species of:

- Rodents: Hare, Black Rat, Grey Mouse, Hedgehog, Small Egyptian, Gerbil, Sorex araneu;
- Reptiles: Common turtle, Lebetine viper, Common chameleon, Horseshoe snake, Allegheny snake, Olivier's mesaline;
- Batracians: Frogs, Green Toad, Painted Discoglosses and othersers;
- Insects: Ants, Scarabs, and others;
- Mammals: Jackal, Fox, Boar, Golden wolf.

In general, most of the species listed within the literature review of previous studies are considered to be of minor concern (exception is made for the Greek tortoise, which is a vulnerable species according to the IUCN (International Union for Conservation of Nature) but none of these species was observed within the project site including the Greek tortoise.

**Table 7.9** - List of animal species, likely to frequent the site according to the bibliography, and their conservation status, according to IUCN (2022)

Categories	English Name	Scientific Name	Conservation status (IUCN 2022)
<b>Rodents</b>	Hare	<i>Lepus europaeus</i>	Least Concern
	Black Rat	<i>Rattus rattus</i>	Least Concern
	Grey Mouse	<i>Mus musculus</i>	Least Concern
	Hedgehog	<i>Erinaceus europaeus</i>	Least Concern
	Gerbil	<i>Jaculus jaculus</i>	Least Concern
	Sorex araneu	<i>Sorex araneus</i>	Least Concern
<b>Reptiles</b>	Common turtle	<i>Testudo graeca</i>	Vulnerable
	Common chameleon	<i>Camaeleo chamaeleon</i>	Vulnerable
	Lebetine viper	<i>Macrovipera lebetina</i>	Least Concern
	Allegheny snake	<i>Hemorrhhis algirus</i>	Least Concern
	Horseshoe snake	<i>Hemorrhhis hippocrepis</i>	Least Concern
	Olivier's mesaline	<i>Mesalina olivieri</i>	Least Concern
<b>Batracians</b>	Frogs	<i>Pelophylax saharicus</i>	Least Concern
	Green Toad	<i>Bufotes viridis</i>	Least Concern
	Painted Discoglosses	Scoglossus pictus.	Least Concern
<b>Insects</b>	Ants	Various species of insects, as noted above	Least Concern
	Scarabs		Least Concern
	Various species of insects		Least Concern
<b>Mammals</b>	Jackal,	<i>Canis aureus</i>	Least Concern
	Fox	<i>Vulpes zerda</i>	Least Concern
	Wild boar	<i>Sus scrofa</i>	Least Concern
	Golden wolf	<i>Canis anthus</i>	Least Concern

\*The same status as 2019 because the review period (between 2019 and 2022) is very short.

It should be noted that none of the species listed above were observed on the site during the field surveys. Reptiles being cold-blooded or poikilothermic, cannot be visible during

the season of our field investigations. Only a few individuals of small lizards are sometimes visible. Large mammals (jackal, fox, wild boar, etc...) are totally absent. Rodent burrows were also not observed at all.

Both of Metbasta IBA site and the project site have similar fauna characteristics.

The Metbasta IBA site has almost the same ecological characteristics as the project site. It is marked by the presence of fauna species of low conservation status (Minor Concern).

For the purpose of getting details on insects within the project site, mainly dragonfly species (*Calopteryx exul* and *Gomphus lucasii*)– especially *Gomphus lucasii*, which appears to be the most likely of all the insects to occur, an invertebrate's survey was required.

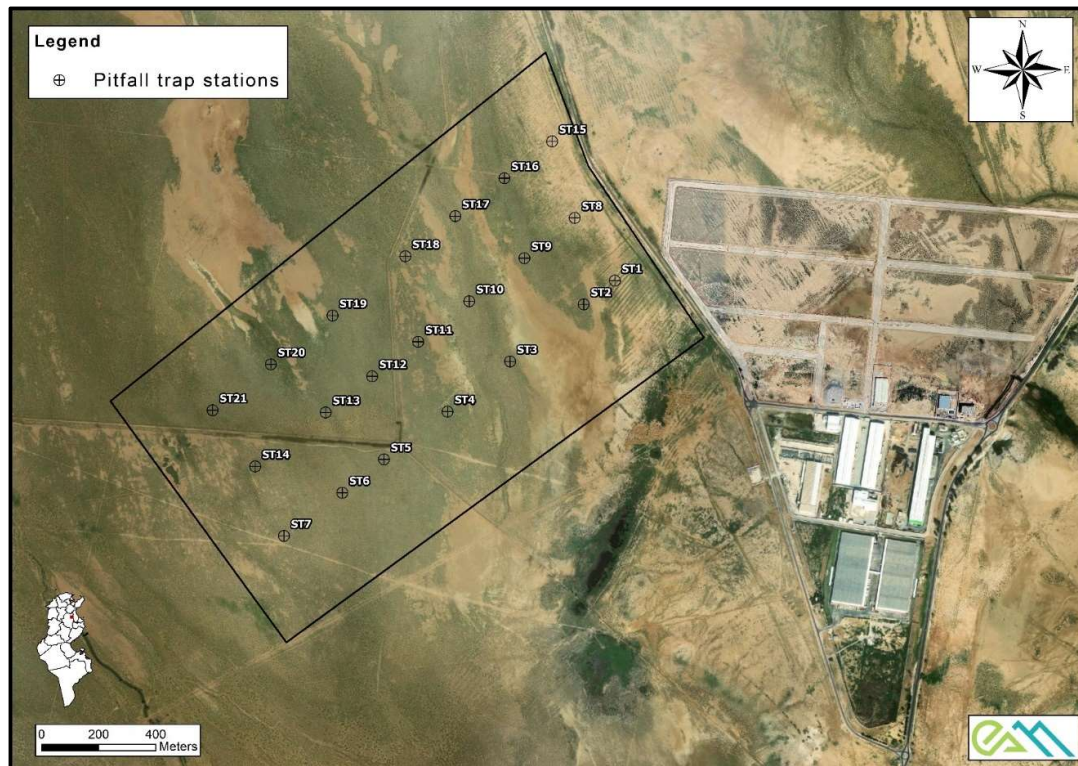
#### 7.3.3.2 *Insects survey*

The aim of the insect survey report was to analyze spatial patterns within the species richness of insects in the project site of Metbasta. For this, a site survey was carried out by an insect specialist during three (3) days (8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup>) in April 2021.

This section provides the results of the preliminary insect survey report. The details of material and methodology used as well as the description of observed species (scientific name, synonyms, diagnosis, material examined, habitat and ecology, distribution, IUCN conservation status, including photos of species and study environment) were provided within the invertebrate survey report in Annex XI.

#### ***Sampling Procedures***

Twenty-one traps were installed in different locations within the project site (see Fig. 7.37).



**Figure 7.37 - Invertebrates Traps Location**

The sampling techniques used were different. Manual sampling is used to collect most of the material; this implies an exhaustive exploration of the land and especially of the most favorable places for insects (under stones, dead leaves, pieces of wood, in the moss or the roots of some plants). The specimens are collected by mouth aspirator or by hand for large sizes and using barber pots (pitfall traps) (see photos below).



**Insect Aspirator**



**Pitfall Traps**

**Photos of equipment used for insect survey within the project site**

**Results**

A total of 5 species belonging to Coleoptera and Odonata orders were collected from the identified different locations within the project site. The order Coleoptera is characterized by 2 Families: Chrysomelidae and Tenebrionidae. The Chrysomelidae family is represented by two species: *Timarcha rugosa* (Linnaeus, 1767) and *Lachnaia paradoxa* (Olivier, 1808), while the Tenebrionidae family is only represented by 1 species: *Cossyphus moniliferus moniliferus* (Chevrolat, 1829). The Odonata order is characterized by 2 species: *Sympetrum fonscolombii* (Selys, 1840) abundant, and *Gomphus lucasii* (Selys, 1849).

Table below summarizes the findings within the project site survey observations.

**Table 7.10 - List of Identified Species**

Order	Family	Genus/ species
Coleoptera	Tenebrionidae	<i>Cossyphus moniliferus moniliferus</i>
	Chrysomelidae	<i>Timarcha rugosa</i>
		<i>Lachnaia paradoxa</i>
Odonota	Libellulidae	<i>Sympetrum fonscolombii</i>
	Gomphidae	<i>Gomphus lucasii</i>

It’s worth mentioning that none of the following species was observed during the survey: *Thorectes puncticollis*, *Heptaulacus pirazzolii*, *Thorectes demoflysi*, *Pancreatium foetidum* and *Esymus sicardi*. These species were observed within sandy soils mainly in the coastal areas of Tunisia. In general, the presence of these species is restricted to the wet season, which may explain their absence during the dry season.

For the species *Gomphus lucasii* which is classified as vulnerable according to IUCN Red list, was collected from the edge of a water puddle near the sampling station 14 within the solar plant site. The number of individuals observed was small to establish a conclusive interpretation regarding the population. However, other populations were also observed in the sampled station.

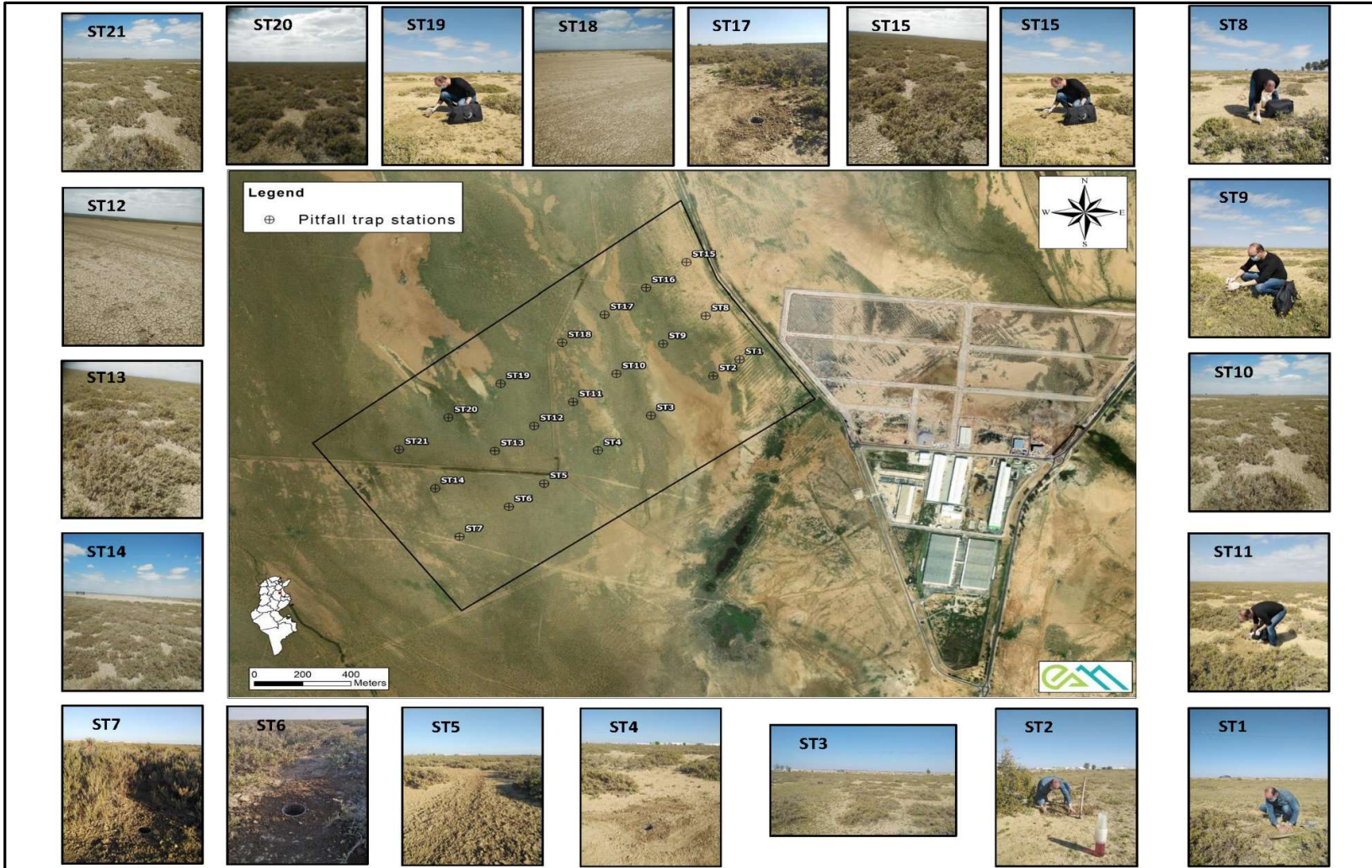
Based on desktop data, the individuals may generally be moved further away for many reasons related to intraspecific competition, predation, or microclimate. *Gomphus lucasii* appears to make displacements which is consistent with their tendency to migrate and feed intensively to support their biological needs, especially when the dry season starts and such environment of puddles disappears leading to confirm that the presence of the species is closely linked to the rainy season and outside of this season, the habitat benefiting these species is limited

The photo below is showing the environment where *Gomphus lucasii* was observed within the project site.



Photo of *Gomphus lucasii* habitat area within the sampling station S14

The figure below shows photos of habitat environment where sampling stations were carried out.



**Figure 7.38 - Natural Habitat within the Insects Sampling Stations**

7.3.3.3 Avifauna

▪ **Autumn Bird Survey**

The ornithological characterization of the project site was based on the observations and findings of the ornithological expert associated with a bibliographical compilation from the most credible references available.

The project area is characterized by the presence of large ecologically interconnected wetlands, encouraging waterfowl to exploit the habitats of the study area. The relative abundance and availability of trophic resources for zoophagous animals, such as Great Waders, including Flamingos, and some Waders, Raptors and insectivorous passerines also contribute to the site's carrying capacity.

The suite of bird taxa likely to frequent the PV project site in Metbasta and its environment has been estimated at 181 species; all phenological seasons combined. The list and phenological status, abundance and conservation status of these species are given in table 7.11 below.

The species recorded are unevenly distributed among three functional groups, namely land birds with 82 species, water birds with 73 species, and raptors with 26 species. This exceptional ornithological richness corresponds to about 40% of the total number of bird species recorded in the national territory.

**Table 7.11** - List and phenological status, abundance and conservation status of avifauna likely to frequent the PV plant site and its environment

Functional Groups/Species	Abundance status (*)	Phenological status (**)	Conservation status (***)
<b>WATERFOWL</b>			
<b>Little Grebe <i>Tachybaptus ruficollis</i></b>	FREQ	HI	LC
<b>Great Crested Grebe <i>Podiceps cristatus</i></b>	FREQ	HI	LC
<b>Black-necked Grebe <i>Podiceps nigricollis</i></b>	RARE	HI	LC
<b>Little Bittern <i>Ixobrychus minutus</i></b>	OCCA	VP	LC
<b>Black-crowned-Night-Heron <i>Nycticorax nycticorax</i></b>	OCCA	VP	LC
<b>Squacco Heron <i>Ardeola ralloides</i></b>	OCCA	NM VP	LC
<b>Western Cattle Egret <i>Bubulcus ibis</i></b>	FREQ	HI	LC
<b>Little Egret <i>Egretta garzetta</i></b>	FREQ	VP HI	LC
<b>Great Egret <i>Ardea alba</i></b>	RARE	HI	LC
<b>Gray Heron <i>Ardea cinerea</i></b>	FREQ	VP HI	LC
<b>Purple Heron <i>Ardea purpurea</i></b>	OCCA	VP	LC
<b>White Stork <i>Ciconia</i></b>	RARE	NM	LC
<b>Glossy Ibis <i>Plegadis falcinellus</i></b>	OCCA	VP HI	LC
<b>Eurasian Spoonbill <i>Platalea leucorodia</i></b>	OCCA	VP HI	LC
<b>Greater Flamingo <i>Phoenicopterus roseus</i></b>	FREQ	VP HI	LC
<b>Greylag Goose <i>Anser</i></b>	RARE	HI	LC
<b>Ruddy Shelduck <i>Tadorna ferruginea</i></b>	OCCA	VP	LC

Functional Groups/Species	Abundance status (*)	Phenological status (**)	Conservation status (***)
Common Shelduck <i>Tadorna</i>	RARE	HI	LC
Eurasian Wigeon <i>Anas penelope</i>	FREQ	HI	LC
Gadwall <i>Anas strepera</i>	RARE	HI	LC
Eurasian Teal <i>Anas crecca</i>	RARE	HI	LC
Mallard <i>Anas platyrhynchos</i>	FREQ	HI	LC
Northern Pintail <i>Anas acuta</i>	FREQ	VP HI	LC
Garganey <i>Anas querquedula</i>	OCCA	VP	LC
Marbled Duck <i>Marmaronetta angustirostris</i>	RARE	NM HI	VU
Red-crested Pochard <i>Netta rufina</i>	OCCA	HI	LC
Common Pochard <i>Aythya ferina</i>	FREQ	HI	VU
Ferruginous Duck <i>Aythya nyroca</i>	RARE	VP HI	NT
White-headed Duck <i>Oxyura leucocephala</i>	RARE	HI	EN
Water Rail <i>Rallus aquaticus</i>	OCCA	HI	LC
Spotted Crake <i>Porzana porzana</i>	OCCA	VP	LC
Common Moorhen <i>Gallinula chloropus</i>	RARE	VP HI	LC
Purple Swamphen <i>Porphyrio porphyrio</i>	OCCA	NM	LC
Eurasian Coot <i>Fulica atra</i>	FREQ	HI	LC
Common Crane <i>Grus grus</i>	FREQ	HI	LC
Black-winged Stilt <i>Himantopus himantopus</i>	FREQ	VP HI	LC
Pied Avocet <i>Recurvirostra avosetta</i>	RARE	VP HI	LC
Eurasian Stone-curlew <i>Burhinus oedicnemus</i>	RARE	NS VP HI	LC
Cream-colored Courser <i>Cursorius cursor</i>	OCCA	NS	LC
Collared Pratincole <i>Glareola pratincola</i>	OCCA	NM VP	LC
Little Ringed Plover <i>Charadrius dubius</i>	RARE	VP HI	LC
Snowy Plover <i>Charadrius alexandrinus</i>	FREQ	NM VP HI	LC
Eurasian Dotterel <i>Charadrius morinellus</i>	FREQ	HI	LC
Greater Golden-Plover <i>Pluvialis apricaria</i>	OCCA	VP	LC
Black-bellied Plover <i>Pluvialis squatarola</i>	OCCA	VP	LC
Northern Lapwing <i>Vanellus vanellus</i>	RARE	HI	NT
Sanderling <i>Calidris alba</i>	OCCA	VP	LC
Little Stint <i>Calidris minuta</i>	RARE	VP HI	LC
Temminck's Stint <i>Calidris temminckii</i>	OCCA	VP HI	LC
Dunlin <i>Calidris alpina</i>	FREQ	HI	LC
Ruff <i>Philomachus pugnax</i>	RARE	VP HI	LC
Jack Snipe <i>Lymnocyptes minimus</i>	OCCA	VP HI	LC
Common Snipe <i>Gallinago gallinago</i>	RARE	VP HI	LC
Great Snipe <i>Gallinago media</i>	OCCA	VP	NT
Eurasian Woodcock <i>Scolopax rusticola</i>	OCCA	HI	LC
Black-tailed Godwi <i>Limosa limosa</i>	RARE	VP HI	NT
Whimbrel <i>Numenius phaeopus</i>	RARE	VP HI	LC
Eurasian Curlew <i>Numenius arquata</i>	RARE	VP	NT
Spotted Redshank <i>Tringa erythropus</i>	RARE	VP HI	LC
Common Redshank <i>Tringa totanus</i>	RARE	VP HI	LC
Marsh Sandpiper <i>Tringa stagnatilis</i>	RARE	VP	LC
Common Greenshank <i>Tringa nebularia</i>	RARE	VP	LC
Green Sandpiper <i>Tringa ochropus</i>	OCCA	VP	LC
Wood Sandpiper <i>Tringa glareola</i>	RARE	VP HI	LC
Terek Sandpiper <i>Xenus cinereus</i>	OCCA	VP	LC

Functional Groups/Species	Abundance status (*)	Phenological status (**)	Conservation status (***)
Common Sandpiper <i>Actitis hypoleucos</i>	OCCA	VP	LC
Little Gull <i>Larus minutus</i>	OCCA	VP	LC
Black-headed Gull <i>Larus ridibundus</i>	RARE	VP HI	LC
Gull-billed Tern <i>Sterna nilotica</i>	RARE	NM VP	IND
Little Tern <i>Sterna albifrons</i>	OCCA	NM	LC
Whiskered Tern <i>Chlidonias hybrida</i>	OCCA	VP HI	LC
Black Tern <i>Chlidonias niger</i>	RARE	VP HI	LC
Common Kingfisher <i>Alcedo atthis</i>	RARE	HI	LC
<b>RAPACE</b>			
Black-winged Kite <i>Elanus caeruleus</i>	OCCA	VA	LC
European Honey Buzzard <i>Pernis apivorus</i>	OCCA	VA	LC
Black Kite <i>Milvus migrans</i>	RARE	VA	LC
Red Kite <i>Milvus</i>	OCCA	VA	NT
white-tailed eagle <i>Haliaeetus albicilla</i>	OCCA	VA	LC
Bearded Vulture <i>Gypaetus barbatus</i>	OCCA	VA	NT
Egyptian Vulture <i>Neophron percnopterus</i>	OCCA	VA	EN
Short-toed Snake Eagle <i>Circaetus gallicus</i>	OCCA	VA	LC
Eurasian Marsh Harrier <i>Circus aeruginosus</i>	RARE	VP HI	LC
Northern Harrier <i>Circus cyaneus</i>	RARE	VP/HI	LC
Pallid Harrier <i>Circus macrourus</i>	RARE	VP	NT
Montagu's Harrier <i>Circus pygargus</i>	RARE	NM VP	LC
Long-legged Buzzard <i>Buteo rufinus</i>	RARE	VP HI	LC
Golden Eagle <i>Aquila chrysaetos</i>	RARE	HI	LC
Booted Eagle <i>Hieraaetus pennatus</i>	RARE	VP	LC
Osprey <i>Pandion halliaetus</i>	OCCA	VP	LC
Lesser Kestrel <i>Falco naumanni</i>	RARE	VP HI	LC
Eurasian Kestrel <i>Falco tinnunculus</i>	RARE	NS VP HI	LC
Red-footed Falcon <i>Falco vespertinus</i>	OCCA	VP	NT
Northern Hobby <i>Falco subbuteo</i>	OCCA	VP	LC
Lanner Falcon <i>Falco biarmicus</i>	RARE	NS	LC
Peregrine Falcon <i>Falco peregrinus</i>	RARE	VP HI	LC
Barn Owl <i>Tyto alba</i>	RARE	NS	LC
Eurasian Scops Owl <i>Otus scops</i>	RARE	NM VP	LC
Little Owl <i>Athena noctua</i>	FREQ	NS	IND
Short-eared Owl <i>Asio flammeus</i>	RARE	VP	LC
<b>CONTINENTAL BIRDS</b>			
Barbary Partridge <i>Alectoris barbara</i>	FREQ	NS	LC
Common Quail <i>Coturnix</i>	FREQ	NM VP HI	LC
Black-bellied Sandgrouse <i>Pterocles orientalis</i>	RARE	NS	LC
Rock Dove <i>Columba livia</i>	FREQ	NS	LC
Eurasian Collared Dove <i>Streptopelia decaocto</i>	RARE	NS	LC
European Turtle Dove <i>Streptopelia turtur</i>	RARE	NM VP	VU
Laughing Dove <i>Streptopelia senegalensis</i>	COMM	NS	LC
European Bee-eater <i>Merops apiaster</i>	FREQ	VP	LC
Hoopoe <i>Upupa epops</i>	FREQ	NM VP HI	LC
Eurasian Nightjar <i>Caprimulgus europaeus</i>	OCCA	NM	LC
Red-necked Nightja <i>Caprimulgus ruficollis</i>	RARE	NS	LC
Pallid Swift <i>Apus pallidus</i>	COMM	NM VP	LC

Functional Groups/Species	Abundance status (*)	Phenological status (**)	Conservation status (***)
Little Swift <i>Apus affinis</i>	RARE	NS	LC
Ammomane isab. <i>Ammomanes isabellina</i>	OCCA	NS	IND
Calandra Lark. <i>Melanocorypha calandra</i>	RARE	NS	LC
Greater Short-toed Lark <i>Calandrella brachydactyla</i>	RARE	NM VP HI	LC
Lesser Short-toed Lark <i>Calandrella rufescens</i>	RARE	NS	IND
crested lark <i>Galerida cristata</i>	FREQ	NS	LC
Thekla's lark <i>Galerida theklae</i>	COMM	NS	LC
woodlark <i>Lullula arborea</i>	RARE	HI	LC
Eurasian skylark <i>Alauda arvensis</i>	RARE	HI	LC
sand martin <i>Riparia</i>	FREQ	VP	LC
Crag martin <i>Ptyonoprogne rupestris</i>	OCCA	HI	LC
Barn swallow <i>Hirundo rustica</i>	COMM	NM VP	LC
Red-rumped Swallow <i>Hirundo daurica</i>	OCCA	VP	IND
House martin <i>Delichon urbicum</i>	RARE	VP	LC
tawny pipit <i>Anthus campestris</i>	RARE	NM VP	LC
western yellow wagtail <i>Motacilla flava</i>	RARE	NM VP	LC
White wagtail <i>Motacilla alba</i>	RARE	HI	LC
rufous-tailed scrub robin <i>Cercotrichas galactotes</i>	OCCA	VP	LC
European robin <i>Erithacus rubecula</i>	OCCA	HI	LC
Common Nightingale <i>Huscinia megarhynchos</i>	OCCA	VP	LC
Black Redstart <i>Phoenicurus ochururos</i>	OCCA	HI	IND
Moussier's redstart <i>Phoenicurus moussieri</i>	RARE	NS	LC
Whinchat <i>Saxicola rubetra</i>	RARE	VP	LC
African Stonechat <i>Saxicola torquatus</i>	OCCA	HI	LC
northern wheatear <i>Oenanthe</i>	RARE	VP	LC
western black-eared wheatear <i>Oenanthe hispanica</i>	RARE	VP	LC
Desert Wheatear <i>Oenanthe deserti</i>	RARE	NM	LC
red-rumped wheatear <i>Oenanthe moesta</i>	RARE	NS	LC
Black wheatear <i>Oenanthe leucura</i>	RARE	NS	LC
common blackbird <i>Turdus merula</i>	RARE	NS HI	LC
Zitting Cisticola <i>juncidis</i>	RARE	NS	LC
Savi's Warbler <i>Locustella luscinioides</i>	RARE	VP	LC
moustached warbler <i>Acrocephalus melanopogon</i>	RARE	NS HI	LC
Sedge warbler <i>Acrocephalus schoenobaenus</i>	RARE	VP	LC
Eurasian reed warbler <i>Acrocephalus scirpaceus</i>	RARE	NM	IND
western olivaceous warbler <i>Hippolais opaca (pallida)</i>	RARE	NM VP	LC
icterine warbler <i>Hippolais icterina</i>	OCCA	VP	LC
spectacled warbler <i>Sylvia conspicillata</i>	RARE	NS HI	LC
eastern subalpine warbler <i>Sylvia cantillans</i>	RARE	VP	LC
Sardinian warbler <i>Sylvia melanocephala</i>	FREQ	NS HI	LC
western Orphean warbler <i>Sylvia hortensis</i>	RARE	NM VP	LC
common whitethroat <i>Sylvia communis</i>	OCCA	VP	LC
garden warbler <i>Sylvia borin</i>	RARE	VP	LC
Eurasian blackcap <i>Sylvia atricapilla</i>	RARE	VP HI	LC
Western Bonelli's warbler <i>Phylloscopus bonelli</i>	OCCA	VP	LC
wood warbler <i>Phylloscopus sibilatrix</i>	RARE	VP	LC
chiffchaff <i>Phylloscopus collybita</i>	RARE	VP HI	LC

Functional Groups/Species	Abundance status (*)	Phenological status (**)	Conservation status (***)
spotted flycatcher <i>Muscicapa striata</i>	RARE	VP	LC
collared flycatcher <i>Ficedula albicollis</i>	OCCA	VP	LC
European pied flycatcher <i>Ficedula hypoleuca</i>	RARE	VP	LC
Fulvous Chatterer <i>Turdoides fulva</i>	RARE	NS	LC
African blue tit <i>Parus teneriffae</i>	OCCA	NS	IND
Eurasian Golden Oriole <i>Oriolus oriolus</i>	OCCA	VP	LC
Southern Grey Shrike. <i>Lanius meridionalis</i>	FREQ	NS	VU
woodchat shrike <i>Lanius senator</i>	RARE	NM VP	LC
Eurasian magpie <i>Pica</i>	RARE	NS	LC
common raven <i>Corvus corax</i>	OCCA	NS	LC
common starling <i>Sturnus vulgaris</i>	FREQ	HI	LC
Spotless Starling <i>Sturnus unicolor</i>	COMM	NS	LC
sparrow <i>Passer sp</i>	COMM	NS	LC
Eurasian Tree Sparrow <i>Passer montanus</i>	OCCA	NS	LC
common chaffinch <i>Fringila coelebs</i>	RARE	NS	LC
European Serin <i>Serinus serinus</i>	FREQ	NS HI	LC
European greenfinch <i>Carduelis chloris</i>	FREQ	NS HI	LC
European Goldfinch <i>Carduellis carduellis</i>	OCCA	NS HI	IND
Common Linnet <i>Carduelis cannabina</i>	RARE	NS HI	LC
trumpeter finch <i>Bucanetes githagineus</i>	OCCA	NS	LC
striolated bunting <i>Emberiza striolata</i>	OCCA	NS	LC
common reed bunting <i>Emberiza schoeniclus</i>	RARE	HI	LC
Corn Bunting <i>Emberiza calandra</i>	OCCA	NS	LC

(\*) According to the opinion of the ornithological expert on the occurrence - abundance of the species in question at the level of the area concerned by the project. (\*\*) According to the phenological status proposed by Isenmann et al. (2005) to the species in Tunisia and after modification depending on the nature of the migratory routes followed by the different species. (\*\*\*) According to the IUCN Red List of Birds updated in 2017 (<https://www.iucn.org/resources/conservation-tools/iucn-red-list-threatened-species>).

It's worth mentioning that Metbasta IBA site includes species that may be encountered and are those likely to occur in the project site.

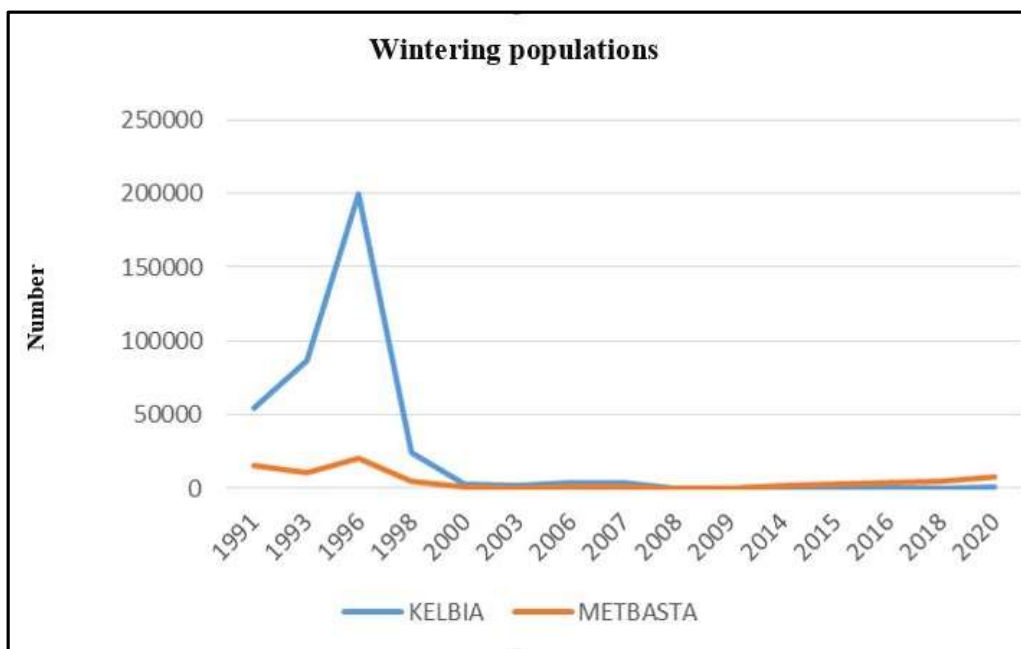
▪ **IBA Bird Species**

***Importance of Wintering Waterfowl Populations***

Censuses conducted during the last ten years reveal a continuous and significant decline in the total number of wintering waterfowl that frequent both Sebkhet Kelbia and Metbasta. This is mainly due to the impoundment of dams upstream of the watersheds of the wadis that flowed directly to these two wetlands.

Regardless of the census year, the size of wintering populations remains dependent on average rainfall, particularly during the fall seasons.

It should be noted that the size of flocks of wintering birds that frequent Sebkhet Metbasta slightly exceeds, in recent years, that recorded at the Sebkhet Kelbia which receives virtually no more exogenous water inflows even in case of releases by dams.



**Figure 7.39 - Evolution of total wintering waterfowl Populations in Kelbia and Metbasta**

***Wintering and Nesting of the Marbled Teal***

The bibliographical studies carried out with the most important ornithological treaties of Tunisia does not reveal any serious observation of the nesting of the Marbled Teal at the level of Sebkheth Metbasta.

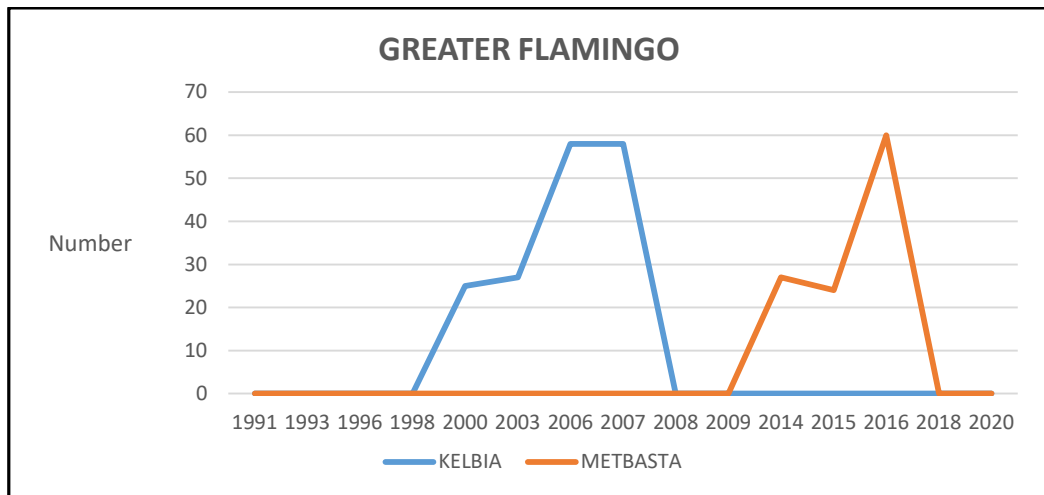
Indeed, overall, only three observations in the Kairouan landscape have been cited respectively at Sebkheth Kelbia in 1990 and 1976 and at the Marguellil dam (Isenmann et al., 2005).

As for the Marbled Teal wintering, it also remains occasional since the largest contingents, in Tunisia, are observed on the small wetlands located on the Saharan margins of the country within the governorates of Kebili and Douz.

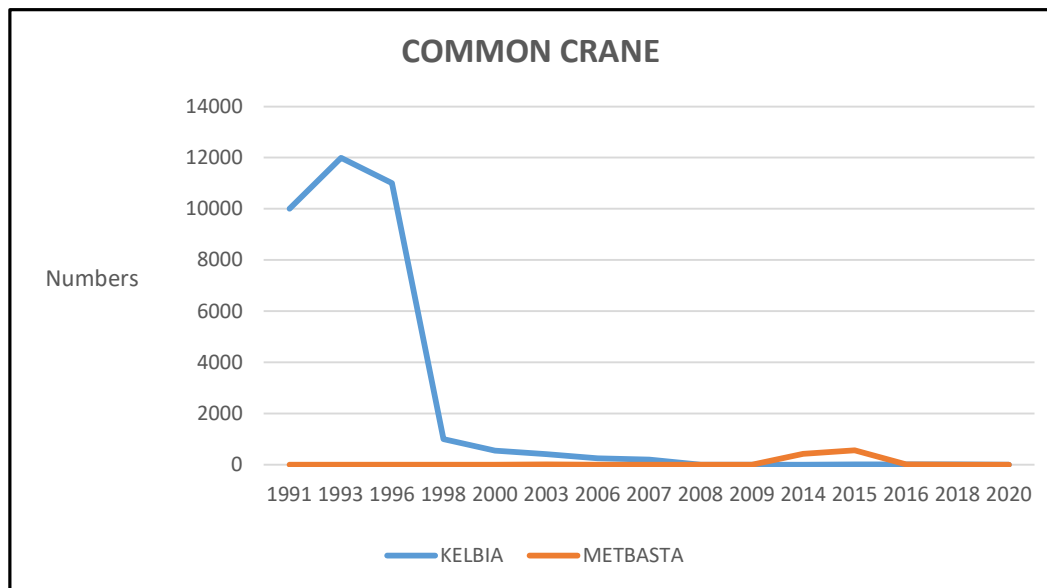
At the level of Sebkheth Metbasta and Sebkheth Kelbia, the contingents observed are irregular visits with numbers below 20 birds each time.

***Wintering and Passage of Common Crane and Greater Flamingo***

The continuous monitoring of these two herons in the Kairouan plain wetlands shows that their numbers are in continuous decline as is the case for all wintering waterfowl species in the study area.



**Figure 7.40** - Evolution of wintering flamingo numbers in Kelbia and Metbasta



**Figure 7.41** - Evolution of wintering crane numbers in Sebkhet Kelbia and Sebkhet Metbasta

This situation is also related to the construction of dams and the lack of fresh water supply to the wetlands downstream of the most important watersheds.

The wintering flamingo numbers are very low, especially since they hardly exceed 100 individuals.

As for the Common Crane, the ornithological censuses carried out show that it winters particularly at the level of Sebkhet Kelbia with numbers that rarely exceed 10,000 birds. During the last years, the size of the wintering population of cranes has completely dropped. This is also related to the construction of dams and the drying wintering areas.

**(i) Abundance Status**

The analysis of the abundance status adopted for the species in the above list has made it possible to distinguish four main categories of species whose abundance and occurrence differ significantly:

- Occasional species: 58 occasional species whose presence is sometimes dependent on ecological conditions exogenous to the study area were distinguished. These are natural but misplaced populations that can be observed in an occasional way in time as well as in space.
- Rare species: 88 rare species are likely to occur in the study area, including the project site.
- Frequent species: 29 frequent species have been identified in the study area. These are birds that are likely to be well adapted to local and regional ecological conditions.
- Common Species: Only 6 species are classified as common and can be observed in all available habitats, i.e. Laughing Dove, Thekla Larks, Barn Swallow, Spotted Starling, Pale Swift Sparrow sp.

**(ii) IUCN Status**

Based on the IUCN Red List and excepted the species of minor concern (LC: 157 species) or no special status (IND: 9 species) identified, the study site can host 15 species with a special conservation status, which are indeed very vulnerable to changes in their natural habitats, regardless of the phenological period of the year or the size of the projects:

- Near-threatened species (NT): water birds (Ferruginous Duck, Northern Lapwing, Great Snipe, Black-tailed Godwit, Eurasian Curlew) and raptors (Red Kite, Bearded Vulture, Pallid Harrier and Red-footed Falcon);
- Vulnerable species (VU): water birds (Marbled Teal, Greater Scaup) and continental birds (Turtle Dove and Southern Shrike);
- Endangered Species (EN): including a water bird (White-headed Duck) and a raptor (Egyptian Vulture).

**(iii) Phenological status - Bird migration**

Furthermore, the phenological status in Tunisia, the results of the ornithological mission carried out and the data obtained from the bibliographic compilation, show the essentially winter presence of Large Waders and Palmipeds. The species belonging to the other groups are mainly transients (mainly waders) or sedentary (passerines). In addition, it should be noted that migratory movements are largely influenced by factors exogenous to the study

area, in particular weather conditions, particularly the summer sirocco and winter trade winds, which influence the transits of Western Palaearctic bird species, being two continental currents which, when they blow strongly, limit the migratory front, which is usually wider, along the coast.

▪ **Spring Bird Survey**

***Method of conducting the bird spring survey***

The listening point technique is commonly used to count breeding continental birds in terrestrial habitats (Passeriformes), including forests, scrub and open areas such as the project site. Regardless of the habitat surveyed (H1, H2 or H3), we took the precaution of choosing listening points located in representative habitats of the study area (photos 1 to 6 below).

To perform this technique, the bird expert remains still for about 20 minutes and notes all species heard or observed, regardless of detection distance.

The length of the observation radius will depend on the detectability distance of the song or calls of the individuals heard.

***Results of the spring survey***

The use of the listening point technique at this phenological period of the year allowed the detection of 25 bird species. These included one waterfowl, three raptors, one passing corvid and twenty Passeriformes (Table 7.12).

Among these species are the Sardinian Warbler and the Spotless Starling, both of which are considered endemic to North Africa.

Except for the Southern Grey Shrike, which is classified as vulnerable on the IUCN Red List, no other species present a particular conservation status. They have mostly a least concern status with a low risk of extinction.

**Table 7.12 - List and Distribution of Birds Surveyed during the Second Campaign**

Species	Conservation Status I.U.C.N	Onsite Activities	Distribution		
			H1	H2	H3
<b>WATERFOWL</b>					
Cattle Egret <i>Bubulcus ibis</i>	LC	Feeding	0	0	3
<b>RAPTOR</b>					
Hen Harrier <i>Circus cyaneus</i>	LC	Feeding	1	0	0
Lesser Kestrel	LC	Feeding	3	0	0

Species	Conservation Status I.U.C.N	Onsite Activities	Distribution		
			H1	H2	H3
<i>Falco naumanni</i>					
Common Kestrel <i>Falco tinnunculus</i>	LC	Feeding	9		1
<b>CORVIDS</b>					
Common Raven <i>Corvus corax</i>	LC	Passage	1		0
<b>PASSERINES</b>					
Common Pigeon <i>Columba livia</i>	LC	Passage	0	0	5
Laughing Dove <i>Streptopelia senegalensis</i>	LC	*	0	0	2
European Bee-eater <i>Merops Apiaster</i>	LC	Passage	?		
Common Hoopoe <i>Upupa epops</i>	LC	*	0	1	0
Pallid Swift <i>Apus pallidus</i>	LC	Feeding	6		0
Lesser Short-toed Lark <i>Calandrella rufescens</i>	LC	*	0	0	0
Crested Lark <i>Galerida cristata</i>	LC	*	3	1	0
Woodlark <i>Lullula arborea</i>	LC	*	1		0
Barn Swallow <i>Hirundo rustica</i>	LC	Feeding	11		0
Little Swift <i>Apus affinis</i>	LC	Feeding	2		0
Tawny Pipit <i>Anthus campestris</i>	LC	*	0	1	0
Sardinian Warbler <i>Sylvia melanocephala</i>	LC	*	0	0	2
Spectacled Warbler <i>Sylvia conspicillata</i>	LC	*	0	0	1
Eurasian Blackbird <i>Turdus merula</i>	LC	*	0	0	2
Southern Grey Shrike <i>Lanius meridionalis</i>	VU	*	0	6	2
Common Redstart <i>Phoenicurus phoenicurus</i>	LC	*	0	0	1
Common Starling <i>Sturnus unicolor</i>	LC	Dormitory	0	0	>70
Sparrow <i>Passer sp</i>	LC	Dormitory	0	2	>100
European serin <i>Serinus serinus</i>	LC	*	0	0	1
European Greenfinch <i>Carduelis chloris</i>	LC	Passage	0	0	8

\*: Observation of singing males in nuptial plumage; LC: Least Concern

***Habitat and distribution of the main ornithological observations***

During the site observation, among the spatial units of the Kairouan landscape, only the project site was surveyed. The listening points were distributed over three different habitats but ecologically connected by the individual or flock movement of birds.

**List of photos of H1, H2 and H3 habitats on the project site**



**Nearly uncovered glades**



**Habitats covered mainly by halophytes with some thorny shrubs**



**Habitats bordering the site revealing mainly tamarix and thorny shrubs**

The observed birds divide the site's habitats into feeding and hunting areas, staging areas for resting activities (cleaning, resting, sleeping), and breeding areas for singing and mate finding, nest building, egg laying, chick rearing, etc.

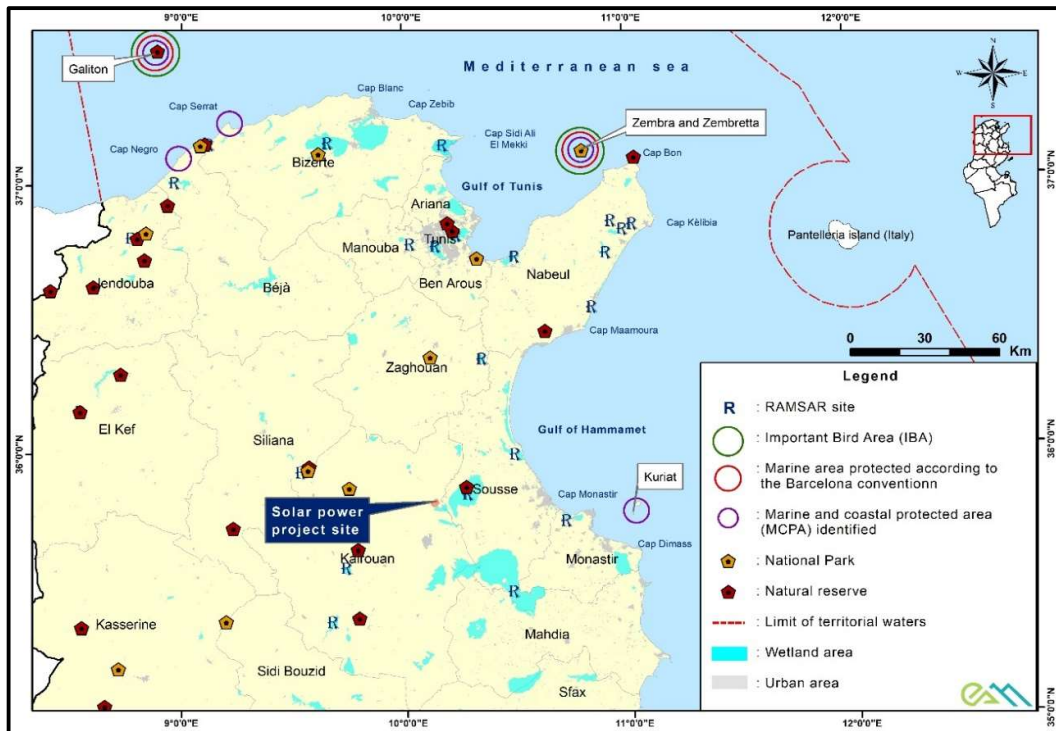
In accordance with the digitized map and our direct field observations, three distinct habitats were identified:

- Habitat (H1) free of vegetation cover and representing variable surface areas. The edge zone between H1 and H2 is a privileged space for the reproduction of the Lesser Short-toed Lark.

- Habitat (H2) covered mostly by a shrubby formation dominated by the halophyte *Salsola tetrandra*. This habitat is also dotted by about twenty feet of thorny shrubs namely *Lycium shawii*. These constitute a refuge or/and a perch or/and a nesting support for several pairs of the Southern Grey Shrike.
- Habitats (H3) which is located at the south-eastern edge of the project site. It is dominated by tree (*Tamarix aphylla*) and shrub (*Lycium shawii*) stands that provide a significant dormitory area for two important populations of Spotless Starling and Sparrow. A few species likely nest here, such as Sardinian Warbler, Eurasian Blackcap, *Sylvia Cantillans*, Common Nightingale, European serin and Common Redstart.

**7.3.4 Protected Areas**

The photovoltaic power plant site is devoid of protected natural areas. However, in the extended study area we note the presence of Jbel Zaghdoud National Park and Sebkheth Kelbia Nature Reserve, about 30 km and 5 km away from the project site, respectively (Figure 7.42 - Map of Protected Areas).



**Figure 7.42 - Map of Protected Areas**

**7.4 Social Environment**

The social analysis focuses on the human environment and economic activities, particularly in terms of land use, archeology and cultural heritage, socio-economics, and other.

Assessment of baseline conditions in relation to the social environment was based on a site visit undertaken by the 'ESIA Team' to the Project site and surrounding areas. In addition, desktop review as well as collection of secondary data was undertaken on key characteristics related to the social environment. Additional details are provided below as relevant.

#### **7.4.1 Land Use**

The site allocated for the development of the solar project is a piece of land in the private domain of the State which has never been subject to a previous land acquisition process.

A land lease agreement was signed between the Government and the Developer on 22 June 2022.

No other private land titles are supposed to be directly affected by the construction of the solar power plant.

The reconnaissance and field investigations revealed the absence of any physical structure on the project site. With regard to socio-economic activities, pastoralism is the only activity found in the Metbasta range.

The land in the Metbasta area was used by livestock farmers who may also use the solar power plant site during certain seasons of the year.

The livestock observed are mainly sheep and goats, but the presence of dromedary faeces indicates the potential presence of camels.

The 200 ha site of the proposed photovoltaic power plant is part of a private state domain (Land title: 9796/20323 Kairouan) which, located in the Metbasta region, covers an area of 7323 hectares, 23 ares and 47 centiares. The forest district of Kairouan is in charge of the management of this area (subdivision Kairouan-Nord).

Some of the parcels located near the project area are used for agricultural purposes. Thus, due to the quality of the rangeland, grazing is limited to periods when the vegetation is abundant, diversified and palatable to livestock.

The forestry service also ensures the protection, control and management of the rangeland. Similarly, in partnership with the Livestock and Pasture Office, it guides livestock farmers in all matters relating to the rotation of livestock in the improved (managed) areas.

The vegetation of the Metbasta rangelands is essentially made up of halophyte plant formations characteristic of wetlands.

The areas bordering the water body have a very rich and varied flora, especially in rainy years.

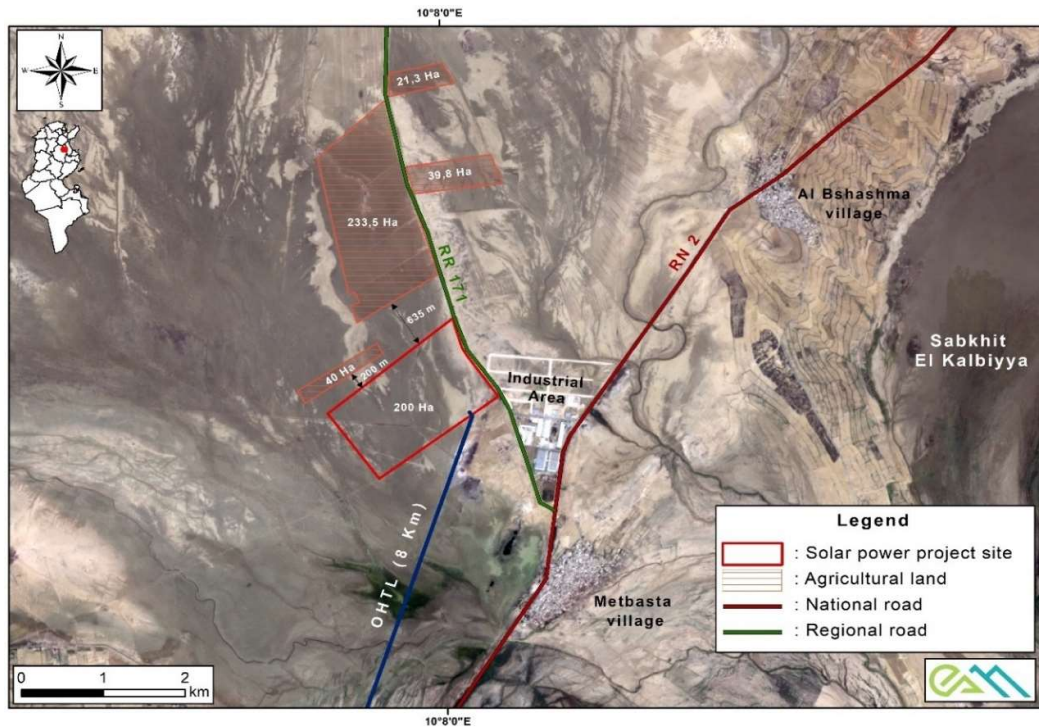


Figure 7.43 - Agriculture parcels in vicinity of the project site

The district of the forests of Kairouan introduced allochthonous species within Metbasta rangeland of improvement of pastoral lands. According to the district, this rangeland was disturbed because of overgrazing.

So, due to the quality of the rangeland, grazing is limited to periods when vegetation is abundant, diverse, and palatable to livestock.

The figure below illustrates the type and period of grazing of this halophilic steppe.

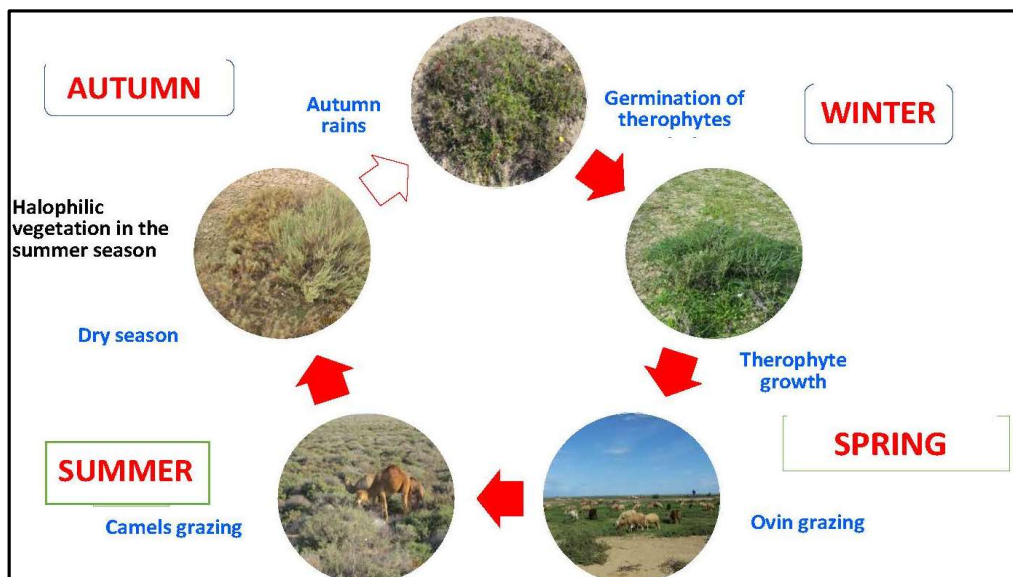


Figure 7.44 - Type and season of grazing of the halophilic steppe within the project area

The figure above suggests the following comments:

- During the dry season (summer), the vegetation is exclusively composed of woody halophytes which are not palatable plants by animals.
- With the autumn rainfall, there is a strong germination of annual plant species, which are very tender and very palatable, and therefore very sought after by the animal. These therophytes germinate especially in and near the clumps of woody halophytes, where the soil is less salty (extraction of NaCl by these halophytic woody plants).
- In winter, the annual vegetation develops, and the vegetation cover reaches very high values in the spring season. From this season onwards, sheep and goats graze in search of the soft vegetation. This vegetation usually has a relatively short life cycle (a few weeks to a few months), so it is important to exploit it before it dries out.
- In summer, and after drying of the therophytes, the biological spectrum will again include only the chamaephytes, or low woody plants, which are only valued by the dromedary. The latter being rare in the region, is limited to a few heads.

To sum up, in addition to the overgrazing within Metbasta rangeland, the woody species which are almost not eaten and the annual species having a very short life cycle and present only during limited period of the year the other units within the solar plant site either have none or a limited a pastoral interest value. According to data from the national forestry and pastoral inventory (2010), the supply of fodder units is on average 104 FU/ha/year in such natural rangelands and can reach 300FU/ha/year within rainy years. In improved plots that are important for the nutrient needs of the animals (see Table 35), the Acacia and the Pinecone Cactus populations provide 700 FU/ha/yr and 250-350 FU/ha/yr, respectively. Furthermore, based on section related to site field observations, areas with annual vegetation have also a good pastoral value, in fact such areas produce between 500 and 600 kg of dry matter/ha/year. If we consider the pastoral value of 1 kg DM = 0.33 FU (Feed Unit), the pastoral production of this zone would be 165 to 198 FU/ha/year. This represents 50% of the annual fodder needs (350 to 400 FU/year) for a 45 kg sheep.

**Table 7.13 - Daily needs of livestock in FU (Forage/ Livestock Unit)**

Livestock	Daily needs (FU/Day)
Camelidae	4 to 5
Equidae	4.7 to 5
Cattles	5.8 to 6.9
Sheep	0.7 to 0.9
Goats	0.7 to 0.9

Source: CRDA, 2021

According to CRDA data (see Annex XII) provided following the meeting held in 2021, the number of herders using the Metbasta land for grazing is determined on the basis of royalty vouchers issued by the Sbikha forest district.

It should be noted that extensive pastoralism is undertaken in the open lands of the Metbasta region, which cover an area of more than 10,000 hectares and are covered by land titles 20321 Kairouan, 20523 Kairouan, 20323 Kairouan and 33767 Kairouan. On the basis of information provided by the CRDA of Kairouan, the number of breeders who frequent the Metbasta grazing area is approximately 30 for a herd of 3000 head of cattle, to which must be added approximately 20 breeders who practice transhumance (who come from neighbouring areas) and whose herd size is estimated at 2000 head of cattle.

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the solar power plant site and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of the identified herders ranges from 30 to 400.

The value of the grazing fee is fixed and in the form of a pro rata (see Table 7.14). It does not in any way represent the reality.

**Table 7.14** - Grazing rates by type of livestock, by head and by type of range (in TND)

Livestock	Natural rangeland	Improved rangeland
Camelidae	0.6	1
Equidae	0.6	1
Cattle	0.6	1
Sheep	0.4	0.8
Goats	0.4	0.8

Source: CRDA, 2021

Figure 7.45 below is of livestock being grazed within Metbasta rangeland (photo taken during the site visit on September 26<sup>th</sup>, 2020).



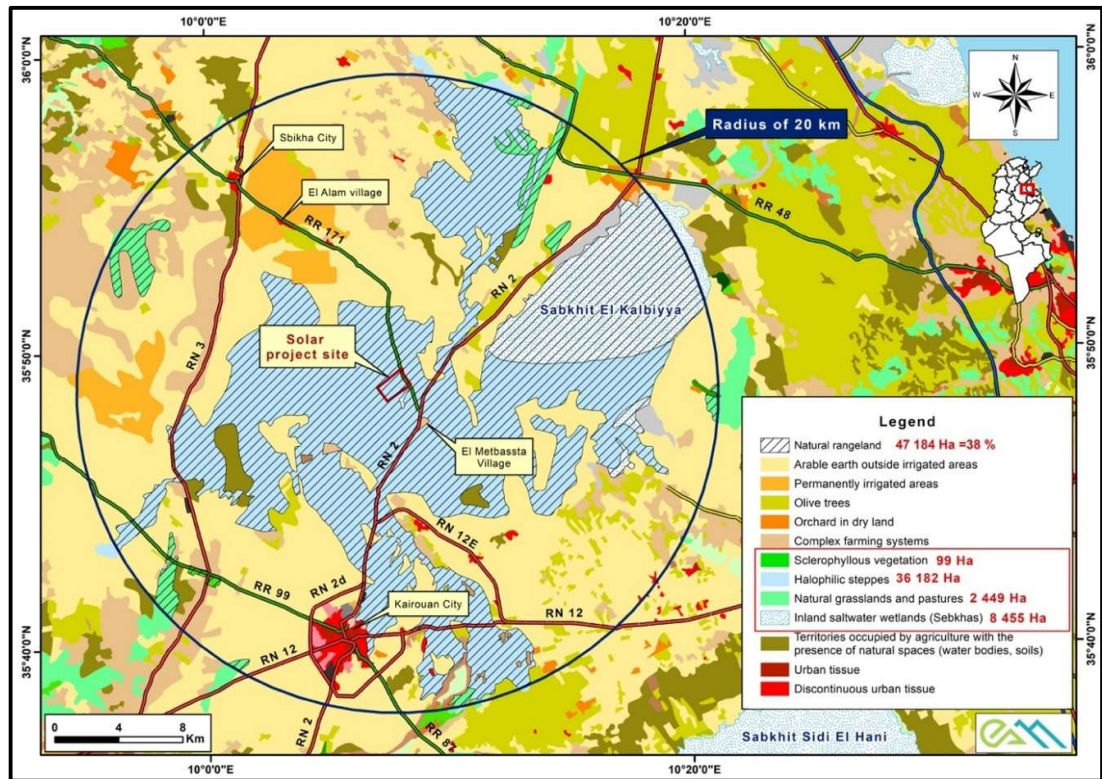
**Figure 7.45** - Livestock grazing within Metbasta rangeland (26/09/2020)

The project area in general is used throughout the year by herders from the villages of Dallousi and Metbasta. According to the consultations undertaken (see section 6.9), other marginal land uses are observed such as hunting and timber collection (which are very minor). It is important to note that these activities are generally undertaken on open land - which includes the wider Project site area.

The degradation of the Metbasta rangeland combined with the removal of rangeland areas for agricultural projects in the profile of young graduates in the governorate of Kairouan has contributed to the reduction in the number of herders using the Metbasta rangeland.

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the site of the solar power plant and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of the identified herders ranges from 30 to 400.

The figure below shows the extent of the grazing area and the location of the project site in relation to this area.



**Figure 7.46 - Rangeland grazing area around the Project site**

In addition, and based on communities' consultations, there is no specific objections or concerns raised in relation to land use and grazing activities specifically within the solar plant site.

#### 7.4.2 Archeology and Cultural Heritage

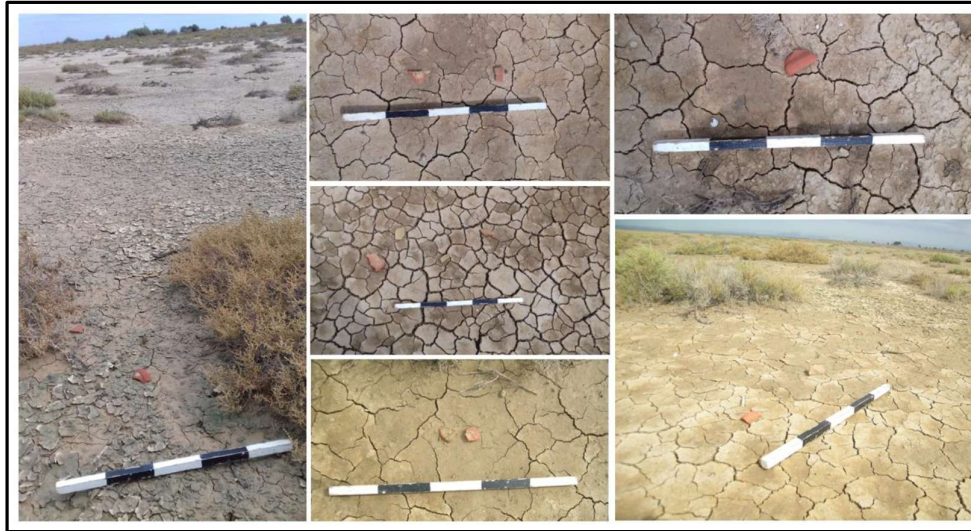
The archeology and cultural heritage baseline were based on a site-specific survey undertaken by an archeology and cultural heritage expert, in addition to review of available secondary data on the area.

The proposed site for the project has not been covered within the framework of the archaeological prospection campaigns, previously organized on behalf of the National Map of Archaeological Sites and Historical Monuments project (Tunisia). However, this site belongs to the topographic map of Maktar at the 1:200,000 scale which was investigated within the framework of the project of *the Prehistoric Atlas of Tunisia* (sheet No 8, Maktar (=Makthar). Institut National d'Archéologie et d'Art de Tunis and Ecole Française de Rome, col. de l'EFR-81). Published in 1985, the notices on this map does not indicate the presence of any archeology or cultural heritage site within the Project site and its surroundings to include pre-protolithic sites, stations, habitats, or monuments.

Furthermore, the survey did not reveal any traces of historical and/or pre-protolithic

occupation on the project site. However, it did allow the location and identification of certain artefacts

- A few shards of African sigillata ceramic, sometimes mixed with rare fragments of amphoras and shards of medieval ceramics, whose glaze is strongly diminished by the attack of the saline solutions produced by the salts accumulated in the soil (**Figures a and b**). These debris were probably brought by streams and rivers flooding the proposed site for the project; Such findings are not important and considered common and more importantly does not affect Project development.
- Several ceramic sherds - mostly ancient - towards the northern side of the RR-171 road leading to Sbikha, outside the site (**Figures c**). In fact, this is an accumulation produced by the presence of a gutter built under the embankments of RR-171 road for the evacuation of rainwater from the wadis and runoffs feeding the entire prospected sector; Such findings are considered common and not important, so, they do not affect Project development.
- Some rare and blunt traces of walls and scattered fragments of a colonial construction at the foot of the RR-171 road, on the northwestern corner of the project site (**Figure d**). Such findings are considered not important and common and does not affect Project development.
- A farm from the colonial period is located at the El-Alem agricultural estate, 6 km northwest of the site and about 10 km east of Sbikha (on the right side of the RR-171 road). It is most likely a farm - whose main activities were cattle breeding as well as cereal production and storage - which belonged to the “Société des Fermes Françaises de Tunisie” founded in 1898 (**Figures e and f**). Such findings are not important and common and more importantly does not affect Project development.



Rare shards of african sigillata and medieval ceramics found on the site



Amphora handles and ceramic shards brought by rivers flooding the site



Ceramic shards towards the north side of RR-171 road, outside the site



Scattered fragments of a colonial construction at the foot of the RR-171 road



**Panoramic view on the location of the colonial farm of the El-Alem agricultural estate**



**General view on the remains of the colonial farm of the agricultural domain El-Alem**

In conclusion, the prospected sector shows no trace of historical and/or pre-protohistoric occupation. The rare antique and medieval ceramic shards found on the Project site do not present any possible phases of human occupation in historical and/or pre-protohistoric times; they are considered outside the context of archaeological information and outside the context of direct chrono-archaeological testimony, since they were brought by the rivers flooding the site. Such findings are considered common and do not affect the Project development.

### **7.4.3 Socioeconomics**

This section presents the socio-economic conditions of the affected communities which as discussed earlier include: (i) El Alem, (ii) El Dalloussi, (iii) Bir Jdid, (iv) El Bechechma, and (v) Metbasta. The socio-economic conditions are based on collection of secondary data available on socio-economic indicators.

#### *7.4.3.1 Population*

The study area belongs to the delegation of Sbikha which is administratively under the jurisdiction of the governorate of Kairouan.

According to the latest census carried out during the year 2014, the Sbikha delegation had 71,922 inhabitants grouped into 16,168 households and 18,115 housing (INS, 2014).

According to the INS estimate, the population of the Sbikha delegation was 74,464 inhabitants in 2018.

***For the below sections of statistics on demography, education and employment, data is available only at the scale of the governorate and the delegations.***

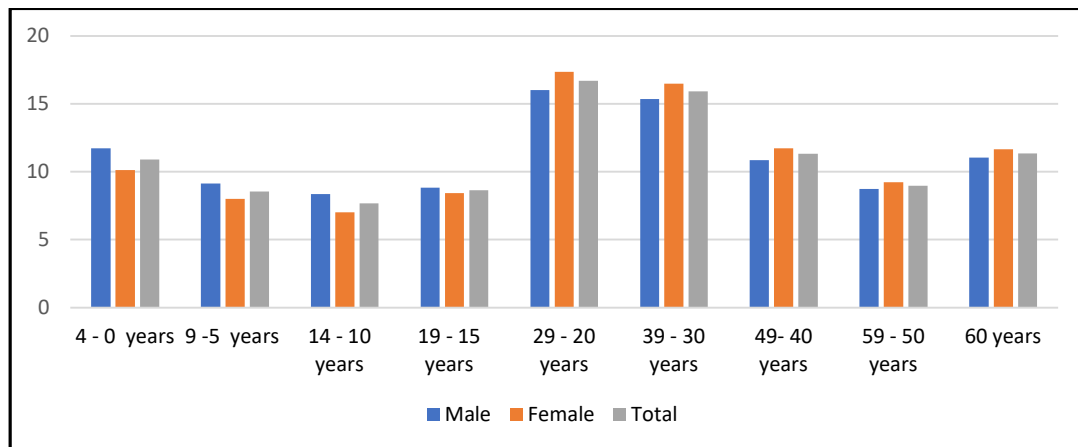
**7.4.3.2 Demographic data**

The distribution of the population by gender and the projection of the population by gender and age groups in the Sbikha delegation are provided in Table 7.15 and Figure 7.47, respectively.

**Table 7.15 - Distribution of the population by gender**

Region	Male	Female	Total
Delegation of Sbikha	35,224	36,698	71,922
Delegation of Kairouan Nord	47,834	48,947	96,781
Governorate of Kairouan	280,186	290,250	570,436
Tunisia	5,472,251	5,510,222	10,982,476

Source: INS, RGPH 2014



Source: INS, RGPH 2014

**Figure 7.47 - Distribution of the population by gender and age groups**

The demographic structure of the Sbikha region is characterized by its youth, composed of almost as many males as female. Indeed, in 2014, the population aged between 20-29 years represented about 17% of the total population of the region (INS, RGPH 2014).

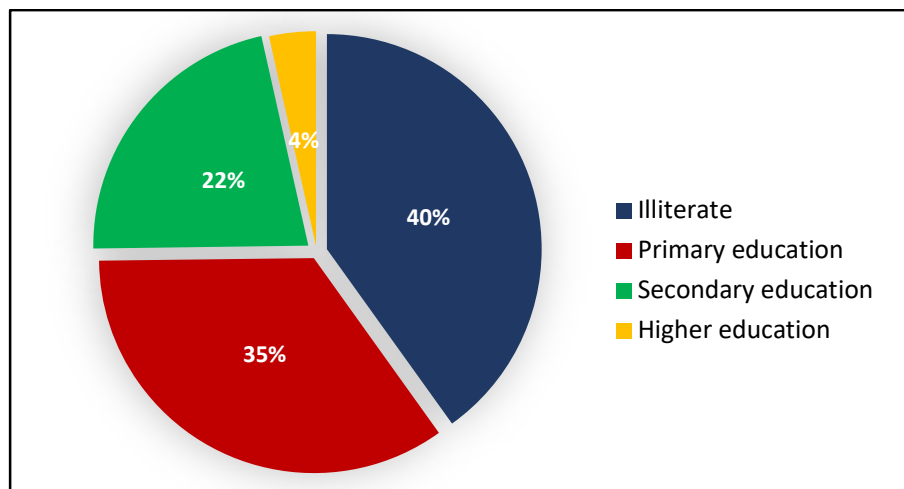
**7.4.3.3 Education Characteristics**

The education characteristics of the Sbikha delegation are illustrated in Table 7.16 and Figure 7.48, respectively.

**Table 7.16 - Education Characteristics (%)**

Education level	Illiterate	Primary Education	Secondary education	Higher education	Population 10 years and older
<b>Male</b>	26.3	43.6	26.4	3.6	27,878
<b>Female</b>	52.9	26.5	17.3	3.3	30,049
<b>Total</b>	40.1	34.7	21.7	3.5	57,927

Source: INS, RGPH 2014



**Figure 7.48 - Distribution of the population 10 years and older by level of education in the Sbikha delegation**

#### 7.4.3.4 Unemployment

Details associated with unemployment are provided in Table 7.17.

**Table 7.17 - Unemployment rate by gender in 2014 (%)**

Region	Male	Female	Total
<b>Delegation of Sbikha</b>	12.41	22.72	15.30
<b>Delegation of Kairouan Nord</b>	13.23	27.61	17.77
<b>Governorate of Kairouan</b>	12.87	28.95	16.96
<b>Tunisia</b>	11.43	22.45	14.82

Source: INS, RGPH 2014

The information associated with unemployment indicates that the rate of 15.30% in Sbikha is lower than the average of the governorate (16.96%) but higher than the national average of 14.82% in 2014. Females are significantly more affected by unemployment (22.72%) than males (12.41%). Moreover, it affects mainly youth (29.50%) and specifically young women (33.24%) (INS, 2014). Furthermore, among graduates, the unemployment rate is 30.45% with 42.61% affecting young female graduates (INS, 2014).

**Table 7.18 - Unemployment rate for higher education graduates (%)**

Region	Male	Female	Total
Delegation of Sbikha	19.48	42.61	30.45
Delegation of Kairouan Nord	16.96	38.34	27.64
Governorate of Kairouan	16.52	37.51	26.63
Tunisia	12.12	28.80	20.06

Source: INS, RGPH 2014

7.4.3.5 Livelihoods

The level of economic activity is given in Table 7.19.

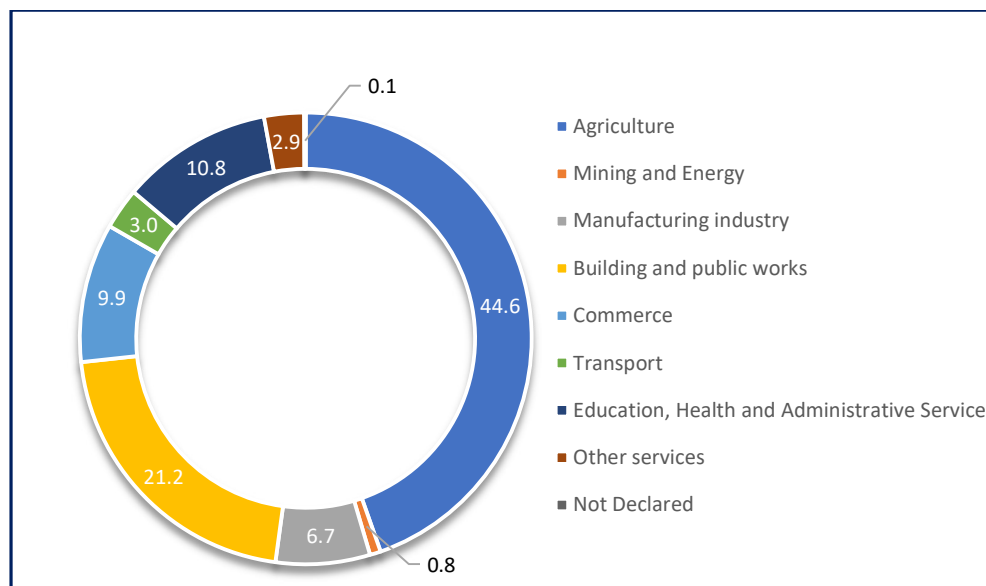
**Table 7.19 - Activity rate (%)**

Region	Male	Female	Total
Delegation of Sbikha	64.47	22.85	42.65
Delegation of Kairouan Nord	67.08	29.51	47.83
Governorate of Kairouan	62.37	19.69	40.20
Tunisia	65.47	28.20	46.55

Source: INS, RGPH 2014

The data in Table 7.19 indicates that the total labor force participation rate in Sbikha (42.65%) is higher than the governorate of Kairouan (40.20%) and lower than the national rate (46.55%).

The economic structure in the Sbikha delegation is illustrated in Figure 7.49.



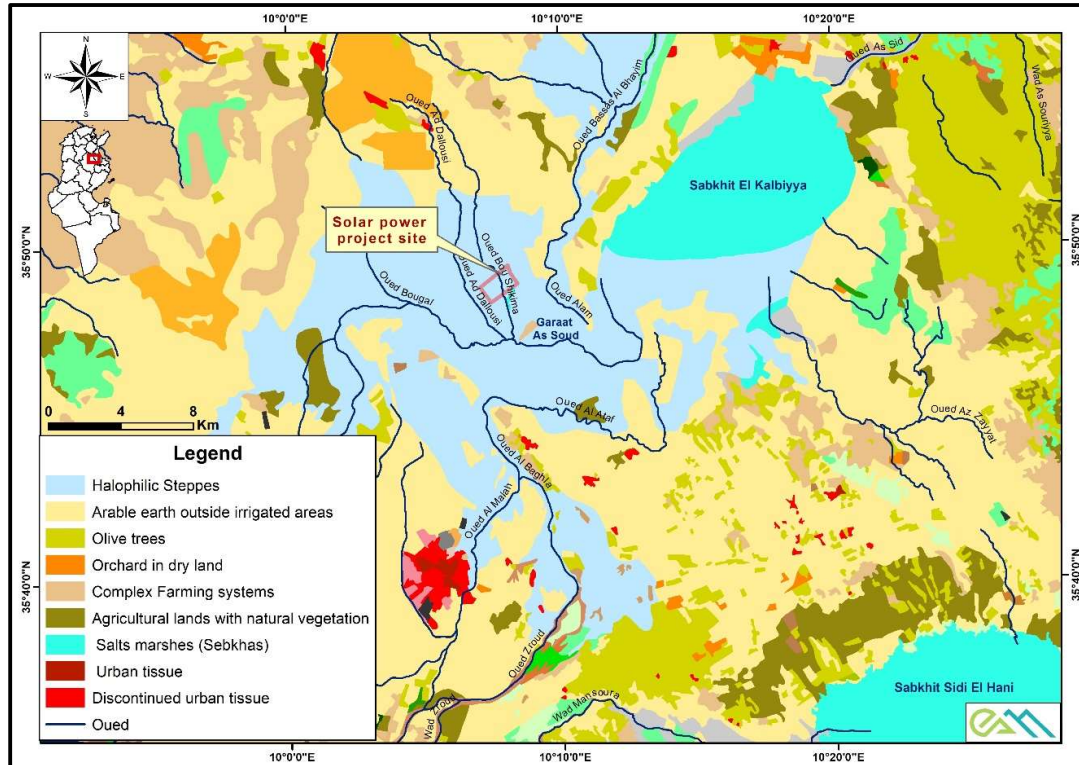
**Figure 7.49 - Structure of the employed labor force by industry sector**

According to the figure above, economic activity in the study area is mainly centered on three sectors: agriculture (44.6%), construction and public works (21.2%), education, health, and administrative services (10.8%) (INS, 2014).

**(i) Agriculture**

According to INS data, agriculture is the main economic activity of the population of Sbkha. It is the primary sector of the local economy, employing 44.6% of the active population.

According to the land use map, the proposed PV power plant is located in a land with halophilic steppes where salt plant species were extending over the plain (see Figure 7.50 Land Use Map).



Source: Land use map of Tunisia at 1/100,000; established by the Ministry of the Environment by adopting the CORINE LAND COVER nomenclature, 1996.

**Figure 7.50 - Land Use Map in the Study Area**

The distribution of the area by land use category in 2018 is given in the table below.

**Table 7.20 - Area distribution by land use category (ha)**

Area distribution by land use category		Soil types			
		Arable land	Pastoral Land	Forests	Others
Region	Delegation of Sbkha	46,178	42,662	4,687	8,824
	Delegation of Kairouan Nord	13,616	7,808	-	5,099
	Governorate of Kairouan	347,929	207,119	37,627	62,260

Source: ODCO, 2019

Crop production by species is given in the table below.

**Table 7.21 - Crop production by species (Tons)**

Crop production by species		Region		
		Delegation of Sbikha	Delegation of Kairouan Nord	Governorate of Kairouan
Types of crops	Cereal growing (quintal)	199,900	67,760	865,538
	Vegetables (ton)	105,585	14,007	402,506

Source: ODCO, 2019

According to the above data, agricultural production in the Study Area is mainly dominated by the production of cereals (199,900 quintals) and vegetables (105,585 tons) in 2018. Olive production in the Kairouan region is on the rise, from 50,680 tons in 2015 to 128,300 tons in 2018 (ODCO, 2019).

During a site visit carried out in April 2021, a fenced plot with an area of almost 400 ha for agricultural use was seen. This plot is located almost 1 km northern the solar plant site, along the RR-171 (see photos on section 7.2.4 Hydrology). According to data collected from CRDA of Kairouan, other plots will be provided to young unemployed people for agricultural use within a governmental project aiming to decrease unemployment rate within Kairouan region.

**(ii) Breeding**

Breeding in the Sbikha delegation is also an important activity. It is mainly traditional breeding (goat, cattle, sheep). Table 7.22 shows the distribution of livestock within Sbikha and Kairouan Nord delegations as well as within all the governorate of Kairouan.

**Table 7.22 - Livestock**

Livestock census		Livestock		
		Cattle	Sheep	Goats
Region	Delegation of Sbikha	9,696	79,700	6,700
	Delegation of Kairouan Nord	1,171	35,300	1,764
	Governorate of Kairouan	26,000	719,000	56,000

Source: ODCO, 2019

According to the data in the table above, the livestock in the Kairouan region consists mainly of sheep, where 79,700 productive females are counted in the delegation of Sbikha, i.e. 83% of the total livestock in this delegation. In fact, when there is rainfall, the site is covered with therophytic vegetation and is transformed into a grazing area with a more attractive food and nutrient quality for pastoralism. Given their proximity, the herders of

Dallousi and Metbasta are the most interested in the site of the planned solar power plant (figure below).



**Figure 7.51** - Livestock grazing within Metbasta rangeland (26/09/2020)

Furthermore, the Kairouan region is known for camel breeding. This was confirmed by the field visit, where the remains of dromedary faeces were found on both sides of the site (see figure below), as the camel grazing period is mainly limited to the summer season. Indeed, camel husbandry is enhanced by the availability of natural rangelands and watering points, and the use by camels of a wider range of pastoral resources than other species, thus better preserving the arid environment and on the other hand better contributing to indigenous food security as well as to the regional economy (UNOPS-TUNISIA, 2015).



**Figure 7.52** - Camelina excrement (04/09/2020)

At the level of the Metbasta area, the detailed data collected from the forestry service of Kairouan show that the natural course of Metbasta extends over a total area of about 10,000 ha with a vegetation composed mainly of plant groups of *Zizifus lotus* ; *Stipa tenacissima*; *Edysarum carnosum*; *Oleae europea*, as well as halophilic groups such as *Salicornia arabica*, *Sueda Frutecosa*, *Arthrocnemum indicum*, *Arthrocnemum glocum* and *Atriplex Halimus*, *Atriplex glauca*, not to mention the species *Tamarix aphylla*, *Cirpes*, *Typha* and *Phragmites*

The Metbasta range in general and the solar power plant site in particular have been severely disturbed by overgrazing. Although the rangeland improvement project has been completed and plants such as *Brachychiton acerifolius*, *Acacia cyanophylla*, *Acacia cyclopes* and *Opuntia ficus indica* have been introduced, none of these species were observed during the biodiversity survey of the project site, confirming the disturbed nature of the site.

Details of grazing activity have been provided above in section 7.4.1 on land use.

Finally, the use of Metbasta's rangelands is highly unstable, whether temporarily, spatially or zootechnically, as it depends on several factors, namely: climatic, ecological, social and economic.

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the solar power plant site and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of the identified herders ranges from 30 to 400.

**(iii) Industries**

The human potential is very important, the workforce is available but limited in qualifications. The natural potential is also important, especially in the food processing, transformation, building materials and storage. A diversified industrial fabric and an activity based around 178 industrial units that offer in 2018, the number of 10,211 jobs.

**Table 7.24 - Breakdown of companies by industry**

Breakdown of companies by industry		Number of companies	Number of jobs
Types of industries	<b>Agri-Food Industries</b>	3	55
	<b>Building Materials, Ceramics and Glass Industries</b>	1	40
	<b>Various Industries</b>	2	1,194
	<b>Total</b>	<b>6</b>	<b>1,289</b>

Source: ODCO, 2019

The industrial zones of Kairouan are 6 in number and cover an area of 133.5 ha distributed as follows:

**Table 7.25 - Industrial zones in the governorate of Kairouan**

Zones	Developed surfaces (Ha)	Total number of lots	Lots sold	Built Lots	Lots under construction
<b>Industrial Property Agency</b>					
<b>Kairouan I</b>	10	33	33	28	0
<b>Kairouan II</b>	26	85	66	11	7
<b>El Hajeb</b>	10	43	34	11	2
<b>Sbikha</b>	50	21	17	2	10
<b>Total</b>	<b>96</b>	<b>182</b>	<b>150</b>	<b>60</b>	<b>19</b>
<b>Regional Council</b>					
<b>R. Tunis</b>	1	44	60	59	12.5
<b>R. Baten</b>	-	33	61	41	25
<b>Total 2</b>	-	-	-	-	37.5
<b>Total</b>	<b>1</b>	<b>77</b>	<b>121</b>	<b>100</b>	<b>133.5</b>

Source: ODCO, 2019

It should be noted that three industrial zones are planned in the governorate of Kairouan: El Weslatia industrial zone, Sbikha II industrial zone and Nasrallah industrial zone.

**(iv) Tourism**

The governorate of Kairouan has important assets that could make it a great tourist destination. These assets are the following:

- A privileged geographical situation as a central crossroads and a point of passage towards the south, the north, the east and the west of the country.
- A rich and diverse cultural heritage - both tangible and intangible - notably with a medina listed as a world heritage site, but also a dense archaeological potential with the remains of monuments and sites that are as important as each other (archaeological areas of Raqqada, Jebel Oueslat, Sidi Ammar, Haffouz and Ksar Lamsa).
- A remarkable wealth of natural sites and parks (Djebel Touati park of about 961 ha in the Delegation of Nasr'Allah, the natural park of Djebel Chrichira in Haffouz of about 300 ha and the national park of Djebel Zaghdoud of about 2000 ha in the Delegation of Oueslatia) offering a global surface of 3260 ha of parks and protected areas which can serve a quality ecological tourism.
- Recreational opportunities for hunting - wild boar hunting in Oueslatia and Haffouz and fishing - at the Sidi Saâd dam.
- A potential for hot springs and spas.

- A rich handicraft industry - in particular carpets - as well as ancestral local know-how that can be used to enhance multiple cultural tourism circuits.

7.4.3.6 Rate of electrification

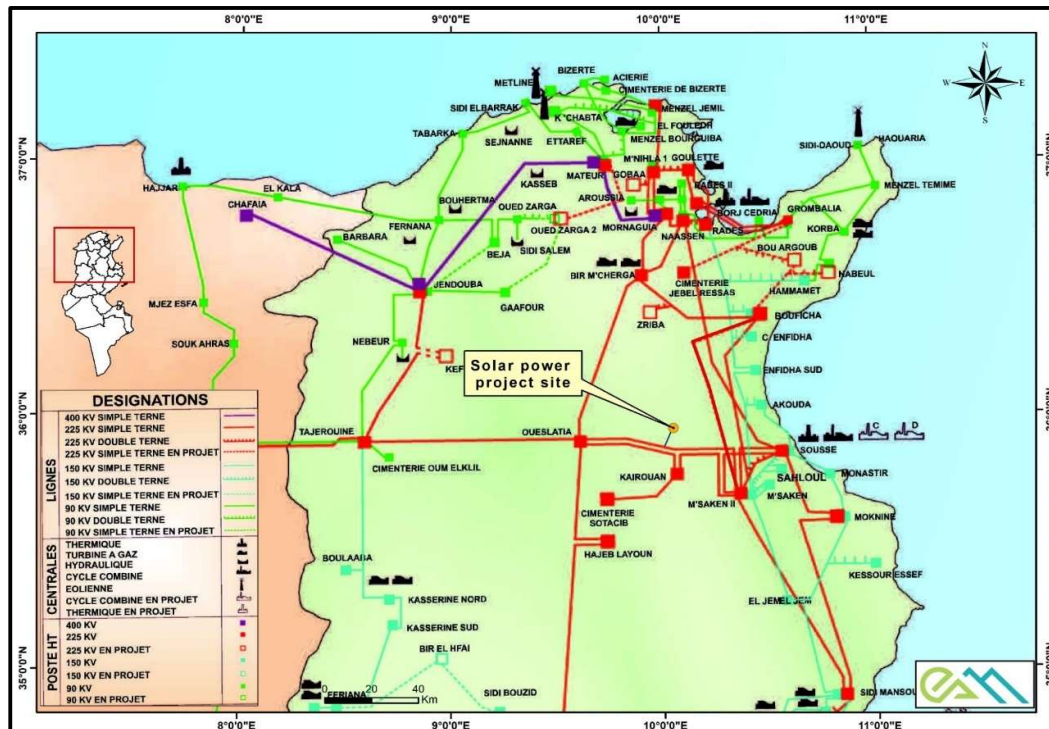
The rate of electricity supply to the governorate of Kairouan and the Sbikha delegation is 99.6% and 97% respectively. The evolution of electricity consumption by beneficiary in the governorate of Kairouan is given in Table 7.26.

**Table 7.26 - Evolution of Electricity Consumption in GWH**

Region	Domestic use			Industrial companies			Other companies		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
<b>Governorate of Kairouan</b>	197	202	207	94	95	68.7	63	65	60.9

Source: STEG, 2019

The map of the electric power generation and transmission system is shown in Figure 7.53.



**Figure 7.53 - Map of the Power Generation and Transmission Network**

The project area includes single circuit 225kV power lines and the Kairouan 225kV HV substation.



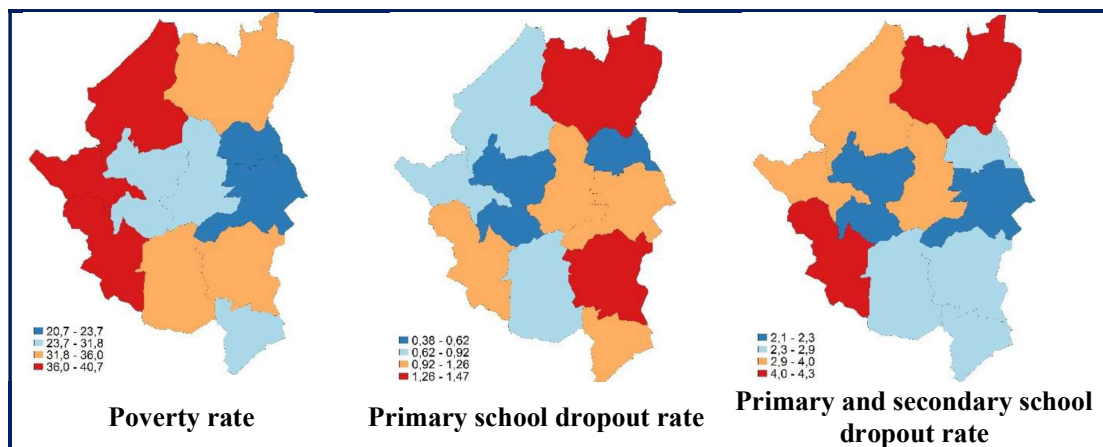
**Figure 7.54 - Site Access Road Through RR-171**

*7.4.3.7 Poverty and school dropout*

The governorate of Kairouan is one of the poorest governorates in Tunisia (3rd). In 2015, a poverty rate of 29.3% was recorded, compared to a national average rate of 15.3%. In addition, the poverty gaps between its different delegations are significant. The delegations of Oueslatia, El Ala and Hajeb el Ayoun have the highest poverty rates, respectively 40.9%, 38.3% and 36.6%, followed by the delegation of Sbikha and Sidi Ali Ben Nasrallah where a rate of 35.1% is recorded.

In addition, the poorest delegations are characterised by subsistence farming, a dominant rural environment, a weakness in basic infrastructure, a high unemployment rate, a high illiteracy rate, a very low level of education among the population, a significant rural exodus and a problem of school drop-out.

The figures and data in the table below illustrate the positive relationship between the poverty rate and the school dropout rate in the governorate of Kairouan in 2015.



Source: INS & BM, 2020

**Figure 7.55 - Relationship between the poverty rate and the school dropout rate in Kairouan Governorate**

**Table 7.27 - School dropout rate and poverty rate of Kairouan delegations (2015)**

Delegation	Primary dropout %	Secondary dropout %	Primary and secondary dropout %	Poverty rate %
<b>Oueslatia</b>	0.6	9.1	3.3	40.9
<b>Ala</b>	0.8	7.3	4.0	38.3
<b>Hajeb El Ayoun</b>	1.3	11.4	4.3	36.6
<b>Sbikha</b>	1.3	8.1	4.1	35.1
<b>Sidi Ali Ben Nasrallah</b>	0.8	6.9	2.7	35.1
<b>Sidi Amor Bou Hajla</b>	1.5	6.9	2.4	32.7
<b>Haffouz</b>	0.5	6.7	2.1	31.4
<b>Cherarda</b>	1.0	6.3	2.9	28.0
<b>Chebika</b>	0.9	7.5	3.4	24.2
<b>Kairouan Sud</b>	1.0	7.4	2.2	23.0
<b>Kairouan Nord</b>	0.4	5.0	2.3	20.8

Source: INS & BM, 2020

The Delegation of Sbikha is the second ranked in terms of school dropout while the highest educational level is recorded at the Delegation of Kairouan-Nord, the one with the lowest poverty rate at the governorate level in 2015.

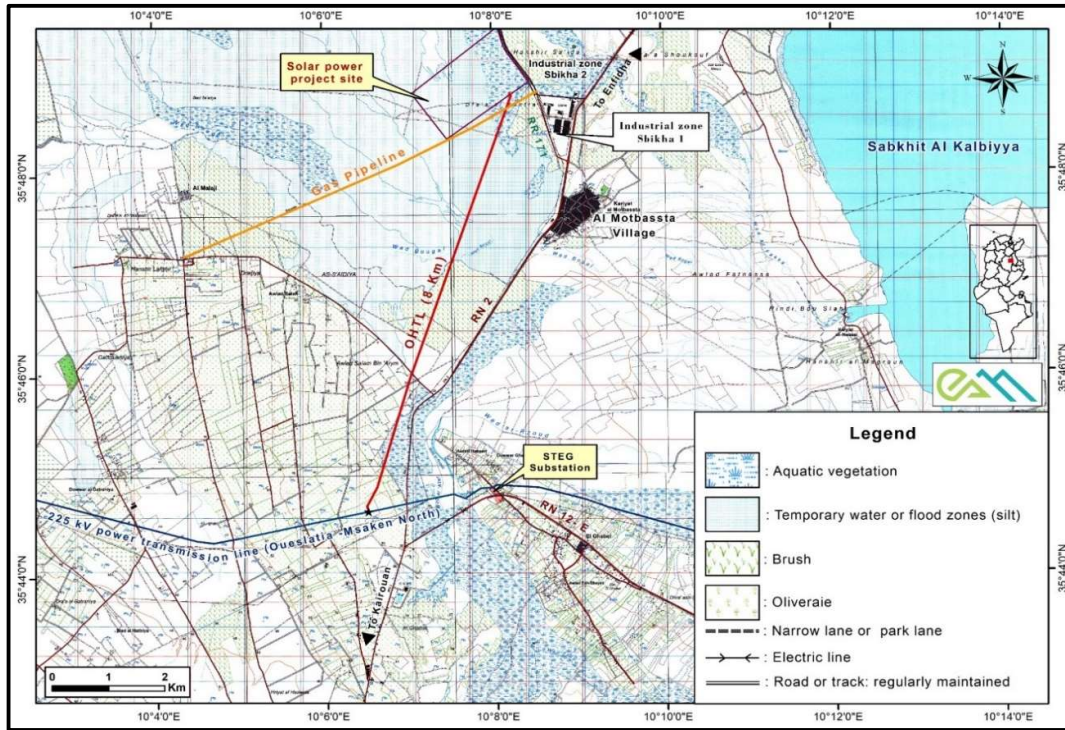
#### 7.4.3.8 Infrastructure and utilities

Assessment of baseline conditions was based on a site visit undertaken by the ‘ESIA Team’ to the Project site and surrounding areas. The site visit aimed to understand any key infrastructure and utility elements onsite. In addition, desktop review was undertaken on collect information and on key infrastructure and utility service provisions as related to the Project development to include water supply, wastewater, solid waste, hazardous waste facilities, and road networks.

##### (i) Site visit

Based on the site visit undertaken, the key infrastructure identified at or within the immediate vicinity of the project site is listed below:

- Existence of a road almost 20 m from the boundary of the project site.
- Presence of STEG 30kV overhead transmission line on the side of the regional road RR-171 linking Sbikha to Kairouan.
- Presence of a gas pipeline (diameter of 8 inches) that runs along the southern boundary of the PV plant to supply the industrial zone of Sbikha with natural gas under a pressure of 20 bars.



**Figure 7.56 - Infrastructure within the Project Area**

The landscape map below shows some photos of the project site and identified key infrastructure.



Figure 7.57 - Landscape within the Project Area

**(ii) Water Supply**

The potable water supply in the Governorate of Kairouan is satisfactory, with a rate of 100% in urban areas and 84.1% in rural areas. In fact, 32.4% of the rural water supply is provided by SONEDE and 51.7% by the Rural Engineering Department of CRDA. Rural Engineering (RE) systems are managed by Users' associations called “Groupement de Développement Agricole” (GDA). Based on 2019 data, there are approximately 129 drinking water GDAs, 78 irrigation GDAs and 6 mixed GDAs for drinking water supply (DWS) and irrigation in Kairouan governorate. Table 7.28 and 7.29 below presented respectively the water supply rate in the governorate of Kairouan and the distribution of GDAs in the project area.

**Table 7.28- Water Supply Rate in the Governorate of Kairouan (2018)**

SONEDE			RE	SONEDE+RE	Total
Communal	Non-communal	Total	Non-communal		
100%	32.4%	56.6%	51.7%	84.1%	89.8%

Source: SONEDE, 2019

**Table 7.29 - Distribution of GDAs in the Project Area (2019)**

Distribution of GDAs		Drinking water GDA	Irrigation GDA	Mixed GDA	Total
Region	Sbikha delegation	31	10	-	41
	Kairouan-Nord delegation	2	2	-	4
	Kairouan Governorate	129	78	6	213

Source: CRDA, 2019

The volume of drinking water distributed in Kairouan Governorate during the year 2018 is 20.4 million m<sup>3</sup> with a consumption of approximately 11.4 million m<sup>3</sup> distributed as follows (SONEDE, 2019):

**Table 7.30 - Volume of water consumption per use in Kairouan Governorate (in 10<sup>3</sup> m<sup>3</sup>)**

Household connected	Household non-connected	Commerce	Administ.	Municipal	Industry	Tourism	Diverse
9 144	533	227	952	275	161	26	41

Source: SONEDE, 2019

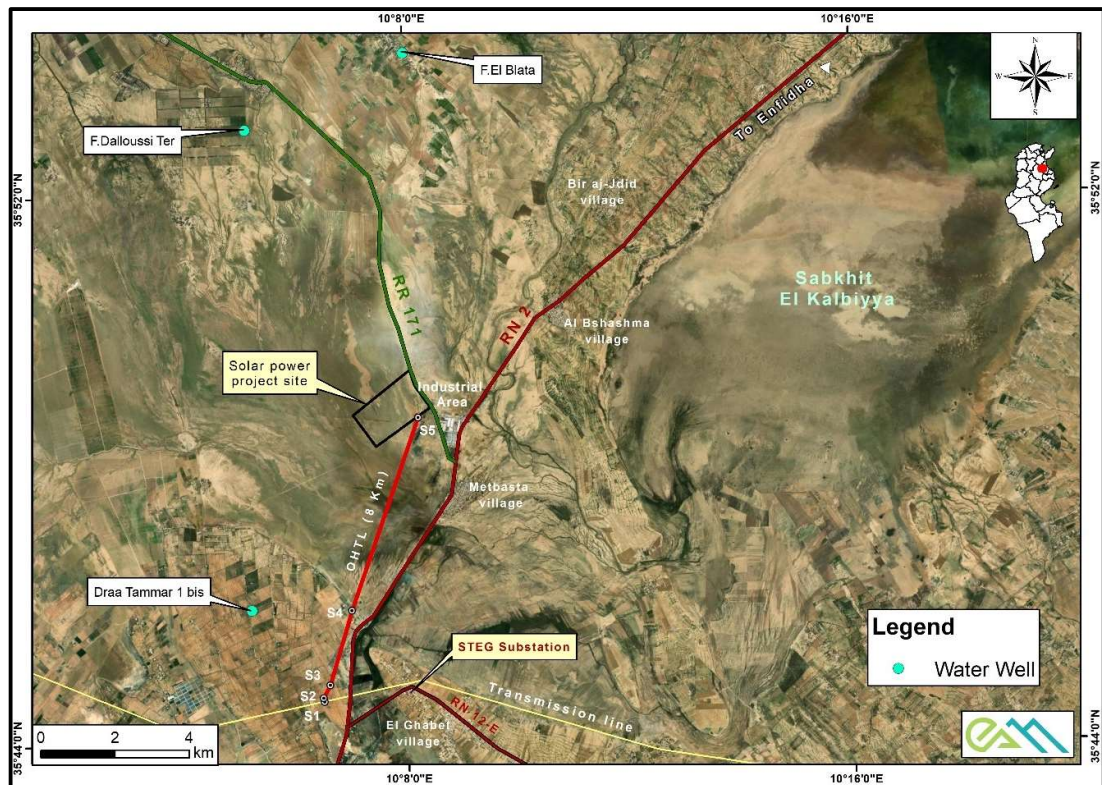
As reported at the section 7.2.5 of the present ESIA, the study area contains only the phreatic groundwater of Sisseb-El Alem and the Plio-Quaternary Sisseb deep groundwater. Based on 2015 data, the Plio-Quaternary Sisseb deep groundwater is exploited through 156 equipped water wells (with pumps). The table below presents the exploitation of the Plio-Quaternary Sisseb aquifer by type of use.

**Table 7.31 - Exploitation of the Plio-Quaternary Sisseb deep aquifer by type of use (2015)**

Potable Water						Agriculture	Industry	Tourism	Total				
SONEDE		RE		Total									
<b>Plio-Quaternary Sisseb deep aquifer</b>													
Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.
0.24	1	0.07	1	0.31	2	7.42	154	0	0	0	0	7.73	156
<b>Total of 32 deep aquifers in Governorate Kairouan</b>													
Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.	Mm <sup>3</sup>	Nb.
39.05	55	7.67	78	46.72	133	60.34	861	2.57	19	0.04	1	109.67	1014

Source: DGRE, 2015

In light of the above, only 2 wells are used for drinking water supply, i.e. 1.28% of the total number of wells drilled, the rest being used for irrigation (7 state-owned and 147 privately-owned wells). To be re-noted that a total volume of 13.1 Mm<sup>3</sup> was withdrawn during the year 2015 from the four aquifer levels of Sisseb El Alem (Plio-Quaternary Sisseb, Plio-Quaternary El Alem, Miocene Sisseb, Oligocene El Alem) per 15 Mm<sup>3</sup> of total available resources. Three deep groundwater wells are located within a radius of 10km around the project area (see Figure 7.58 - Water wells nearby the project area).



**Figure 7.58 - Water wells nearby the project area**

**(iii) Wastewater Infrastructure and Utilities**

There are six wastewater treatment plants in the governorate of Kairouan, distributed as follows:

**Table 7.32 - Wastewater treatment plants in the governorate of Kairouan**

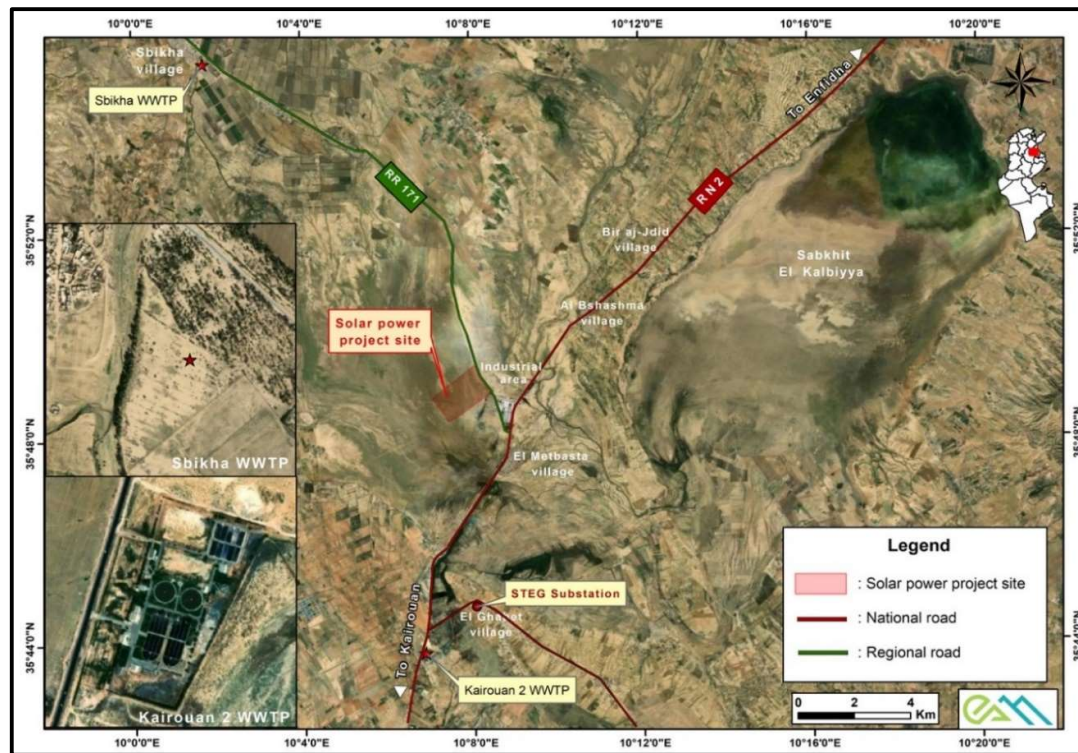
WWTP	Site	Operation date	Treatment capacity (m <sup>3</sup> /d)	Biological capacity (kg/CBOD <sub>5</sub> /d)
Hajeb El youn	Kairouan	2006	2,020	944
Bouhajla	Bouhajla	2006	1,343	552
Oueslatia	Oueslatia	2006	1,020	620
Haffouz	Haffouz/Ain Zena	2006	1,513	792
Kairouan	Kairouan	2008	20,000	9,000
Sbikha	Sbikha	2021	1 200	540

Source: ONAS, 2022

The closest wastewater treatment plant to the project site is the one in Kairouan which is located 10 km southeast of the project site.

It should be noted that the Sbikha wastewater treatment plant was commissioned in September 2021.

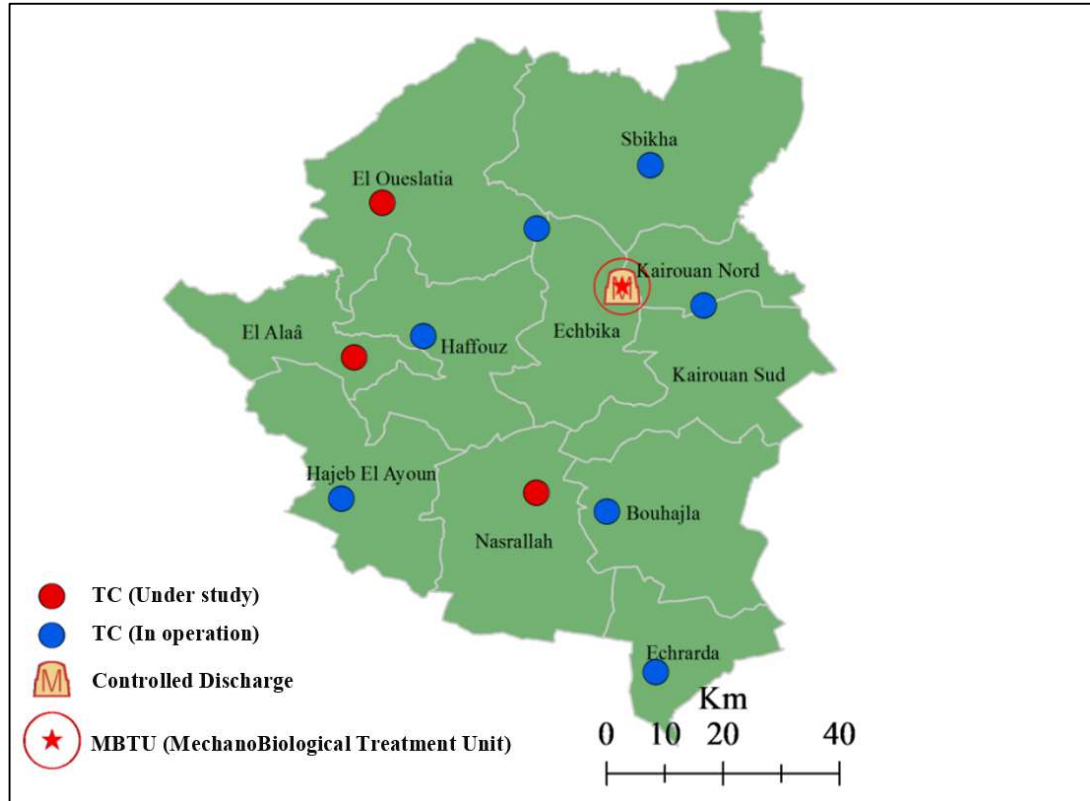
Located about 15 km northwest of the project site and with a nominal tertiary treatment capacity of 1,200 m<sup>3</sup>/day of domestic wastewater, the Sbikha WWTP is currently treating 700 m<sup>3</sup>/day. The treated water is mainly used for the irrigation of the state-owned agricultural land in the Sbikha area.



**Figure 7.59 - Wastewater Locations near the Project Area**

**(iv) Solid waste infrastructure and utilities**

The household waste generated by the project will be transported to the controlled landfill of El Baten. With an initial area of 18 ha, this landfill located 11 km west of the city of Kairouan is in operation since July 2008. Supplied by seven (7) transfer centers within the governorate of Kairouan, namely, Hafouz, Sidi Amor Bou Hajla, Ain Jloula, Hajeb Layoun, Cherarda, El Madina and Sbikha, the controlled landfill of El Baten treats an average of 165 tons of waste per day, an average of 60,000 tons per year.



Source: ANGED, 2017

**Figure 7.60 - Transfer centers and controlled discharge in Kairouan Governorate**

**Table 7.33 - Solid waste infrastructure in Kairouan Governorate**

Controlled landfill	Transfer centers	Number of municipalities involved	Date of start of operation	Annual Capacity	Average daily capacity
El Baten	- Hafouz - Sidi Omar Bou Hajla - Ain Jloula - Hajeb layoun - Cherarda - El madina - Sbikha	11	July 2008	60,000 T	165 T

Source: ANGED, 2022

**(v) Hazardous waste infrastructure and utilities**

The Jeradou centre is the only infrastructure in Tunisia for the treatment and disposal of hazardous waste. This landfill, located in Jeradou, about 80 km north of Kairouan, is currently closed for environmental and social reasons. While waiting for the rehabilitation and reopening of this landfill to the public, industrialists are sometimes forced to temporarily store on site some hazardous waste generated by their activity.

In Tunisia, the collection, transport, treatment and dumping of hazardous and special waste are regulated. The list of companies authorized by the Minister of Environment for the management of hazardous waste is available on the website of the National Agency for Waste Management (ANGED): <http://www.anged.nat.tn/>

The list of authorized companies includes companies specialized in: Management of Electrical & Electronic Waste.

- Management of Lubricating oil
- Transport of hazardous waste.
- The management of batteries.
- Industrial waste management.
- Management of printing cartridges.
- Management of health care waste.

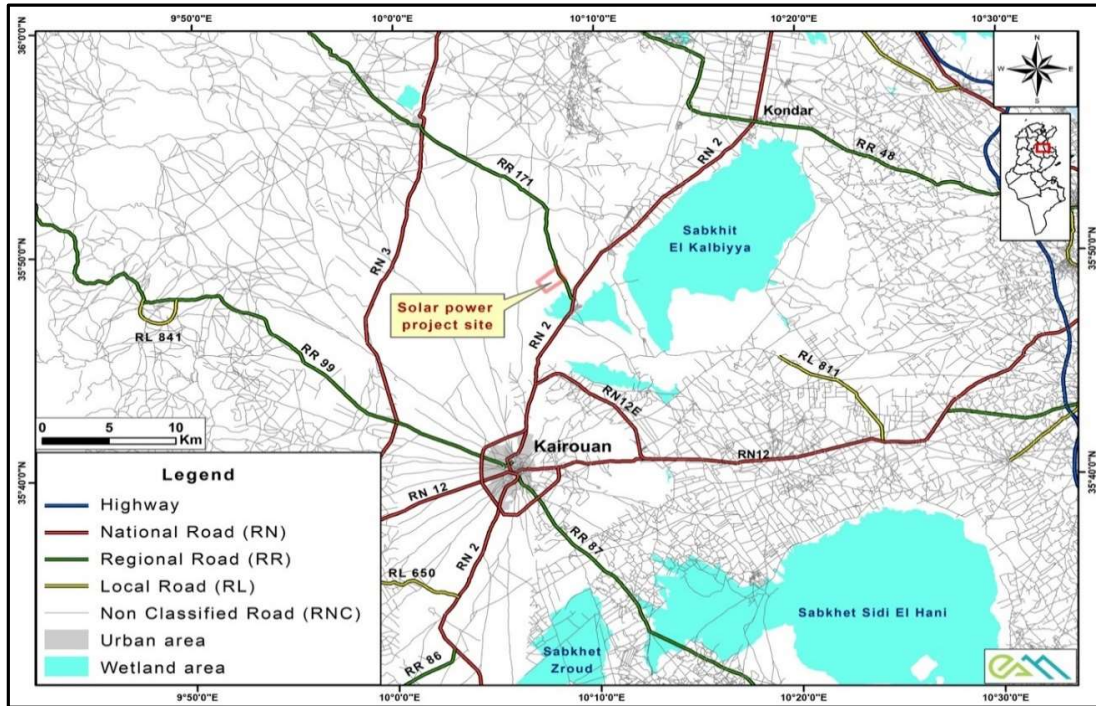
Among these companies, at least 8 companies of collection, transport and treatment of hazardous waste are located in the governorate of Kairouan. It is about :

- “Le Croissant Vert” company: collection, transport, and treatment of healthcare waste.
- “Centre Environnement” company: collection, transport, and treatment of healthcare waste.
- “MRAD” company: collection, transport, and recycling of print cartridges.
- “Mohiddine H'SSIN” company: SOTULUB Storage Center (collection and transport).
- “ECO METAL TRADING” company: Collection, transport, and recycling of used batteries.
- “METAL BLANC TUNISIE”: Collection, transport and recycling of used batteries and scrap metal non-ferrous.
- “ECO WASTE”: Collection, transport and recovery of waste electrical and electronic equipment and household appliances.
- “GREEN TIC” company: collection, transport, storage, sorting, and recycling of waste electrical and electronic equipment.

**(vi) Road networks**

The project area is located west of the national road RN2. It is the main road that connects Enfidha (in the north) to Skhira (in the south).

From the RN2, there is the regional road RR-171 connecting Metbasta to Sbikha, to which the project site is adjacent (see Figure below). The road traffic on the RN2 and the RR-171 is respectively estimated at 10,886 and 2,964 vehicles per day, including heavy goods vehicles (DGPC, 2017).



**Figure 7.61 - Site Access Map**

## 8.0 IMPACT ASSESSMENT AND MITIGATION MEASURES

This chapter assesses the way the solar plant will interact with elements of the physical, biological environment, social environment and infrastructure and utilities to produce impacts to resources/ receptors. It has been organized as per the various phases of the Project life cycle to understand the risks and impacts associated with each phase.

The following definitions are used:

- **Project Site:** is the area where the solar PV will be constructed and will be surrounded by a fence.
- **Project Area:** is the project site and its nearest surroundings where indirect, combined, and cumulative effects are likely to occur on the surrounding areas and communities.
- **Study area:** is the wider area of influence where indirect, combined, and cumulative effects are likely to occur at the scale of the total governorate of Kairouan.

### 8.1 *Impacts during the Construction phase of the solar plant*

This section identifies and assesses the anticipated impacts within the solar plant and surrounding areas during the construction phase. For each impact, a set of mitigation and monitoring measures are identified to avoid and minimize adverse impacts or are designed to maximize positive impacts.

#### 8.1.1 Impacts on physical environment

##### *8.1.1.1 Landscape and Visual*

Site preparation activities by the EPC Contractor will include the installation of arrays and the various project components, including transmission cables, access roads and internal road network, storage buildings, etc. These activities will result in land clearance, ground levelling, excavations, and grading.

From the start of construction activities, visual changes will occur from the modified ground surface and the presence of construction equipment and machinery (excavators, trucks, front end loaders, compactors, and others).

#### **Mitigation Measures**

The following mitigation measures will be applied:

- The project will be designed to balance site cuts and fills.
- The construction site will be left in a tidy condition at the end of each workday.

- Waste streams will be properly stored and not allowed to spread outside of the Project Site, in conformity with the waste management plan (WMP) to be followed by the EPC contractor.
- All areas will be fully restored once they have been used for construction works to restore the natural visual setting to the extent possible.
- All artificial lights used will adopt a downlighting strategy so that artificial light does not escape outside of the Project Site and will not have a negative impact on driving conditions on RR-171.

**Monitoring and reporting requirements**

The following monitoring measures will be implemented:

- The condition of the worksite each day shall be inspected which includes the waste storage area, to ensure that the site is kept tidy.
- The ground areas disturbed during construction shall be inspected before the contractor demobilizes, to check that the land has been adequately restored.
- The condition of the boundary natural vegetative screening will be checked to see if this is becoming established and maintained, as required.

Impact	Landscape and visual
Type of impact	Negative
Type of Effect	Direct
Duration	The effects will commence from the start of construction and thereafter permanent changes in visual character will occur, including into operations.
Reversibility	Irreversible until the entire Project infrastructure is decommissioned.
Receptor Sensitivity	Low on the basis that there is no international or national tourism receptors in the area, and the land has little, if any aesthetic value.
Magnitude	Medium – the changes to the visual condition of the land will occur within the Project Site and will be noticeable across the surrounding area.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(i) Soil, groundwater and surface water drainage***

The site is located in an arid area and subject to the accumulation of water during wet season. Streams are characterized by intermittent regimes, with large inter-seasonal and annual variations, mainly due to seasonal storms.

The use of construction machinery within the Project Site will degrade soils and modify local drainage flows through a combination of compaction, physical disturbance, creating

rutting along tire tracks, and from excavations and stockpiling material. This could result in the turbidity of nearby surface water receptors. This disturbance will be low given that the plant flood risk engineering design prepared by Developer is proposing to construct the dikes around the project area which will be limiting the impact of construction on the water drainage system around the site.

Leaks and spills from the use of construction machinery, and from refueling activities can result in localized soil and groundwater pollution.

Effluent will be generated from operation of the base camp where workers will be present. Black water, grey water and kitchen water will be generated within the Project Site.

### **Mitigation Measures**

The following mitigation measures will be applied:

- To preserve the arable layer during excavation works (trenching or local soil levelling), the first 20-30 cm of soil will be excavated and stored to allow later reuse. This soil will be stored apart on a dedicated area, in 1-2 m high, non-compacted windrows to maintain the quality of the soil. Arable soil will be reused for the restoration and rehabilitation.
- Construction machinery will not be permitted to conduct off-road driving.
- The machinery used will be subjected to a regular maintenance, to decrease the risk of accidental pollution. All maintenance activities will take place within a dedicated area (impermeable and bounded).
- A dedicated refueling area will be used and fitted with a bounded surface, boundary sumps to catch any localized spills before they are able to escape into the environment, and spill kits will be available. This area will also be protected from rainwater.
- Spill kits (e.g.: absorbent rolls, containment systems) will be available at specific locations across the site, including the refueling area.
- The proposed dikes to be constructed around the project site are of limited disturbance on the water drainage system around the site.
- The base camp and construction site will be located at more than 100 meters of the closest stream and provided with impermeable septic tanks for the collection of wastewaters to reduce risk of direct pollution from sanitation facility, the few hazardous materials storage, and the concrete area.
- Construction work (removing soil, soil compaction, use of equipment etc.) shall be occur at site boundary. The land area will be fenced. Coordination with relevant local

authorities and STEG should be planned to avoid damage to the underground gas pipeline which is located outside of the site boundary.

- The gas pipeline shall be considered in the Emergency Preparedness and Response Plan in coordination with STEG and relevant authorities.

**Monitoring and reporting requirements**

The following monitoring measures will be implemented:

- A visual inspection of stored soils will be made each month to check that they remain suitable for future restoration and rehabilitation activities.
- The condition of soil within the Project Site shall be checked each day to ensure that no trenches or areas that could generate floodwater are present.
- The refueling area will be subject to a daily inspection to ensure that no localized spills are occurring.
- The construction machinery will be inspected each week for their general condition and all hoses will be checked.
- The availability of spill kits will be checked during a site inspection process each month to ensure that they are in good condition, are available for use and clearly marked so the workers can find them in the event of a spill.

Impact	Soil degradation & sealing
Type of impact	Negative
Type of effect	Direct as it will affect soil only
Duration	Temporary changes in soil character and chemical composition may occur in the short-term. Long-term impacts are not expected to occur unless significant contamination occurs that can be cleaned up, which is unlikely.
Reversibility	Reversible as localized spills and soil compacted areas can be cleaned and restored.
Receptor Sensitivity	Low – the quality of the soil is not unique in the area and does not have significant agricultural value.
Magnitude	Low as site construction activities will be restricted to occur only in the Project Site
Significance of the impact without mitigation	Not Significant
Significance of the impact with mitigation	Not Significant

***(ii) Flood Risks***

As discussed in the baseline section, the Project area in general intersects with three temporary streams or wadis as Wadi Boushkima; Wadi Dalloussi and Wadi Boughal (see paragraph 7.2.4) with endorheic flow towards Sebkheth Kelbia; where one stream directly intersects with the Project site in specific.

Such streams and wadi systems could be subject to local flood hazards especially during the rainy season and during flash flood events. If not considered properly, such flood risks could entail impacts on the Project components (resulting in damage and destruction of equipment and machinery onsite) and could also entail health and safety impacts on workers onsite.

In addition, it's worth mentioning that the photovoltaic power plant site is crossed by an existing rainwater retention dike of about 0.8 m height. This dike is designed by CRDA of Kairouan slightly more than 20 years ago to minimize the flooding risk of the site by deviating the nearest water course to not discharge into the site and minimize flooding within this area. The aim of the dike construction is primarily to allow for better spreading of runoff water to enhance the development of pastoral plants.

In addition, the new enclosure dykes constructed as part of agricultural development projects approximately 1 km hydraulically upstream of the PV plant site will significantly alter the runoff regime and significantly reduce the downstream hydraulic flooding of the land, including the Metbasta PV plant site.



**Photo of the existing earth dike crossing the project site**

### **Mitigations Measures**

A flood risk assessment was undertaken by the developer as part of the design phase of the project. Based on the topographic survey, the finding of hydrological study shows that :

- The flow conditions are controlled by the downstream (south-west) part of the terrain and the maximum height of the water is 31.63 m ASL;

- The maximum local velocity in the terrain is 2 m/s and the average velocity is less than 1 m/s.

According to the Flood Protection Study (June 2022), the Proponent is inclined to construct three 31.63 mASL earthen embankments to protect the Project site from flooding as follows :

- Dike A (designed to protect against two tributary flows affecting the site) with a 1,200 m linear length, a height of between 0.4 and 1 m, and a volume of 2,800 m<sup>3</sup>;
- Dike B with a 960 m linear length, a height of between 0.25 and 1 m, and a volume of 2,150 m<sup>3</sup>;
- Dike C with a 1,480 m linear length, a height of between 0 and 0.9 m, and a volume of 3,785 m<sup>3</sup>.

It should be noted that the dikes will be built within the 200 ha of the project site. The construction of the 3640 m of dykes will replace the old dykes which have lost their usefulness due to recent hydraulic developments.

The flood protection proposed design is provided within figure 8.1.

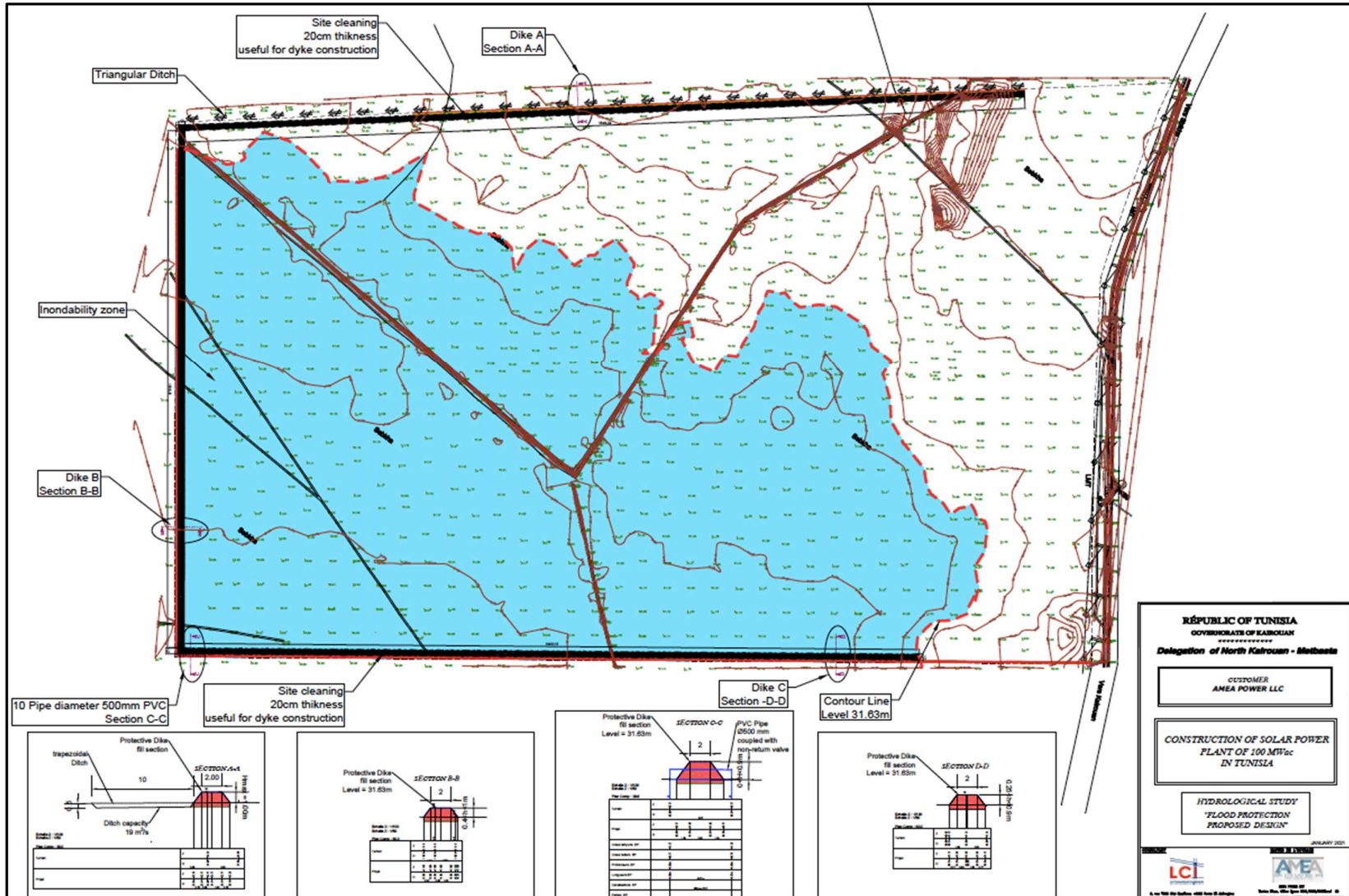


Figure 8.1 - Flood Protection Proposed Design within the 200 ha of the project site

**Monitoring and reporting requirements**

Submission of a flood risk assessment

Impact	Flood risk
Type of impact	Negative
Type of Effect	Direct
Duration	Long-term if changes to natural drainage patterns are introduced, although this will be avoided to the extent possible.
Reversibility	Changes to natural drainage flows are likely to be reversible as they could be restored once the site is decommissioned and restored.
Receptor Sensitivity	Medium – nearby land users that could be impacted from changes in drainage flows.
Magnitude	Low-to medium as the generation of floodwater is seasonal although could impact receptors outside of the Project Site located within the Project Area.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor.

***(iii) Air Quality***

The use of construction equipment has the potential to generate dust and emissions within the Project Site, and these could travel outside of the Project Site and impact adjacent land users.

The main impacts on air quality associated with construction activities will be:

- Dust generation resulting from earthworks (such as leveling, grading, excavation works), movement of vehicles across dirt/unpaved roads, topsoil, and excavated soil handling.
- Exhaust emissions: of SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>, will be attributed predominantly to exhaust emissions from generators and construction machinery.
- Generation and dispersion of dust depends on weather conditions; dry conditions with high wind speeds would cause excessive dust generation, while wet conditions and low wind speeds will prevent the generation of dust. Given the characteristics of the site (its upper arid bioclimatic temperate winter) low and very low wind are most likely in the project area and wind-blown dust migration or wind-blown soil erosion is not considered likely.
- The results of air quality monitoring indicated that baseline conditions are good, and all recorded parameters are within allowable limits.
- There are no adjacent receptors in relation to the Project Site with the nearest settlement being Metbasta village located 2.2 km from the Project Site.

### **Mitigations Measures**

The following mitigation measures will be applied:

- Spoil and other storages of fine material will be minimized to the extent possible.
- In the event of long-duration, dry spells of weather when strong winds do occur, dust control and suppression measures will be used which could include the regular watering of roads, planning of dust-causing activities to reduce the time when such activities take place.
- Regular inspection and covering of stockpiles and excavated material if this material cannot be readily used elsewhere.
- Proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin); and
- The speed of vehicles on site and approach road will be limited to 15-20 km/hr which will help in minimizing fugitive dust emission due to vehicle movement.
- Prohibiting the idling of vehicles so that fuel usage and air emissions are minimized to the extent possible.
- Solid waste burning in the project site is strictly prohibited.
- Develop a regular fit-to-work inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant emissions, before being allowed to be deployed/used on site.
- Optimization of the itineraries, route conditions to reduce the number of vehicle movements for the transport of personnel and materials.
- Workers and senior management at the nearby industrial plant will be informed about the start of construction works and the potential generation of off-site air and dust emissions. This shall include details of the Project's grievance mechanism.
- The grievance mechanism will be monitored to check the activities been undertaken when air and dust-related complaints were made. In the event that such complaint is raised, then the procedures used by the site will be re-evaluated to ensure that complaints to not re-occur in the future, with changes to working practices modified accordingly.

### **Monitoring and reporting requirements**

The following monitoring measures will be implemented:

- Inspection and visual monitoring of the works should be always carried out to check for the presence of areas that could be subject to wind erosion during the dry season.

This shall also include a visual inspection of all stockpiled areas.

- Periodic inspections will be conducted at the entrance to the nearby road (RR-171); to determine whether dust from construction activities has impacted off-site areas. Where this is identified to have occurred, the areas will be immediately cleaned up and washed down.
- Periodic inspection of the maintenance and repair program for vehicles, machinery, and equipment to be used throughout the construction phase, to reduce potential impacts including:
  - Replacing older vehicles with newer, more fuel-efficient alternatives.
  - Converting high-use vehicles to cleaner fuels, where feasible.
  - Installing and maintaining emissions control devices (e.g., catalytic converters).
- All drivers of vehicles will be informed about the prohibition on vehicle idling as part of their on-site induction, and this training shall be recorded.
- A guard at the site entrance shall check that all loads of fine materials are covered by tarpaulin if necessary; and
- A grievance mechanism can be used to report and investigate all complaints associated with air emissions and dust.

Impact	Air Quality
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to construction phase only
Reversibility	Reversible given that air quality would revert back to baseline conditions after construction works is completed
Receptor Sensitivity	Low given that there are no settlements adjacent to the Project Site. The nearest adjacent land user is industry.
Magnitude	Medium given that the generation of dust is limited to the Project Site, and the area is not prone to large-scale wind-blown erosion.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(iv) Noise***

The use of construction machinery and vehicles will generate noise within the Project site and the Project Area. Off-site noise impacts could result in a nuisance to workers at the adjacent industrial facility, and adjacent land users conducting grazing activities.

The use of vehicles to transport personnel and materials is a further source of noise during construction along the public road network.

### **Mitigations Measures**

The following identifies the mitigation measures to be applied by the EPC Contractor during the construction phase:

- Only well-maintained equipment should be operated on-site to avoid the generation of unnecessary sources of noise. All loads shall be securely fastened to the trucks to prevent clanging, etc.
- The speed of vehicles on site and approach road will be limited to 15-20 km/hr which will help in minimizing noise emission due to vehicle movements.
- Prohibiting the idling of vehicles so that fuel usage and noise emissions are minimized to the extent possible.
- Optimization of the itineraries, route conditions to reduce the number of vehicle movements for the transport of personnel and materials.
- No work will be carried out at night to avoid important disturbance for the surroundings communities. The noisiest operations (pile driving, blasting, hydraulic hammer, earthwork, and grading) will only be done between 8 am and 6pm.
- Workers and senior management at the nearby industrial plant will be informed about the start of construction works and the potential generation of off-site noise emissions.
- A grievance mechanism will be available to inform people about the way in which noise-related complaints shall be recorded and investigated.

### **Monitoring and reporting requirements**

The monitoring and reporting requirements are listed below:

- Noise measurements will be conducted at regular intervals to check the level of off-site emissions that are occurring. The measures will coincide with noise activities to reflect worst-case, actual conditions. In addition, noise measurement will be checked for all equipment/vehicles as part of the fit-to-work verification
- The grievance mechanism will be monitored to check the activities undertaken when noise-related complaints were made. If such complaints are raised, then the procedures used by the site will be re-evaluated to ensure that complaints to not re-occur in the future, with changes to working practices modified accordingly.

Impact	Noise
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to construction phase only
Reversibility	Reversible given that noise levels will rapidly revert to baseline conditions after construction works is completed
Receptor Sensitivity	Low given that there are no settlements adjacent to the Project Site. The nearest adjacent land user is industry.
Magnitude	Medium given that the generation of noise is likely to be limited to the use of construction machinery and earth movements.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

### 8.1.2 Impacts on Biological Environment

The foreseeable impacts related to the construction phase of the solar power plant in Metbasta are identified in the following paragraphs.

Site preparation activities which are to take place onsite by the EPC Contractor for installation of PV arrays and the various Project components to include to inverters, underground transmission cables, internal road network, buildings, etc. are expected to include land clearing activities, excavation, grading, etc.

Such construction activities could result in the alteration of the site's habitat and thus potentially disturb existing habitats (flora, fauna, and avifauna) and result in the displacement or exclusion of species particularly threatened, endemic, or endangered species which might be present within the Project site and surrounding areas. Other impacts on the biodiversity of the site are mainly from improper management of the site which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

The construction of the PV arrays has the potential to impact to the habitat of the IUCN Vulnerable dragonfly *Gomphus lucasii*.

Moreover, there are a collision risk and roadkill (which is considered as a premier mortality source for fauna) from vehicles movements, especially for species that are large and slow-moving, which are likely to be more prone to becoming the victim of vehicle collision, than species that are small and fast-moving, as well as species that have higher local abundances (Forman et al., 2003).

### **Assessment of no net loss to biodiversity**

The International Finance Corporation (IFC) Performance Standard 6 (PS6) on "Biodiversity Conservation and Sustainable Management of Living Natural Resources" requires that a biodiversity loss offset mechanism be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss of biodiversity, but rather preferably in a net gain, especially in the case of critical habitats. In addition, the African Development Bank's (AfDB) Operational Safeguard 3 (OS3) on Biodiversity and Ecosystem Services requires that efforts be made to restore or rehabilitate biodiversity, including, where some impacts are unavoidable, the implementation of biodiversity offsets to ensure that there is "no net loss, but a net gain" of biodiversity. SO 3 also sets out requirements for the release of genetically modified organisms (GMOs) into the environment.

Habitat degradation and land use are among the main drivers of biodiversity loss at the Project site. As found during the biodiversity survey, Metbasta's rangelands that are subject to overgrazing pressure by livestock have been excessively degraded in recent years and especially after 2011. In particular, allochthonous plant species introduced in the 1990s such as *Brachychiton acerifolius*, *Acacia cyanophylla*, *Acacia cyclopes* and *Opuntia ficus indica* to improve this rangeland have completely disappeared, confirming the highly degraded characteristic of the site.

It should be noted that extensive pastoralism is undertaken in the open lands of the Metbasta area, which cover an area of over 10,000 hectares and are the subject of land titles 20321 Kairouan, 20523 Kairouan, 20323 Kairouan and 33767 Kairouan.

The Kairouan forest district is responsible for the management of this range (Kairouan-Nord subdivision).

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the site of the solar power plant and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of the identified herders ranges from 30 to 400.

The effects of grazing on rangeland biodiversity include biomass removal, trampling and destruction of root systems.

For the purposes of the impact analysis, the degree of disturbance is considered high when more than 20% of the total area of a vegetation grouping in the study area is affected. It is medium when this percentage is between 5 and 20%. It is low for values below 5%.

In order to quantify the impacts of land use on biodiversity, a baseline of natural habitat mapping was prepared (see section 7.3.2). The method used is to project the distribution of existing species using recent Google Earth, Landsat 8 and Sentinel 2A multispectral imagery, supplemented by conducting a site visit to describe the relationship between the extent of natural habitat and its individual species composition at the solar plant site. This approach assumes that the distribution of species changes in response to environmental variables (topography and rainfall amounts causing temporary flooded areas).

The results of the natural habitat mapping for the 200 ha Project site reveal the presence of three types of vegetation cover extent as follows: high on 27 ha, medium on 147 ha and bare ground on 26 ha.

With respect to grazing issues, only an area of approximately 4.5 ha, which is very small and represents 2.5% of the total vegetation cover of the Project site, is of interest for grazing. This land extends along RR171 with a high density of annual species known to be present for limited periods of the year and which are valued by livestock.

In addition, the dominance of the two species *Salsola tetrandra* and *Suaeda mollis*, which are very rich in salts, and offer no palatability for sheep and goats, have a high vegetation cover. The ecosystem services provided by the highly dominant *Salsola tetrandra* and *Suaeda mollis* units in the site are almost negligible.

In view of the above, the brackish nature of the species within the high vegetation cover area coupled with the hydromorphy of the site and the issue of climate change result in very limited faunal settlement within the solar power plant site, leading to confirmation of the lack of natural habitat value.

During the construction of the Project, the project infrastructure will be installed on the site itself, which could result in negative impacts on biodiversity. In order to balance this negative impact, the relevant biodiversity values that could be affected by the Project will be described by providing the extent of the areas to be disturbed taking into account their natural habitat content and demonstrating no net loss.

The area is a rangeland with medium to high natural vegetation cover. However, the proximity of the solar project and the presence of some listed protected species make it a particularly interesting and potentially useful study area. The method used for this is to overlay the site plan with natural habitat (vegetation) mapping.

Figure 8.2 below shows the project components in the distribution of vegetation cover.

Based on the analysis of the map below, the relevant biodiversity disturbance will be described as follows:

- 13% (26/200) of solar plant components will be constructed on the bare soil area which is extending over an area of 26 ha (mainly building area, 3 inverter station and part of drainage infrastructure). In fact, 13% of project components construction will avoid natural habitat feature and will gain no habitat loss.
- The remaining areas having medium to high vegetation cover (174 ha= 27+147) with a disturbed rangeland character with no habitat value either for protected species or for grazing animals will be covered with PV modules array area and roads area. The estimated area to receive PV panels within the natural habitat extent is 134 ha (160 ha- 26 ha), so almost 77% of natural habitat area will be covered by PV panels.

**Table 8.1 - No Net Loss Calculation**

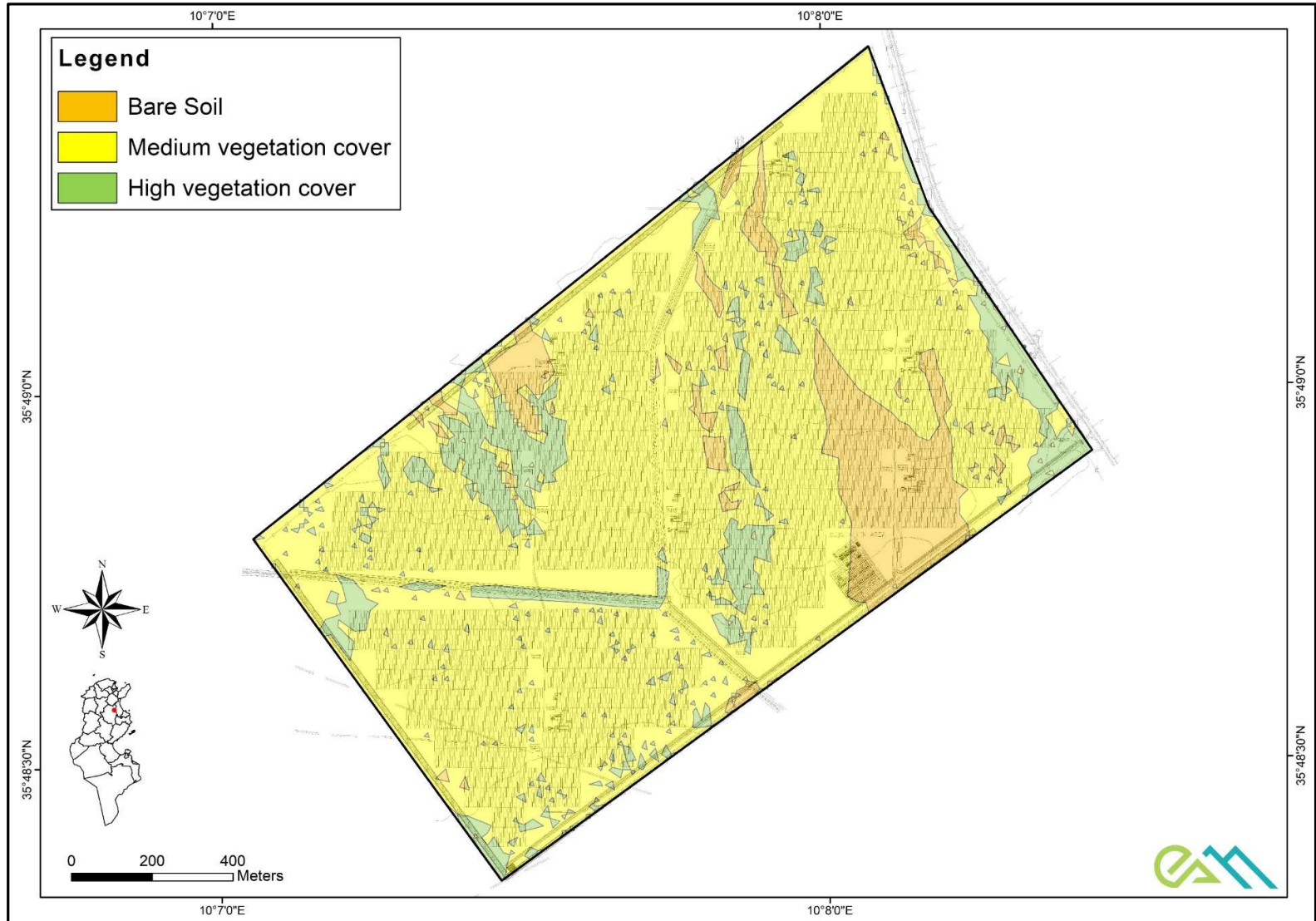
Vegetation Type Cover	Area (pre-construction)	Habitat Condition (Pre-construction)	Area (Post-construction)	Habitat Condition (Post-construction)
Bare Ground	26 ha	Poor	0	n/a
High Vegetation Cover	27 ha	Good	28 ha	Good
Medium Vegetation Cover	147 ha	Moderate		Moderate
PV Array	0 ha	n/a	160 ha	Moderate
Access Roads, Drainage area Buildings Inverter Stations Main substation area	0 ha	n/a	2 ha 4.5 ha 0.2 ha 4 ha 1.3 ha	n/a
<b>Total</b>	<b>200 ha</b>		<b>200 ha</b>	

In addition, the PV panels tend to occur in areas of habitat for the protected invertebrate *Gomphus lucasii* identified based on the invertebrate survey (see Figure below). The location of PV panels intersects with the range of 1 species of potential conservation concern, and which was observed within the solar plant site.

The PV panels installation within the natural habitat area will lead to ultimately means no net reduction given that vegetation will not be removed, and no levelling of the soil will occur, therefore diversity within and among species and vegetation types will remain conserved as well as insuring the long-term viability of species and vegetation types.

On the other hand, PV power plant technology may modify microclimatic and biota conditions. However, the way and magnitude of the effects depend on local conditions and power plant’s scale. In addition, solar tracking technology showed less influence on

microclimate and species composition between Sun and Shade in the power plant. Indeed, shady conditions provided a refuge for some species like arthropods. Furthermore, having more space between the mounts, could allow the cool air to get inside the solar power plant and thus, the extreme abiotic conditions could be prevented (Suuronen et al., 2017).



**Figure 8.2 - Project Components within the Vegetation Cover**

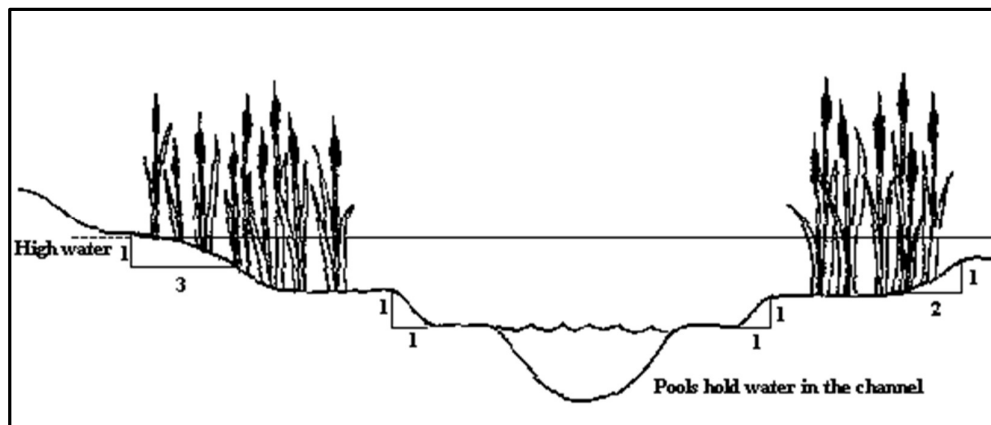
### **Mitigations Measures**

Overall, for all identified wildlife groups it is recommended to implement the following mitigation measures:

- Establish a schedule of work that will consider the seasonal nature of the project climate. In this sense, it is recommended to carry out clearing work and earthwork during the dry season (July to September) to limit as much as possible the impacts on fauna as birds nesting period extends from mid-March to mid-July and to avoid managing water during earthworks.
- Limit vehicle movements to only be on designated paved/unpaved roads and maintain a speed of vehicles to 15-20 km/h.
- Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.
- Mark out and fence of the construction activities.
- Plan site preparation and construction to cause the least impacts to vegetation ground cover & cause the least disruption to topsoil.
- When stripping is necessary, carefully remove & store topsoil following internationally recognised standards.
- Plan infrastructures layout avoiding natural habitat features as much as possible. Areas that can be left undisturbed will be demarcated to avoid damage.
- Select wildlife-friendly design for infrastructures, e.g., elevated fencing to allow small mammals movements, properly designed drainage channels to avoid animals being trapped inside.
- Make gaps designed into fencing to allow fauna to pass.
- Limit vehicle movements to only be on designated paved/unpaved roads to reduce impacts to surrounding natural vegetation.
- Restoration and revegetation (ecological restoration) of temporary-use areas, lay down areas and areas distributed during construction of the PV Array as soon as reasonably practicable after construction activities are complete. Restoration method design will be done by a competent specialist.
- Restoration of the natural habitats that will be disturbed during the development of the PV array in order to meet the NNL aim.
- The natural habitat temporary pond area for *Gomphus lucasii* will be protected as far as possible. The sensitivity of this area will be communicated to all workers on site. No

vehicle activity will be permitted in this area. Restoration of vegetation will occur immediately, should vegetation be damaged in this area.

- It is recommended that eco-design features are incorporated to provide temporary wetlands within the boundary ditches as habitat for *Gomphus lucasii*.
- The dike will be constructed to replicate a natural stream channel, allowing for areas of ponding and with banks of varying gradients. The following image illustrates these ideas.



**Figure 8.3 - Drainage Ditch with Natural Profile**

- Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading, etc.
- An additional species inventory should be carried out during the wet season to detect associated birds and amphibians. The analysis will serve at avoiding sensitive areas or species, propose additional mitigation measures and to better understand fauna circulation on site and usage of Boushkima water course and wet area by local fauna (amphibians, birds but also mammals).
- Plan to hire an ecologist to monitor environmental measures during the construction phase (in particular for clearing and earthwork) and to advise the project leader and the construction company (s) throughout the project.

**Monitoring and reporting requirements**

The monitoring and reporting requirements are listed below:

- Inspection of the works should be carried out at all times.
- Submission of a Construction Environmental Monitoring Plan including all biodiversity aspects and mitigation measures presented above.

Impact	Fauna
Type of impact	Negative
Type of effect	Direct and indirect as it will affect Fauna / Flora
Duration	Long Term as impacts will persist throughout the operating period
Reversibility	Reversible: some species could remove to the project area after construction Irreversible for Entomofauna: impact for the individuals destroyed will remain low because it is limited to the areas of land clearing, earthworks, and vehicle traffic
Receptor Sensitivity	High presence of 3 wetland areas (IBA) at 1km, 5.4 km and 5.4 km from the project site
Magnitude	Medium as site construction activities will be restricted only in the project site. Fauna could move away to similar habitats in the surrounding activities also
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

### 8.1.3 Impacts on social environment

#### *(i) Land use - Impact to Livelihoods from Land Access Restrictions*

The solar power plant will be built on 200 hectares of private land. The land is currently used by occasional livestock farmers who frequent the site during certain periods of the year with livestock, mainly sheep, goats and camels. The main impact on land use could be a reduction in the amount of land. This is because the site will be permanently fenced off and livestock farmers will no longer have access to the grazing areas within it. Although grazing takes place in the wider Metbasta grazing area, other developments such as the 400ha agricultural project being developed upstream could further reduce the availability of grazing land, increase competition for the remaining grazing land and lead to further degradation. This could lead to a potential loss of grazing livelihoods.

However, according to the land user consultation undertaken in October 2020, grazing is not limited to the solar power plant site; it is practiced in other sufficient surrounding areas with similar biological characteristics to the Metbasta range.

It should be noted that extensive pastoralism is undertaken in the open lands of the Metbasta region, which cover an area of more than 10,000 hectares and are covered by land titles 20321 Kairouan, 20523 Kairouan, 20323 Kairouan and 33767 Kairouan.

The Kairouan forest district is responsible for the management of this area (Kairouan-Nord subdivision).

The results of the CRDA survey (May 2022) concluded that the number of herders potentially using the site of the solar power plant and a section of the OHTL is limited to about 20 (10 herders from Dallousi and 10 herders from Metbasta). The livestock size of

the identified herders varies from 30 to 400 heads.

The socio-economic conditions of the herders are developed in the Abridged Resettlement Action Plan (ARAP).

The value of the grazing rights is fixed and in the form of a pro rata. It is underestimated because it takes into account the socio-economic conditions of the herders and right holders. It does not in any way represent reality.

The royalty value of the grazing right is flat-rate and in the form of a pro rata.

It is possible that areas within the site will be used during construction for the storage of materials, supplies and equipment necessary for the construction of the PV plant on the project site.

During construction, fencing will be installed to surround the entire project site to prevent unauthorized entry and to reduce health and safety risks to the community. Once the construction fencing is installed, access to the land within will be prohibited to livestock farmers. There are no residential or other types of structures in the areas to be fenced and the land is currently used only by livestock farmers.

Land restrictions during the construction of the solar power plant will result in a marginal loss of available grazing land for pastoralists. However, based on the mapping of natural habitats within the project site, and with the exception of the unit along the Sbikha-Kairouan road, which is of pastoral interest, due to the high density of annual species, the other units have little or no pastoral interest, due to the nature of the species that structure them (annual species consumed by livestock).

With regard to grazing, only an area of about 4.5 ha, which is very small and represents 2.5% of the total vegetation cover of the Project site, is of interest for grazing. This land extends along RR171 with a high density of annual species known to be present for limited periods of the year and which are valued by livestock.

### ***Gender and Vulnerability Considerations***

Women are not directly involved in herders' livelihoods. However, women may in principle be affected if a herder's income is reduced or if the quality of the household's livestock deteriorates.

The socio-economic conditions of pastoralists including their households are developed at the level of the Abridged Resettlement Action Plan (ARAP).

### **Mitigation Measures**

The developer shall undertake consultations with these land users prior to the commencement of any construction activities to inform them of the project schedule, the

construction of the site boundary fence, the construction activities to be undertaken, and the foreseeable impacts associated with the proposed activities.

The developer must inform the public of the grievance mechanism that can be used to file complaints about impacts to livelihoods or for any other reason. A livelihood restoration plan will be prepared by the developer and will include details on the number of herders and size of livestock grazing on the solar plant site, as well as their socio-economic conditions.

A register will be held with the names and contract details of pastoralists known to frequent the land, so that the Project can keep a record of when each land user was last engaged with.

The developer could investigate the potential reuse of treated wastewater from the construction and operation of the solar power plant for land irrigation in the surrounding areas. This is to improve vegetation cover and help compensate for the loss of livestock feed in the study area and thus land use activities for grazing.

**Monitoring and reporting**

The following monitoring measures will be implemented:

- Submission of a livelihood restoration plan

If grievances arise after the fences are installed and restrictions to land are imposed, then these concerns will be addressed through the Project’s grievance mechanism.

Impact	Land use
Type of impact	Negative
Type of effect	Direct
Duration	Long Term as such impact will occur during construction and continue into the operation phase as the boundary fence will still be present.
Reversibility	Irreversible as land area will be changed into a solar PV project development which no longer can be used for grazing
Receptor Sensitivity	Low as the area to be occupied by the site is not unique pastureland and there are adjacent areas of similar quality available locally and throughout the region.
Magnitude	Low as the number of pastoralists active is relatively low
Significance of the impact without mitigation	Not significant
Significance of the impact with mitigation	Not significant

***(ii) Archaeology and cultural heritage***

Based on the site survey (carried out by an archaeological expert on September 4th, 2020), the project site shows no trace or evidence of historical and / or pre-protolithic occupation. However, a total of 17 shards of African sigillated ceramic, sometimes mixed with rare fragments of amphorae and shards of medieval ceramic, were observed during the site walkover. These shards are understood to have been transported by the streams and water courses flooding the project site -such findings are considered common.

There are no significant impacts on archaeology and cultural heritage on surface remains. Site preparation and earthwork activities for installation of PV arrays and the various Project components to include central inverters, underground transmission cables, internal road network, buildings, etc. may reveal underground fortuitous discoveries of vestiges, concerning prehistoric or historical periods. Improper management (if such sites are discovered) could potentially disturb or damage such sites which could potentially be of importance.

**Mitigations Measures**

The following identifies the mitigation measures to be applied by the EPC Contractor during the construction phase:

Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential archaeological remains in the ground might be discovered. A chance find procedure will be developed and implemented. Those mainly require that construction activities be halted, and the area fenced along with proper signage, while immediately notifying the National Heritage Institute and follow the applicable procedures.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

For chance find procedure, inspection of actions taken in case of new discoveries should take place, including fencing, limiting access to site, and formal communication with the National Heritage Institute. Report should be prepared and submitted to the Institute in such a case which details the above.

Impact	Archaeology and cultural heritage
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is limited to the construction phase only
Reversibility	Could be irreversible as if sites are damaged or disturbed
Receptor Sensitivity	Low as the likelihood of such discoveries is low
Magnitude	Medium given that if sites are discovered they could be of value and importance
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(iii) Trespassing of Unauthorized Personnel***

Construction activities generates a variety of community health and safety risks to local people arising from:

- General construction works which shall include the use of mechanical excavation machinery, rotating construction tools and mobile machinery.
- The introduction of slips and trips that could cause an injury inside fenced-off areas.
- Heavy lifting of components and construction tools; and
- Working with live electrical components during construction and operation.

An incident during construction, such as a local person gaining unauthorized entry into a working area where excavations are present, could result in an injury or fatality.

**Mitigation Measures**

The following mitigation measures will be implemented:

- Public access to the site will be restricted from the use of a boundary fence.
- Security guards will be used to prevent unauthorized access.
- Fences shall have signs with warning notices (in Arabic and English) to deter people from entering. Contact details will be placed on the fences that use the details in the grievance mechanism so that any person can request additional information on the fence lines, should they wish to do so; and

**Monitoring and Reporting Requirements**

The following monitoring measures will be implemented:

- Regular security inspections shall be conducted to check the integrity of the boundary fence. Where this needs to be repaired, repairs will be made immediately.
- All attempts at unauthorized entry will be recorded and investigated.

Impact	Trespassing of Unauthorized Personnel
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential permanent health and safety impacts
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	Low given distance of any nearby settlements or villages
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(iv) Worker Influx – incoming workforce and workforce accommodation camp***

The anticipated impacts that could be generated by the influx of workers and the construction of the living camp are similar in nature to the impacts assessed during the construction phase. In particular, the influx of workers may create a strain on existing infrastructure, mainly water and sanitation systems, as well as road accidents and other adverse consequences of the increased traffic generated by the project (dust, noise and pollution). In addition, the presence of a large number of workers, mainly men, may lead to an increased spread of communicable diseases. Women, especially young girls, are threatened by the presence of the incoming workforce seeking sexual services. Interactions between incoming workers and women are likely to increase the incidence of communicable diseases, raise tensions and increase gender-based violence.

Thus, the construction of workers' housing and its potential impacts on communities should be managed in the same way as for the construction of the project itself, including the following points:

The EPC contractor should prepare a workers' accommodation plan, which should provide details of the accommodation needs of the workforce, including location, facilities, transport needs, etc. The plan should ensure that workers are provided with decent accommodation that meets their basic needs. In particular, if a live-in camp is provided on site, it should be in line with international industry good practice - principally the document "Workers' accommodation: process and standards" (EBRD/IFC Guidance Note, 2009). This document provides guidance notes on general living camp facilities, bedrooms, medical facilities, management of accommodation units, etc. The workers' accommodation plan should include a specific COVID-19 protocol.

An HSE management and performance report on the ongoing work at the project site shall be submitted on a monthly and quarterly basis. Each report is submitted to the project owner and the responsible HSE branch by the 5th of the month following the end of the relevant quarter and shall contain the following data in accordance with the project's corporate HSE monitoring and reporting procedures.

- o Summary of accidents/incidents during the last month;
- o Summary of daily and cumulative working hours;
- o Lost time due to accidents/incidents;
- o First aid data;
- o Quasi-accidents/unsafe conditions reported;
- o Emergency drills conducted;
- o Number of training hours, including toolbox training;
- o Safety audit and meeting information;
- o Waste collected and disposed of;
- o Water consumption
- o Electricity consumption;
- o Fuel consumption;
- o Environmental monitoring data.

The EPC Contractor should prepare a worker influx plan to be implemented for the construction phase of the project. This plan should take into account the following elements

- The medical examination programme.
- Development of a code of conduct for workers that takes into account the appropriate behaviour of workers at all times, religious customs and practices, traditional cultures and social norms of the region. In addition, it should include specific requirements regarding social vices, including violence, exploitation, sexual abuse and harassment, alcoholism, drug abuse, etc.
- Initial training and awareness sessions on the risks associated with the most common contagious diseases (the flu virus), communicable diseases, general hygiene measures, code of conduct to be implemented and others, as appropriate ....
- Specific protocol for COVID-19.

In order to prevent complaints of harassment and violence, the grievance mechanism to be implemented will include an effective sexual harassment complaints procedure, which will

detail how cases of sexual exploitation, abuse, harassment and gender-based violence will be treated seriously and in a fair and confidential manner.

**Monitoring and Reporting Requirements**

The following monitoring measures will be implemented:

- Submission of a Worker Accommodation Plan
- Submission of a Worker Influx Plan.

These plans shall be implemented by the EPC contractor during the construction phase.

Impact	Worker Influx
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	Medium as the entire workforce of up to 450 personnel could be exposed to increased risk.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

***(v) Security Personnel***

The inappropriate behavior of security personnel towards local communities could result in resentment, distrust and escalation of unrest and tensions.

**Mitigation Measures**

The EPC Contractor will prepare a Security Management Plan to be implemented for the construction phase of the Project. The plan will identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues.

- A security risk assessment associated with the use of security personnel by the project to identify the types of incidents that could occur, how they may be generated/triggered, and the potential ways in which security personnel could respond to provocation.
- Details of a screening procedure to ensure that all security personnel involved in the project have not been implicated in past human rights abuses. This screening procedure shall be applied during their original recruitment so that only screened personnel are selected.

- Details of training that will be provided to all security personnel to ensure that they are trained in the rules of force (QHSE security induction), culturally appropriate engagement, and the Project’s grievance mechanism.
- Details of the uniform to be used so that they are easily identified as security personnel, including a unique reference/label that can be used to make a grievance about a specific person.
- Details of communications equipment so that personnel can request support during the start of any incident, and Personal Protective Equipment (PPE); that shall be provided free-of-charge to all personnel, along with training on its usage.
- A cross-reference to the Project’s grievance mechanism that can be used to address any concerns promptly associated with the actions of security personnel, and details as to how this is to be disclosed; and
- Reporting and monitoring indicators which shall include periodic audits of third-party security companies used to provide personnel, to check that the provisions above have been adequately implemented.

**Monitoring and Reporting Requirements**

Submission of the Security Management Plan

Impact	Security Personnel
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	Medium given that could result in potential health and safety risks
Magnitude	Low given distance of any nearby settlements or villages
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(vi) Occupational Health and Safety***

Throughout the construction phase there will be generic occupational health and safety risks to workers, as working onsite increases the risk of injury or death due to accidents. The following risks are generally associated with solar PV development projects:

- Slips and falls.
- Working at heights.
- Working with powered and hand-held tools.

- Struck-by objects.
- Moving machineries.
- Working in confined spaces and excavations.
- Exposure to chemicals, hazardous or flammable materials.
- Working in sunny conditions and high temperatures.
- Exposure to electric shocks and burns when touching live components.

### **Mitigation measures**

An Occupational Health and Safety Plan (OHSP) will be prepared for the construction, installation and commissioning of the project as well as general site activities.

The objective of the OHSP is to ensure the health and safety of all personnel to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property of the EPC Contractor and all involved sub-contractors.

The OHSP for the construction phase should be Project and site specific and must take into account the national requirements mainly the “Law No. 87-31 of July 6<sup>th</sup>, 1987”. In addition, it must also be compliant with the AfDB OS 5 (Labor Conditions, Health, and Safety) provisions and, the IFC PS2 (Labor and Working Conditions) which recognize the importance of avoiding or mitigating adverse health and safety impacts on workers and require the development of a project-specific health and safety plan that is in accordance with Good International Practice (GIP).

In general, the OHSMP should address the following elements, as outlined in the Environmental and Social Management Plan (ESMP):

- Identify roles and responsibilities of the personnel involved within the Project to include the EHS manager, construction manager, supervisor, and other subcontractors’ responsibilities.
- Identify details and procedures for always ensuring and maintaining hygienic conditions onsite specifically related to toilet and washing facilities, eating areas, etc.
- Identify in detail information in relation to formulation of safety committees, communication protocols, first aid personnel and facilities, first aid training programs, occupational health and safety culture, quality system, reporting requirements, competence and job safety training, safety inspections, recruitment procedures, safety audits, risk assessment, etc.
- Identify in detail the hazards that may be associated with various activities to take place and the various measures to be implemented to reduce such risks including the

requirements for Personal Protective Equipment (PPE). This includes for example hand tools, access equipment, lifting equipment, mobile working equipment, etc.

- Establish training requirements for workers to comply with health and safety procedures and protective equipment.

The EPC Contractor is expected to adopt and implement the provisions of the ESMP throughout the construction phase of the project, including applicable national requirements. The EPC Contractor shall prepare and submit a Site ESMP or ESMP to the lenders (AfDB and IFC) for validation prior to the installation of sites and the start of any works.

### **Emergency Preparedness and Response**

The EPC Contractor must also prepare and implement a comprehensive, detailed and site-specific Emergency Preparedness and Response Plan (EPRP) for the construction phase of the project.

The objective is to establish a series of organizational, operational, and preventive measures in the event of an emergency that are adapted to the circumstance of such situations, which in turn will ensure the safety of workers and property within the specific Project site. The plan should consider the following based on indented type of accidents / emergencies, impacted target (person or structure), and scenarios:

- Inclusion of requirements for an emergency responder team that includes at a minimum first aiders and firefighters that receive appropriate and certified training.
- Inclusion of requirements to undertake emergency drills in coordination with external emergency response services if required (e.g. civil defense, nearest hospital, etc.);
- Identify in detail of emergency procedures to be implemented to include first actions, alerting emergency contacts, site evacuation, communicating with external emergency services.
- Identification in details of emergency control measures to include but not limited to fire, personnel accidents, spillage, sandstorms, heats strokes, and other.
- Identification of location of assembly points onsite.
- Identification of emergency evacuation routes, muster points to be implemented onsite; and
- Identify roles and responsibilities for implementation of plan to include establishment of an emergency committee and assigning roles to an emergency manager.

- An HSE management and performance report on the ongoing works at the project site will be submitted monthly and quarterly to, among others, feed into the quarterly ESMP implementation monitoring report to the Donors (AfDB & IFC). Each report shall be submitted to the project owner and the responsible HSE branch by the 5th of the month following the end of the relevant quarter and shall contain the following data in accordance with the project's corporate HSE monitoring and reporting procedures
  - o Summary of accidents/incidents during the last month ;
  - o Summary of daily and cumulative working hours;
  - o Lost time due to accidents/incidents;
  - o First aid data;
  - o Quasi-accidents/unsafe conditions reported;
  - o Emergency drills conducted;
  - o Number of training hours, including toolbox training;
  - o Safety audit and meeting information;
  - o Waste collected and disposed of;
  - o Water consumption; o Electricity consumption
  - o Fuel consumption;
  - o Environmental monitoring data

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Submission of an Occupational Health and Safety Plan (OHSP); and
- Submission of an Emergency Preparedness and Response plan

Impact	Occupational Health & Safety
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety s the Project’s highest priority.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

***(vii) Potential labor violations within the supply chain***

The use of a supply chain introduces the potential for labour violations to occur. This

include, for example, poor working conditions, a lack of written worker contracts being used, low-levels of occupational health and safety, child labour, forced labour and other forms of labour-related exploitation.

### **Mitigation Measures**

Developer will implement a Supply Chain Management Plan. This will include the following:

- All primary (Tier 1) suppliers will be required to be pre-qualified before any contract is placed. The process to become a pre-qualified supplier will include an assessment of the supplier's existing controls and monitoring activities on their own internal (Tier 2) supply chain and the risk of labour violations to be occurring.
- A register of all Project suppliers will be maintained so that a central record is available of the companies involved, and the types of goods or services that they are providing.
- Developer will identify potential sources of risk within its Tier 1 and Tier 2 supply chain and conduct a screening to identify potential sources of risk based upon the general profile of the supplier and the type of goods and materials to be contracted. Using the results of the screening assessment, additional actions (such as audits, review of supplier's audit and inspection records, etc.) may be undertaken to check the adequacy of existing controls and monitoring activities.
- Developer's Environmental and Social Management System will include details of the minimum specifications of working conditions and worker recruitment, including controls to avoid forced and child labour. The contracts between Developer and all suppliers will include legally binding obligations for them to undertake their contracted scope in accordance with the ESMS. This is important, as if a legally binding obligation is not present, then it can be difficult to persuade suppliers to improve their worker conditions as they then only have an obligation to comply with national legislation.
- Developer shall take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the construction of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) that categorically prohibit and ban (i) child labour or the exploitation of vulnerable people and (ii) the practice of forced labor, human trafficking and slavery. The Promoter will be required to give a written undertaking that this commitment will be strictly adhered to and will submit to the lenders (AfDB and IFC)

a description of the procedures it will put in place to achieve this in collaboration with the EPC Contractor using the AfDB template.

**Monitoring and Reporting Requirements**

- Inspection to ensure implementation of the Supply Chain Management Plan.

Impact	Potential labour violations within the supply chain
Type of impact	Negative
Type of effect	Direct
Duration	Short Term during the construction phase
Reversibility	Depending upon the nature of any long-term consequences of exploitation, the impact could be reversible or irreversible.
Receptor Sensitivity	The sensitivity is high as this is a key Project issue. Any labour violations within the supply chain will not be tolerated.
Magnitude	The negative impact magnitude is medium as there is a risk that labour violations will occur amongst the supply chain. In Tunisia, Gaining the support from Tunisia’s leading trade union UGTT is vital for the realization of these goals in Tunisia The long-term aim of FAIR is the reduction in deceptive and coercive practices during the recruitment process and violations of fundamental principles and rights at work, as well as other human and labour rights, brought about through increased safe migration options, effective regulation of public and private employment agencies, and unscrupulous actors being held accountable for violations.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

***(viii) Community health and safety risks from road transport***

The use of road vehicles to transport materials and personnel to/from the site introduces significant community health and safety risks.

**Mitigation Measures**

The EPC Contractor is required to develop a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed. The Plan must consider the following:

- The plan must adhere to the relevant local legislations related to traffic and transport.
- Identify the traffic requirements of the Project related to materials, equipment, machinery, project workers, services, etc. where for each the number of vehicles, weight loads, schedule, route/duration and other as appropriate must be identified.

- Identification of appropriate traffic management procedures (both onsite and offsite). Such procedures requirements for haulage suppliers, licensing, driving instructions and code of conduct, speed limits, accident management, monitoring, and reporting, etc.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor during the construction phase and which include:

- Submission of Traffic and Transport Plan endorsed by the authorities

Impact	Community health and safety risks from road transport
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety is the Project’s highest priority.
Magnitude	High as the number of road movements could be substantial when compared to the existing situation.
Significance of the impact without mitigation	Major
Significance of the impact with mitigation	Minor

***(viii) National, Local and Regional Economy***

The Project will positively influence the regional and national economy during construction from the direct procurement and supply of materials and services from companies based in the governorate of Kairouan and elsewhere in Tunisia. This includes for example, companies providing earth moving equipment, workers to complete general civil works, logistics services to transport the solar panels to the Project area, and construction of the worker accommodation camp. Other companies located outside of Tunisia will be responsible for the supply of the solar panel components, such as the panels and supporting structures and cables.

The impact is positive because construction activities will generate economic growth at a local, regional and national level through the procurement of services and materials. The increased demand for business-to-business services to small-to-medium enterprises (SMEs) will generate increased revenue across the district, resulting in higher turnover for the SMEs involved. The impact is reversible as it will be only limited to the construction phase.

**Mitigation Measures**

In order to strengthen the positive effects, it is recommended that the EPC Contractor under

supervision from the Developer, implement a Local Content Policy that would seek to procure goods and services from SMEs based in the governorate of Kairouan to ensure that the positive effects of using SMEs are experienced as close to the Project site as possible to enhance the positive benefits of the Project at this location. This should also aim to consider to the extent possible female-owned businesses.

The total capital spent on SMEs during the construction phase will be recorded, broken down by where they are based and operational (i.e. at a local community, governorate and/or national level).

Impact	National, Local & Regional Economy
Type of impact	Positive
Type of effect	Direct & Indirect
Duration	Short Term as it is expected during the construction phase only
Reversibility	Reversible as it will be only limited to the construction phase.
Receptor Sensitivity	Medium as the businesses involved will benefit directly from the increased revenue.
Magnitude	Medium as a number of local and regional businesses may be involved in the supply chain.
Significance of the impact without mitigation	Minor

***(ix) Employment and management of the workforce***

The composition of the construction workforce is estimated to be around 450 to include 350 low skilled workers and 100 skilled workers. A Local Employment Plan will be developed in order to guarantee the creation and the maximization of jobs for local communities as a result of the diagnosis of specific local needs and of highlighting the community development. Indeed, there will be no need for the Project to use low-skilled people from outside the local area as there is sufficient supply of people based in the nearby community of Metbasta, Dalloussi and El Alem and elsewhere in governorate of Kairouan. In addition, priority for skilled workers should also be for people within the Governorate of Kairouan and if not available workers from outside of the Governorate can be considered.

The individuals employed during the construction stage, and their household members, will benefit from increased income that is likely to increase their overall standard of living, access to healthcare and educational resources, and reduce their socio-economic vulnerability. The provision of job opportunities and training has repeatedly been mentioned during stakeholder engagement activities and is a key, local expectation arising from the Project.

However, there is a potential for local tensions to arise if residents within local communities incorrectly perceive that people from outside the local area are being provided with employment opportunities. Whilst local employment is generally a positive impact, a loss of reputation and negative perceptions towards the Project could occur if the local recruitment process is not adequately managed and negative perceptions arise. In this case, management of expectation with respect to the duration of work and opportunities after construction has been completed need will be taken into consideration to avoid occurrence of such tensions.

### **Gender and Vulnerability considerations**

There is an opportunity for women to become a substantial part of the low-skilled and skilled workforce, benefitting from the vocational training and earned income. This has the potential to work towards gender-include economic growth and increase the ability of women to influence decisions in the households associated with spending decisions. Given that the employment will be important during construction phase and the low number of skilled labor among the local community, the chance is given to men considering the nature of construction activities.

### **Mitigation Measures**

The Project will develop and implement a Construction Local Employment Plan that includes:

- Details of the Project Company's policies towards working conditions, anti-harassment and bullying, and legislative compliance.
- A summary of the numbers and job description profile required for the construction phase.
- Preparation of a future register that contains details of the active workforce, including personnel within contractor supply chains, broken down by:
  - Permanent, part-time, temporary, seasonal, and migrant workers.
  - Number of companies currently involved in the supply chain.
  - Permanent, part-time, temporary, seasonal and migrant workers (by gender) in the supply chain.
- A description of the process used to recruit the construction workforce based upon the low-skilled and skilled workers and how this is to be disclosed to local communities mainly, Metbasta, Daloussi and El Alem is indispensable. The description will include details of the way in which positions are to be publicly advertised, how candidates can

apply and what support will be provided to candidates seeking work who are not able to complete an application form due to literacy or other reason, how candidate details will be recorded on a central register/database; how candidates will be individually screened based upon a clearly defined criteria to be applied to determine the suitability of candidates against specific job requirements, and how workers will be subject to a medical test to demonstrate their fitness to work;

- A prohibition of recruitment of local people at the gatehouse, or any other entry point to the site to prevent people from moving towards the site expecting work. Any person wishing to apply for an employment position must follow the appropriate procedure and people will not be employed ‘on the spot’.
- How the legal rights and terms and conditions of employment are to be provided to workers at the start and periodically during their employment. This will include details of their salary, right for freedom of association, severance pay, working hours, overtime payments, tax and other types of deductions, and provision of insurance from a Project-related health and safety incident. In addition, emphasize shall be made that the employment positions are temporary in nature and will continue during a portion, or all, of the construction stage. The offer of an employment position during construction does also not mean they will be provided with a suitable position during operations.
- Wages, benefits, and conditions of work offered (including hours of work) will, overall, be at least comparable to those offered by equivalent employers in the region to prevent public sector workers leaving key posts (such as teachers, etc.) and seeking local employment for the Project.
- Targets for women to form a substantial part of the low-skilled and skilled construction workforce, and details as to how women will be encouraged to apply for employment positions.
- How labor relations are to be managed during the construction period to ensure the workplace is suitable for the presence of women and potentially others who are legally eligible to be employed. This will include a Worker’s Code of Conduct that is presented individually during their initial HSE induction process for their review and signature to reflect their acceptance. Adherence to the Worker’s Code of Conduct shall be mandatory.
- Details of a worker grievance mechanism that will be available (and disclosed) during the recruitment process and regularly during their employment (which will include an anonymous ‘whistle-blower hotline’ where allegations of bullying or harassment can

be reported.

- Providing workers with regular information about the temporary nature of their position, during their employment, and ensuring they are provided with enough notice so that when termination of their contract does occur, notification does not come as a sudden shock and trigger resentment or protests amongst the workforces.
- How the above arrangements will apply to contractors used within the EPC Contractor's primary supply chain; and
- Reporting and monitoring indicators covering the recruitment process and ongoing management of the workforce.
- Specific assistance measures shall be provided to vulnerable groups and specific measures shall be developed to work towards gender equality, poverty eradication and gender-inclusive economic growth.

NOTE: Legal contracts between the Promoter and the project supply chain will be used to ensure that the above requirements are included in the legal documentation, so that project contractors must include the above measures in their own human resources management. In order to identify the potential for labour violations within the supply chain, a risk assessment will be undertaken which will identify possible child labour as well as any form of forced labour.

### **Monitoring and Reporting Requirements**

Following implementation of the Construction Employment Plan and additional controls to be incorporated into the ESMS, it is anticipated that negative impacts associated with the recruitment process are reduced to minor. However, it is possible that local people may remain dissatisfied with the recruitment procedure, due to the limited number of available positions during construction, from unrealistic salary expectations, or other reason.

- The implementation of a flow management plan by the EPC contractor.

Impact	Local & Employment and training
Type of impact	Largely positive as local employment is a key expectation amongst local village residents and their representatives. However, there is a potential for local tensions to arise if residents within local communities incorrectly perceive that people from outside the local area are being provided with employment opportunities.
Type of effect	Direct
Duration	Short Term as it is relevant to the preparation and construction phase as the workforce receives training prior to the start of construction works.
Reversibility	Could be reversible as the income generated from local employment will cease at the end of their employment as numbers reduce towards the start of operations.
Receptor Sensitivity	<b>High</b> as local employment is a key expectation amongst local people.
Magnitude	<b>Medium</b> associated with local employment.
Significance of the impact without mitigation	<b>Moderate</b>

**(x) Community Development**

The Promoter aims to design and implement a Community Development Plan (CDP) which aims to provide a range of indirect compensation to people in local communities in the vicinity of the project.

The CDP will have the following objectives:

- To establish procedures for responding to community needs, working with the community and other partners including local government, planning, and implementing community Projects, and managing financial arrangements.
- To describe the way in which information associated with community development is to be disclosed and shared in a culturally appropriate manner.
- To ensure that the needs of women and vulnerable groups are taken into consideration during the selection of community development Projects.
- To define clear roles and responsibilities between the various stakeholder groups involved; and
- To define monitoring and reporting procedures that can be used to track implementation over time.

**Gender and vulnerability considerations**

The provision of these types of social welfare services is expected to benefit women and children in a positive manner.

### **Mitigation Measures**

This is a positive impact, and no mitigation measures are required. The table of contents of the CDP will comprise the following:

- 1) Introduction
- 2) Objectives
- 3) Scope and budget
- 4) The need for community development and types of assistance required
- 5) Management of the CDP and Social Agreements
- 6) Financial arrangements
- 7) Potential initiatives within the Social Agreements
- 8) Project approval process
- 9) Documentation
- 10) Roles & responsibilities
- 11) Monitoring & reporting

Impact	Community Development Plan
Type of impact	Positive
Type of Effect	Direct and indirect because the provision of the facilities will have a direct impact upon the overall quality of life of local residents.
Duration	Long-term as the CDP will be implemented throughout the operational phase of the Project.
Reversibility	Irreversible as the provision of the facilities is expected to provide lasting benefits for local residents.
Receptor Sensitivity	<b>High</b> as there is a high level of expectations associated with the way in which The Project Company will provide support to local people and municipalities.
Magnitude	<b>Medium</b> as the initiatives are likely to benefit a high number, and broad range of local residents including children.
Significance of the impact without mitigation	Moderate

#### **8.1.4 Impacts on infrastructure and utilities**

##### ***(i) Water Resources***

Water requirements for the construction phase are low and are limited to sanitary use by site personnel (drinking, showering, etc.) and preparation of raw materials such as concrete, cleaning of machinery and equipment, dust control, etc. The water requirement is estimated at approximately 5500 m<sup>3</sup>. The table below shows the water consumption during the construction phase (data received by the Promoter). Water will be supplied by SONEDE.

Item	Quantity	Units	Consumption Rate (Liters/Unit)	Consumption (Litres)	Frequency	Consumption (Litres)
Laydown area	22 000	m <sup>2</sup>	64	1 408 000	1	1 408 000
Temporary roads	24 000	m <sup>2</sup>	48	1 152 000	1	1 152 000
Concrete for all foundations	715	m <sup>2</sup>	150	107 280	1	107 280
Washing facilities / hygiene / ablutions	48 000	Man days	53	2 544 000	1	2 544 000
Drinking Water	48 000	Man days	4.5	216 000	1	216 000
Fire fighting system	1	Tank	10 000	10 000	1	10 000
<b>TOTAL Consumption during construction phase (Litres)</b>						<b>5 437 280</b>

**Mitigations Measures**

The following identifies additional requirements to be applied by the EPC Contractor during the construction phase:

- Coordinate with CRDA (Regional Commission for Agricultural Development) and conduct a water selection study to determine the most feasible and practical approach for securing the water requirements of the Project (if required).
- Document water consumption of the Project during construction (monthly) and during operation (annually).
- Minimization by abatement controls, involving acting for water conservation and wastewater management measures (e.g., water recycling facility).

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Submit report with proof of coordination with authorities discussed above; and
- Submit water consumption report.
- Monitor community water sources.

Impact	Water Resources
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to the construction phase
Reversibility	Reversible as water resources in general can be considered rechargeable
Receptor Sensitivity	Medium due to importance of water supply conditions within the area
Magnitude	Low as water requirements are considered relatively low
Significance of the impact without mitigation	<b>Minor</b>
Significance of the impact with mitigation	<b>Not Significant</b>

***(ii) Waste and the use of water***

The Project is expected to generate the following waste streams during the construction phase:

- Wastewater is mainly expected to include black water (sewage water from toilets and sanitation facilities), as well as grey water (from sinks, showers, etc.) generated from workers during the construction. Wastewater quantities are expected to be approximately 700 m<sup>3</sup>/Month (53 liters/day/person). Wastewater will be collected on site in sealed septic tanks and evacuated by vacuum trucks to the ONAS wastewater treatment plant in Sbikha.
- Solid waste will include construction waste (mainly dirt, rocks, soil, debris, etc.) as well as general municipal waste (such as food, paper, glass, bottles, plastic, etc.). Solid waste quantities generated are not expected to be significant and are likely to be easily handled by closest approved solid waste disposal facility, as the public landfill of Sbikha.
- Hazardous waste will include spent oil, lubricants, paint cans, solvents, etc. Hazardous waste quantities generated are not expected to be significant and will be recovered by companies authorized by the Minister of the Environment.

**Mitigation Measures**

The following identifies the additional requirements to be applied and which include:

- A waste management plan shall be prepared which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal.
- Adequate sanitary facilities, i.e. toilets and showers, will be provided for the construction workforce;
- Any third-party waste management facility or transport/handling company will be inspected prior to use to ensure that it is being operated in compliance with national legislation, IFC/AfDB provisions and GIIP.
- Sanitary wastewater will be collected in a watertight, IFC/AfDB provisions and evacuated by vacuum tank to the ONAS station in Sbikha, or other location.
- Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.
- Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if necessary.

- Final disposal will be checked for compliance with IFC/AfDB and GIIP standards.
- All waste transfers will be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the destination of waste and a quarterly report to donors (IFC and AfDB).
- A detailed register will be held to record and document all waste streams.
- Minimization by abatement controls, involving acting for water conservation and wastewater management measures (e.g., water recycling facility).

### **Monitoring and Reporting Requirements**

The monitoring and reporting requirements are listed below:

- Inspection of wastewater and solid waste management practices onsite to ensure waste is being segregated and adequately stored.
- Review of chain of custody records for all waste types generated.
- Development and reporting of key performance indicators to funders (IFC and AfDB) to monitor waste reduction and recycling; and
- Inspection of all third-party waste transporters or waste treatment/disposal facilities prior to their use. The scope of the inspection will include the following:
  - Transportation of waste should be conducted to prevent or minimize spills, releases, and exposures to employees and the public. All waste containers designated for off-site shipment should be secured and labeled with the contents and associated hazards, be properly loaded on the transport vehicles before leaving the site, and be accompanied by a shipping paper (i.e., manifest) that describes the load and its associated hazards.
  - Facilities should be specially designed to receive waste types generated, for examples: composting operations for organic non-hazardous wastes; properly designed, permitted, and operated landfills or incinerators designed for the respective type of waste; or other methods known to be effective in the safe, final disposal of waste materials such as bioremediation.
  - Their capacity to accept Project waste types and volumes over the lifetime of the construction stage.
  - Adequate temporary waste collection area, a waste sorting facility, leachate methane and air emission controls.
  - Water, soil contamination and air emissions monitoring at and around the facilities.
  - Have the technical capability to manage the waste in a manner that reduces immediate and future impact to the environment.

- Have all required permits, certifications, and approvals, of applicable government authorities.
- Have been secured using formal procurement agreements
- Obtaining formal collection agreements that comply with national regulations.
- Provide measures for the temporary management of hazardous waste during the temporary closure of the Jeradou centre.

Impact	Waste Utilities
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to the construction phase only
Reversibility	Water abstraction is expected to be reversible. The use of waste treatment/disposal facilities is expected to be non-reversible as once space in landfill facilities is used, this will be permanently used.
Receptor Sensitivity	Low as such utilities are expected to be able to handle project requirements
Magnitude	Low as waste generated from project is considered relatively minimal
Significance of the impact without mitigation	<b>Not Significant</b>

## 8.2 Key Impacts during the Operation Phase

This section identifies and assesses the anticipated impacts within the solar plant and surrounds during the operation phase. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

### 8.2.1 Impacts on physical environment

#### (i) Land scape and visual

The Project is expected to be visible within the immediate vicinity and up to some kilometers around the Project site only and thus is likely to create visual impacts.

As discussed earlier, nearby visual receptors located in the vicinity of the Project site are:

- The industrial area of Sbikha1 at 500 m and the industrial area Sbikha2 (planned development) at 100 m to the South-east.
- The Metbasta wetland located at 1 km to the South. The presence of this wetland as an Important Bird and Biodiversity Area (IBAs), play an important role on the regional conservation of birds, as it constitutes a relevant stopping site for migrant birds and also host several water birds that reproduce and feed there.
- The PV panels are generally 1.5 to 3 m high (up to 6 m for the pivoting). The

installations are generally visible: large surface of dark or remotely reflective color, or high artificial structure, and differentiated at shorter distances.

Landscape impact may be low (facilities are low and easily masked by a vegetal screen). The physical presence of the solar panels will generate a direct visual change through the creation of a reflective surface.

However, being visible is not necessarily the same as being intrusive. Aesthetic issues are by their nature highly subjective. For some viewers, a PV Plant could be regarded as manmade structures with visual burdens while to others it represents a positive impact in the sense that they introduce a break in the otherwise dull and monotonous view.

**Mitigation Measures**

Taking the above into account, there are no mitigations to be considered.

Impact	Land Scape and Visual
Type of impact	Negative
Type of effect	Direct and Indirect
Duration	Long term as it will be relevant all throughout operation phase
Reversibility	Irreversible as visual impacts will be relevant all throughout the operation phase
Receptor Sensitivity	Low given that the location of the project in the vicinity of the existing industrial area of Sbikha
Magnitude	Medium given that project will be visible within immediate vicinity and up to some kilometers
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not significant (no mitigation identified)

**(i) Site flooding**

According to the hydrological study of the solar plant, the water flow is towards southern Metbasta area. The existing drainage infrastructures within the project area (dikes within and outside the solar plant site) as well as the constructed project drainage infrastructure will lead to minimize flooding risk conditions of the site and favorizing natural habitat restoration within and outside the project site. Outside the solar plant, there will be improvement of biodiversity conservation within Metbasta IBA area. The net gain on biodiversity conservation will be achieved by reducing climate change effects (reduced water level within the wetland) during last years on Metbasta IBA area and providing back an attractive site for protected waterfowl species.

The impacts of these drainage infrastructures will be positive.

**Mitigation Measures**

Taking the above into account, there are no mitigations to be considered.

Impact	Land Scape and Visual
Type of impact	Positive
Type of effect	Direct and Indirect
Duration	Long-term if changes to natural drainage patterns are introduced
Reversibility	Changes to natural drainage flows are likely to be reversible as they could be restored once the site is decommissioned and restored
Receptor Sensitivity	Medium – nearby land users that could be impacted from changes in drainage flows.
Magnitude	High as reduces the floodwater within the site although could impact receptors outside of the Project Site located within the Project Area.
Significance of the impact without mitigation	Moderate

**8.2.2 Impacts on biological environment**

The key impact during the operational phase is the potential impacts to avifauna. According to the “Guidelines to Minimize the Impact of Solar Facilities and Associated Infrastructure in South Africa” (Bird Life International, 2015), the most important impact of solar facilities on avifauna is the displacement of critical species and loss of habitat from construction activities – which were discussed earlier.

Other potential impacts generally raised on avifauna include the PV panels being reflective surfaces which could act as attractants for birds through glare or confusion with water bodies and can cause disorientation of flying birds, resulting in injury and/or death. According to the BirdLife Guidelines discussed above it states, “in addition, recent findings at facilities in North America suggest that collision mortality impacts may be underestimated at solar PV plants, with collision trauma with PV panels, perhaps associated with polarized light pollution and/or with waterbirds mistaking large arrays of PV panels as wetlands—the so-called ‘lake effect’”. However, the “Solar Energy Guidance V.1 – Birds and Solar Energy within the Rift Valley/Red Sea Flyway” (Birdlife, 2014) also developed by BirdLife International also states that such impacts are considered to have limited data and require further study.

During operation, there is a particular risk to birds mainly from operation of the high voltage overhead lines from the substation onsite to the High Voltage National Grid. Risks for avifauna are electrocution and collision, both leading to serious injuries and, in most cases, death. Big and heavy birds are in special risk, because of their reduced ability to avoid suddenly appearing power lines, especially in times of reduced sight distances (sandstorms, fog, rain, etc) or strong winds. These impacts are addressed in more details within the stand-alone OHTL ESIA prepared for this Associated Facility (See Annex XIII).

Anyhow, putting things into perspective there is major risk of avifauna mortality, and which could occur with most human development (ranging from buildings to large scale industrial projects).

For insects, solar panels, being a source of polarized light pollution, can become ecological traps associated with reproductive failure and mortality in flying insects that are attracted to them and by extension with rapid population declines or collapse.

According to the insect survey (section 7.3.3.2), the species *Gomphus lucasii*, classified as vulnerable according to the IUCN red list, was collected at the edge of a puddle near sampling station 14 at the solar power plant site. The number of individuals observed was low to establish a conclusive population interpretation.

### **Mitigation and Monitoring Measures**

Restoration measures of the natural habitats, that will be disturbed during O&M activities, following good environmental practices will be implemented.

Although as discussed earlier such impacts are minor, however, to verify this, a bird mortality program is recommended during the operation phase. The bird mortality program should be targeted to the winter and migration periods for 3 years plus any years when rainfall has been sufficient for the adjacent wetland areas to support large numbers of birds. It will be reevaluated based on the outcomes and results. Throughout the year, a complete bird fatality search survey of the Project site will be undertaken through dividing the site into sections and it will be ensured that the entire Project site is covered at least once a week.

For each fatality found, all information should be entered on to the 'bird fatality search survey recording form', see sample below. Photographs of each fatality should be numbered and be cross referenced on the recording form. The state of each carcass will also be recorded using the following condition categories:

- Intact – a fatality that is intact, is not badly de-composed and shows little or no sign of being damaged.
- Damaged – a fatality that is whole but shows signs of being damaged or a dismembered fatality with body parts (e.g. wings, skeletal remains, legs, pieces of skin, etc.) found at a single location.
- Feather patch – ten or more feathers at one location indicating damage. If only feathers are found, 10 or more total feathers or two or more primaries must be discovered to consider the observation a casualty.

All signs of injuries for any fatality encountered should be noted, identifying the affected part of the bird body. Fatalities will be labelled and recovered from site.

The above can be undertaken through one or more dedicated staff members from the Project Operator team.

However, specimens and photographs of fatalities should be examined by an ornithologist to allow the species to be identified to the finest taxonomic level possible. In addition, based on the outcomes of the program in one year, the ornithologist should prepare a report with the details and outcomes and identify any further requirements or mitigation measures to be implemented (if required).

**Sample fatality search survey recording sheet**

Start Time:			Section No.		
End Time:			Temperature:		
Incident #	Time	Species	Condition	Coordinates (decimal degrees)	Photograph No.
-	-	-	-	-	-

For insects, the increasing fragmentation of polarizing surfaces by a white grid reduces their attractiveness to polarotactic insects. This fact can be used to eliminate the trap effect associated with solar panels. By partitioning the active (i.e., highly, and horizontally polarizing) surface of a panel into smaller subpanels with nonpolarizing (e.g., white) borders, the surface is fragmented and becomes much less attractive (Horváth, G., Blahó, M., Egri, A. et al. (2010). Furthermore, an insect monitoring program, especially for *Gonphus luscasii*, will be undertaken during operation phase, including an invertebrate’s survey to ensure that mitigation measures have been successfully implemented.

The development of the solar power plant leads to biodiversity offsets.

**Monitoring and reporting requirements**

The following identifies the monitoring and reporting requirements:

- Establishment of a bird mortality programme should be targeted at the winter and migration periods for 3 years, plus any years where rainfall has been sufficient for the adjacent wetlands to support large numbers of birds.
- A monitoring programme for insects, particularly *Gonphus luscasii*, will be implemented during the operational phase, including an invertebrate survey to ensure that mitigation measures have been successfully implemented.

Impact	Biodiversité
Type of impact	Negative
Type of effect	Direct
Duration	Long term - this is planned along the operational phase.
Reversibility	Irreversible.
Receptor Sensitivity	Medium
Magnitude	Moderate
Significance of the impact without mitigation	<b>Minor</b>
Significance of the impact after mitigation	<b>Insignificant</b>

### Net Positive Impact (NPI)

The construction of flood protection dykes and the installation of a drainage system on the site will potentially involve a conversion of the natural habitat. In the current situation, hydromorphy has always limited the development of natural vegetation on approximately 26 ha of the project site.

The construction of the site's flood protection dykes avoids soil flooding and hydromorphy problems affecting the soil seed bank and seed alteration of plant species. Thus, the reduction of hydromorphy on the project site leads to a gain in biodiversity.

According to the hydrological study of the solar project, surface water during the rainy season flows to the Metbasta IBA, which is located south of the solar power plant site and contains the habitat of a number of protected bird species. This IBA is a former wetland and the water level is constant throughout the year. An exception has been made in recent years: climate change and the onset of dry seasons have led to a reduction in the extent of the water body, which has had consequences for the continued decline in the number of waterbird species known to occur in this wetland (see details of the occurrence status of bird species in Metbasta IBA in section 7.3.3.3).

The combination of these factors leads to an important opportunity for conservation and climate change mitigation: the development of the solar power plant requires an increase in solar energy production, but also minimises its impact on the persistence of biodiversity in a fragile wetland ecosystem and thus achieves no net loss, which means a net positive impact.

### 8.2.3 Impacts on Social Environment

#### (i) Security Personnel

Please refer to paragraph 8.1.3 security personnel as security personnel will still be used during the operations stage. The same set of mitigation and monitoring measures will be

used.

***(ii) Occupational Health and Safety***

Throughout the operation phase there will be occupational health and safety risks to workers. The following risks are generally associated with operational solar PV development projects:

- Slips and falls.
- Working at heights.
- Working with powered and hand-held tools.
- Trench work ;
- Working in sunny conditions and high temperatures.
- Exposure to electric shocks and burns when touching live components.

**Mitigation Measures**

**Occupational Health and Safety**

The Project Operator has not been selected at this stage for the Project. However, at a later stage, it is expected that the Project Operator will prepare an Occupational Health and Safety Plan (OHSP) regarding the Project's works.

The objective of the OHSP is to ensure the health and safety of all personnel to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property of the Project Operator and all involved sub-contractors.

The OHSP for the operation phase should be project and site specific and should take into account national requirements, mainly the local Tunisian workforce. In addition, it should also comply with international standards, in particular, but not limited to, IFC PS2 (labour and working conditions), the AfDB OS5, etc., which recognise the importance of avoiding or mitigating adverse effects on workers' health and safety and require the development of a project-specific health and safety plan in line with Good International Practice (GIP).

**Emergency Preparedness and Response**

The Project Operator will prepare and implement an Emergency Preparedness and Response Plan for the Project operation phase.

The objective is to establish a series of organizational, operational, and preventive measures in the event of an emergency that are adapted to the circumstance of such situations, which in turn will ensure the safety of workers and property within the specific Project site. The plan should consider the following:

- Inclusion of requirements for an emergency responder team that includes at a minimum first aiders and firefighters that receive appropriate and certified training.
- Inclusion of requirements to undertake emergency drills in coordination with external emergency response services if required (e.g. civil defense, nearest hospital, etc.).
- Identify in detail of emergency procedures to be implemented to include first actions, alerting emergency contacts, site evacuation, communicating with external emergency services.
- Identification in details of emergency control measures to include but not limited to fire, personnel accidents, spillage, sandstorms, heat strokes, and other.
- The gas pipeline shall be considered in the Emergency Preparedness and Response Plan in coordination with STEG and relevant authorities.
- Identification of location of assembly points onsite.
- Identification of emergency signs to be implemented onsite.
- Identify roles and responsibilities for implementation of plan to include establishment of an emergency committee and assigning roles to an emergency manager.

In addition, it is recommended to provide training on OHS risks related to solar power plant for the work force that may not have previous experience in this sector.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Submission of an Occupational Health and Safety Plan (OHSP)
- Submission of an Emergency Preparedness and Response plan

Impact	Occupational Health and Safety
Type of impact	Negative
Type of Effect	Direct
Duration	Long term as it is expected during the entire operation phase
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High given that could result in potential health and safety risks to the workforce.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	<b>Minor</b>
Significance of the impact with mitigation	<b>Minor</b>

***(iii) Potential labor violations within the supply chain***

The use of a supply chain introduces the potential for labour violations to occur. This include, for example, poor working conditions, a lack of written worker contracts being

used, low-levels of occupational health and safety, child labour, forced labour and other forms of labour-related exploitation.

**Mitigation Measures**

Similar to mitigation measures adopted for construction activities, Developer will implement a Supply Chain Management Plan.

Developer shall take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the operation of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) that categorically prohibit and ban (i) the abusive employment of children or vulnerable persons and (ii) the practice of forced labor, human trafficking and slavery.

**Monitoring and Reporting Requirements**

- Inspection to ensure the implementation of the Supply Chain Management Plan.

Impact	Potential labour violations within the supply chain
Type of impact	Negative
Type of effect	Direct
Duration	Short Term
Reversibility	Depending upon the nature of any long-term consequences of exploitation, the impact could be reversible or irreversible.
Receptor Sensitivity	The sensitivity is high as this is a key Project issue. Any labour violations within the supply chain will not be tolerated.
Magnitude	The negative impact magnitude is medium as there is a risk that labour violations will occur amongst the supply chain. In Tunisia, Gaining the support from Tunisia’s leading trade union UGTT is vital for the realization of these goals in Tunisia The long-term aim of FAIR is the reduction in deceptive and coercive practices during the recruitment process and violations of fundamental principles and rights at work, as well as other human and labour rights, brought about through increased safe migration options, effective regulation of public and private employment agencies, and unscrupulous actors being held accountable for violations.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

***(iii) Local and Regional Economy***

In order to strengthen the positive effects, it is recommended that the Project Operator under supervision from the Developer, implement a Local Content Policy that would seek to procure goods and services from SMEs based in the governorate of Kairouan to ensure that the positive effects of using SMEs are experienced as close to the Project site as possible to enhance the positive benefits of the Project at this location. This should also aim to consider to the extent possible female-owned businesses.

The total capital spent on SMEs during the operation phase will be recorded, broken down by where they are based and operational (i.e. at a local community, governorate and/or national level).

Impact	Local and Regional Economy
Type of impact	Positive
Type of Effect	Direct and indirect because the company will provide energy to the national grid which will benefit other electricity users (households, businesses, and government buildings)
Duration	Long term as it is expected during the entire operation phase
Reversibility	Reversible as it will only continue during operation.
Receptor Sensitivity	Medium as Tunisia’s energy demand will continue to increase during the lifespan of the Project.
Magnitude	Low as the quantity of energy generated by the Project is an important contribution at 100 MW considering that there are no power generation facilities in the Kairouan region.
Significance of the impact without mitigation	<b>Minor</b>

***(iv) Local Employment***

The composition of the operation workforce is estimated to be around 45 to include low skilled workers and skilled workers. There will be no need for the Project to use low-skilled people from outside the local area as there is sufficient supply of people based in the nearby community of Metbasta, Dalloussi and El Alem and elsewhere in governorate of Kairouan. In addition, priority for skilled workers should also be for people within the Governorate of Kairouan and if not available workers from outside of the Governorate can be considered.

The individuals employed during the operation stage, and their household members, will benefit from increased income that is likely to increase their overall standard of living, access to healthcare and educational resources, and reduce their socio-economic vulnerability. The provision of job opportunities and training has repeatedly been

mentioned during stakeholder engagement activities and is a key, local expectation arising from the project.

However, there is a potential for local tensions to arise if residents within local communities incorrectly perceive that people from outside the local area are being provided with employment opportunities. Whilst local employment is generally a positive impact, a loss of reputation and negative perceptions towards the Project could occur if the local recruitment process is not adequately managed and negative perceptions arise.

**Recommendations**

In order to strengthen the positive effects, it is recommended that the Project Operator under supervision from the Developer, implement a Local Employment Plan. This shall contain a similar set of measures to the plan used for the operation phase.

Impact	Local Employment
Type of impact	Positive
Type of Effect	Direct and indirect because the individuals and their household members are expected to benefit from an increase in standard of living and reduced vulnerability to external shocks.
Duration	Long term as it will continue over the lifetime of the Project
Reversibility	Reversible as it will only continue during operation.
Receptor Sensitivity	Medium as Tunisia’s energy demand will continue to increase during the lifespan of the Project.
Magnitude	Low as the workforce required during operations is relatively small when compared to the construction stage.
Significance of the impact without mitigation	<b>Minor</b>

***v) Potential labour law violations in the supply chain***

The use of a supply chain introduces the risk of labour law violations. Examples include poor working conditions, lack of written employment contracts, low levels of occupational health and safety, child labour, forced labour and other forms of labour exploitation.

**Mitigation measures**

As with the mitigation measures adopted for construction activities, the Promoter will implement a supply chain management plan.

The Promoter shall take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components The Promoter shall take all necessary precautions and make proactive and thorough investigations to ensure that the equipment, components, materials and other supplies used for the operation

of the solar power plant are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) which categorically prohibit and ban (i) the employment of children or abusive employment of vulnerable persons and (ii) the practice of forced labour, human trafficking and slavery.

**Monitoring requirements and reporting**

- Inspection to ensure implementation of the supply chain management plan.

Impact	Potential labour law violations in the supply chain
Nature of the impact	Negative
type of impact	Direct
duration	Short Duration
reversibility	Depending on the nature of the long-term consequences of the operation, the impact may be reversible or irreversible.
sensitivity of the receptors	Sensitivity is high as this is a key issue for the project. Any violation of labour law within the supply chain will not be tolerated.
Magnitude	The magnitude of the negative impact is medium because there is a risk that labour violations will occur within the supply chain. The long-term goal of equity is the reduction of deceptive and coercive practices during the recruitment process and violations of fundamental principles and rights at work, as well as other human and labour rights, through the increase of safe migration options, effective regulation of public and private recruitment agencies and accountability of unscrupulous actors for violations
Importance of the impact without mitigation	moderate
Importance of impact with mitigation	minor

***(v) Community Development Plan***

The Project Company is aiming to continue the Community Development Plan that was started during construction in a similar manner, taking into consideration any lessons learned gained from the construction stage.

**8.2.4 Impacts on Infrastructure and Utilities**

***(i) Water Resources***

During operation, approximately 45 persons will work on the project site, and they will consume approximately 115 m<sup>3</sup>/Year. Water will be supplied by SONEDE.

The PV modules will be cleaned on a regular basis to prevent dust build-up which could affect their performance. A dry-cleaning method is proposed with a dry rolling brush,

which is propelled by a vehicle (tractor) that traverses between the module rows. No water or cleaning solvent is used for cleaning. The cleaning occurs during the early morning and late evening, so as not to reduce PV generation with shading. A total of three vehicles are required to clean the entire PV array, at a frequency of 12 times per year to maintain a reasonable soiling loss (<2%). Thus, the use of dry-cleaning saves approximately 3,000 m<sup>3</sup> of water per year (based on approx. 250 m<sup>3</sup> of water per clean of the entire PV array).

Item	Quantity	Units	Consumption Rate (Liters/Unit)	Consumption (Litres)	Frequency	Consumption (Litres)
Toilet flushing	40	Flushes per day	4	160	260	41 600
Hand washing / ablutions	60	Cleaning minutes per day	3	180	260	46 800
Dish washing	50	Cleaning minutes per day	2	100	260	26 000
<b>TOTAL Consumption during operation phase (Litres)</b>						<b>114 400</b>

**Mitigations Measures**

The same set of mitigation measures will be used during construction, as it is likely that the same source of water will be used.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements to be applied by the Operator during operational phase and which include:

Submit water consumption report.

Impact	Water Resources
Type of impact	Negative
Type of Effect	Direct
Duration	Long Term as it is expected all throughout the operation phase
Reversibility	Reversible
Receptor Sensitivity	Medium due to importance of water supply conditions within the area
Magnitude	Low as water requirements are considered relatively low
Significance of the impact without mitigation	<b>Minor</b>
Significance of the impact with mitigation	<b>Not significant</b>

***(ii) Waste Management***

During operations, very small quantities of waste will be generated, and these will be managed in the same construction waste. Hazardous waste mainly broken PV modules will be recycled by an accredited facility according to all applicable environmental laws. All

third-party waste transporters or waste treatment/disposal facilities will be inspected prior to their use, to ensure that:

- On-site and Off-site transportation of waste should be conducted so as to prevent or minimize spills, releases, and exposures to employees and the public. All waste containers designated for off-site shipment should be secured and labeled with the contents and associated hazards, be properly loaded on the transport vehicles before leaving the site, and be accompanied by a shipping paper (i.e., manifest) that describes the load and its associated hazards.
- Have the technical capability to manage the waste in a manner that reduces immediate and future impact to the environment.
- Have all required permits, certifications, and approvals, of applicable government authorities.
- Have been secured using formal procurement agreements.
- Maintain a hazardous waste management register throughout the operational phase.

#### **Wastewater Generation**

Small quantities of wastewater are expected to be generated during operations and this shall be managed in the same as the measures adopted for the construction stage.

### **8.3 *Key Impacts during the Decommissioning Phase***

According to the PPA, the Project is expected to be operational for 20 years and then the plant shall be handed over to the STEG. In the case of the complete decommissioning of the PV farm, decommissioning activities could include the disconnection of the various Project components (PV array, central inverter stations, substation, etc.) for Re-use, recycling and then, if these options are not available, final disposal. In addition, internal road network will be restored, and gates and fences will be removed.

Generally, the anticipated impacts throughout the decommissioning phase are similar in nature to impacts assessed during the construction phase. Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase. This includes impacts related to the following:

- Landscape and visual
- Biological environment
- Infrastructure & Utilities
- Waste management
- Occupational health and safety

### 8.3.1 Impacts on landscape and visual

Site activities will include the decommissioning of arrays and the various Project components, including transmission cables, access roads and internal road network, storage buildings, etc.

From the start of decommissioning activities, visual changes will occur from the modified ground surface and the presence of construction equipment and machinery (excavators, trucks, front end loaders, compactors, and others).

#### Mitigation Measures

The following mitigation measures will be applied:

- Preparation of a waste management plan (WMP).
- The decommissioning site will be left in a tidy condition at the end of each workday.
- Waste streams will be properly stored and not allowed to spread outside of the Project Site.
- All areas will be fully restored once they have been used for decommissioning works to restore the natural visual setting to the extent possible.
- All artificial lights used will adopt a downlighting strategy so that artificial light does not escape outside of the Project Site.

#### Monitoring and Reporting Requirements

The following monitoring measures will be implemented:

- The condition of the worksite each day shall be inspected which includes the waste storage area, to ensure that the site is kept tidy.
- The ground areas disturbed during decommissioning shall be inspected before the contractor demobilizes, to check that the land has been adequately restored.
- The condition of the boundary natural vegetative screening will be checked to see if this is becoming established and maintained, as required.

Impact	Landscape and visual
Type of impact	Negative
Type of Effect	Direct
Duration	The effects will commence from the start of decommissioning and thereafter permanent restoration in visual character will occur.
Reversibility	Irreversible
Receptor Sensitivity	Low on the basis that there is no international or national tourism receptors in the area, and the land has little, if any aesthetic value.
Magnitude	High – the restoration of visual condition of

Impact	Landscape and visual
	the land will occur within the Project Site and will be noticeable across the surrounding area.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

### 8.3.2 Impacts on Biological Environment

The decommissioning phase involve the dismantling and removal of security perimeter fencing, buildings and access tracks required for operation, electrical infrastructure (transformers, the on-site substation and transmission lines connected to the power grid), and solar panel arrays and their associated structural components. Many of the same procedures and equipment used during construction is employing in decommissioning phase. Generally, the anticipated impacts throughout the decommissioning phase are similar in nature to impacts assessed during the construction phase (alteration and disturb of existing habitats, improper management of the site, collision risk and roadkill, etc.).

#### Mitigations Measures

- The following identifies additional requirements to be applied by the project operator during the decommissioning phase:
- Reviewing the monitoring dataset accumulated over the project lifecycle and undertaking field surveys, if needed, to confirm the sensitive species for consideration during decommissioning.
- Establish a schedule of work that will consider the seasonal nature of the project climate. In this sense, it is recommended to carry out decommissioning work during the dry season (July to September) so as to limit as much as possible the impacts on fauna as birds nesting period extends from mid-March to mid-July and to avoid managing water during earthworks.
- Limit vehicle movements to only be on designated paved/unpaved roads and maintain a speed of vehicles to 15-20 km/h to reduce impacts to surrounding natural vegetation.
- Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.
- Minimising habitat disturbance during infrastructure removal.
- Minimising noise impacts on fauna associated with infrastructure removal procedures.
- Ensure appropriate management of pollution risks to prevent any impact of wildlife and in particular batrachian.;
- Ensuring good practice for reuse, recycling, or disposal of decommissioned components.

- Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading, etc.
- Development of Framework Decommissioning Plan including all disposal options and relevant costs. End-of-life solar plant infrastructure components including solar panels and aluminium and copper cables will need to be recycled or otherwise disposed of responsibly.
- After decommissioning, the site should be reinstated to its original state as far as feasible. In addition, internal road network will be restored, and gates and fences will be removed. Restoration measures following good environmental practices should be the focus during this phase.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Inspection of the works should be carried out at all times.
- Submission of a Framework Decommissioning Plan including all biodiversity aspects and mitigation measures presented above.

Impact	Biological Environment
Type of impact	Negative
Type of Effect	Direct and indirect as it will affect Fauna / Flora
Duration	Short Term as impacts will be limited to the decommissioning period.
Reversibility	Reversible: some species could remove to the site after decommissioning. Irreversible for Entomofauna: impact for the individuals destroyed will remain low because it is limited to the decommissioning work areas and vehicle traffic road.
Receptor Sensitivity	High presence of 3 wetland areas (IBA) at 1km, 5.4 km and 5.4 km from the project site
Magnitude	Medium as site decommissioning activities will be restricted only in the project site. Fauna could move away to similar habitats in the surrounding activities also.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

**8.3.3 Impacts on Infrastructure & Utilities**

*(i) Water Resources*

Water requirements for the decommissioning phase are low and are limited to sanitary use by site personnel (drinking, showering, etc.) and the decommissioning activities such as cleaning of machinery and equipment, dust control, etc.

The source of water for the decommissioning phase is likely to be the same as that used for

the construction stage. Water will be supplied by SONEDE.

**Mitigations Measures**

The following identifies additional requirements to be applied by the contractor during the decommissioning phase:

- Document water consumption of the Project during the decommissioning phase

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Submit water consumption report.
- Monitor community water sources.

Impact	Water Resources
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to the decommissioning phase
Reversibility	Reversible as water resources in general can be considered rechargeable
Receptor Sensitivity	Medium due to importance of water supply conditions within the area
Magnitude	Low as water requirements are considered relatively low
Significance of the impact without mitigation	<b>Minor</b>
Significance of the impact with mitigation	<b>Not Significant</b>

***(ii) Waste and the use of water***

The Project is expected to generate the following waste streams during the decommissioning phase:

- Wastewater is mainly expected to include black water (sewage water from toilets and sanitation facilities), as well as grey water (from sinks, showers, etc.) generated from workers during the decommissioning. Wastewater will be stored onsite though enclosed septic tanks and collected by tankers from the Project to the closest WWTP.
- Solid waste will include waste (mainly dirt, soil, debris, etc.) as well as general municipal waste (such as food, paper, glass, bottles, plastic, etc.). Solid waste quantities generated are not expected to be significant and are likely to be easily handled by closest approved solid waste disposal facility, as the public landfill of Sbikha.
- Hazardous waste will include spent oil, lubricants, paint cans, solvents, etc. Hazardous waste quantities generated are not expected to be significant and will be recovered by companies authorized by the Minister of the Environment.
- Of particular importance in relation to the decommissioning phase is the management

of the panels at the end of their lifetime. The PV panel suppliers are part of a recycling program for PV Panels known as PV CYCLE – an association organizing the take-back and recycling of PV modules at end-of-life. The recycling program of PV CYCLE is a comprehensive recycling process which recovers most of the materials within the PV panel (including glass, semiconductor material, ferrous and non-ferrous metals, etc.) for reuse in new products. Such an option is available and could be used for the PV panels at the end-of-life.

Given that at this stage there is a great deal of uncertainty at the decommissioning phase of the Project (with regards as to whom is the responsible party, prospects on waste disposal facilities in Tunisia, etc.), it is recommended that before any decommissioning activities take place a Disposal Plan for the PV Panels is prepared by the responsible entity undertaking decommissioning activities. The plan should consider the following options and compare the costs/benefits of each:

- It is recommended that the Plan first opt for disposing the panels at the end of their lifetime as part of international recycling programs for PV Panels (such as PV CYCLE's recycling program); and
- If the above could not be achieved, as a last option the plan must investigate the disposal of the Panels at existing waste facilities in Tunisia.

### **Mitigation Measures**

The following identifies the additional requirements to be applied and which include:

- A waste management plan shall be prepared which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal.
- Adequate sanitary facilities, i.e. toilets and showers, (Mixed toilets: (i) 26 to 50 employees = 3 toilets; (ii) 51 to 75 employees = 4; (iii) 76 to 100 = 5 // Men only: (i) 16 to 45 employees = 2 toilets; (ii) 46 to 75 = 3; (iii) 76 to 100 = 4), will be provided to the construction labour force.
- Any third-party waste management facility or transport/handling company will be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Sbikha, or other location.
- Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.
- Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies

authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if necessary.

- Final disposal will be checked for compliance with IFC/AfDB and GIIP standards
- All waste transfers will be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the destination of waste.

### **Monitoring and Reporting Requirements**

The monitoring and reporting requirements are listed below:

- Inspection of wastewater and solid waste management practices onsite to ensure waste is being segregated and adequately stored.
- Review of chain of custody records for all waste types generated.
- Develop and report key performance indicators that tracks waste minimization, and the recycling of waste.
- Inspection of all third-party waste transporters or waste treatment/disposal facilities prior to their use. The scope of the inspection will include the following:
  - Their capacity to accept Project waste types and volumes over the lifetime of the decommissioning stage.
  - Adequate temporary waste collection area, a waste sorting facility, leachate methane and air emission controls.
  - water, soil.
  - contamination and air emissions monitoring at and around the facilities
  - Submission of monthly ESMP monitoring report to AfDB on waste and use of water.

Impact	Waste Utilities
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to to the decommissioning phase only
Reversibility	Water abstraction is expected to be reversible. The use of waste treatment/disposal facilities is expected to be non-reversible as once space in landfill facilities is used, this will be permanently used.
Receptor Sensitivity	Low as such utilities are expected to be able to handle project requirements
Magnitude	Low as waste generated from project is considered relatively minimal
Significance of the impact without mitigation	<b>Not Significant</b>
Significance of the impact with mitigation	<b>Not Significant</b>

### 8.3.4 Impacts on Occupational health and safety

Throughout the decommissioning phase there will be generic occupational health and safety risks to workers, as working onsite increases the risk of injury or death due to accidents. The following risks are generally associated with solar PV projects:

- Slips and falls.
- Working at heights.
- Working with powered and hand-held tools.
- Struck-by objects.
- Moving machineries.
- Working in confined spaces and excavations.
- Exposure to chemicals, hazardous or flammable materials.
- Working in sunny conditions and high temperatures.
- Exposure to electric shocks and burns when touching live components.

#### Mitigation Measures

The project contractor is expected to prepare an Occupational Health and Safety Plan (OHSP) regarding the Project's commissioning works.

The objective of the OHSP is to ensure the health and safety of all personnel to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property of the project operator and all involved sub-contractors.

The OHSP for the decommissioning phase should be site specific and must consider the national requirements mainly the "Law n°87-31 of July 6<sup>th</sup>, 1987". In addition, it must also be compliant with the IFC PS2 (Labor and Working Conditions) which recognize the importance of avoiding or mitigating adverse health and safety impacts on workers and require the development of a project-specific health and safety plan that is in accordance with Good International Practice (GIP).

In general, the OHSP should address the following components:

- Identify roles and responsibilities of the personnel involved within the Project to include the EHS manager, construction manager, supervisor, and other subcontractors' responsibilities.
- Identify details and procedures for always ensuring and maintaining hygienic conditions onsite specifically related to toilet and washing facilities, eating areas, etc.
- Identify in details information in relation to formulation of safety committees, communication protocols, first aid personnel and facilities, first aid training programs,

occupational health and safety culture, quality system, reporting requirements, competence and job safety training, safety inspections, recruitment procedures, safety audits, risk assessment, etc.

- Identify in detail the hazards which may be associated with various activities to take place and the various measures to be implemented to reduce such risks including the requirements for Personal Protective Equipment (PPE). This includes for example hand tools, access equipment, lifting equipment, mobile working equipment, etc.
- Establish training requirements for workers to comply with health and safety procedures and protective equipment.
- Consider the gas pipeline in the Emergency Preparedness and Response Plan in coordination with STEG and relevant authorities.

The project operator is expected to adopt and implement the provisions of the OHSP throughout the Project decommissioning phase.

**Monitoring and Reporting Requirements**

The following identifies the monitoring and reporting requirements:

- Submission of an Occupational Health and Safety Plan (OHSP); and
- Submission of an Emergency Preparedness and Response plan
- Submission of monthly ESMP monitoring report to AfDB including OHSP

Impact	Occupational Health & Safety
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the decommissioning phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety s the Project’s highest priority.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Not Significant

**8.4 Summary of Key Impacts**

The tables below provide a summary of the key impacts of the Project on the physical, biological, and social environment and infrastructure and utilities during the construction, operation and decommissioning phases.

The final specific plan and monitoring requirement for the project will be annexed to the ESIA while all inputs will be completed.

**Table 8.2 - Summary of Impacts during the Construction phase of the solar plant**

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct	Long term	Irreversible	Low	Medium	Minor	Not Significant
Soil degradation & sealing	Direct	Short term	Reversible	Low	Low	Not significant	-
Flood risk	Direct	Long term	Reversible	Medium	Low to medium	Moderate	Minor
Air quality	Direct	Short term	Reversible	Low	Medium	Minor	Not Significant
Noise	Direct	Short term	Reversible	Low	Medium	Minor	Not Significant
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Long term	Reversible & Irreversible	High	Medium	Moderate	Minor
Fauna	Direct & indirect	Long term	Reversible & Irreversible	High	Medium	Moderate	Minor
<b>Impacts on social environment</b>							
Land use	Direct	Long term	Irreversible	Low	Low	Not significant	-
Archaeology and cultural heritage	Direct	Short term	Irreversible	Low	Medium	Minor	Not Significant
Trespassing of Unauthorized Personnel	Direct	Short term	Irreversible	High	Low	Minor	Not Significant
Worker Influx	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
Security Personnel	Direct	Short term	Irreversible	Medium	Low	Minor	Not Significant
Occupational Health and Safety	Direct	Short term	Irreversible	High	Low	Minor	Not Significant
Labor violations within supply chain	Direct	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Community health and safety risks - road transport	Direct	Short term	Irreversible	High	High	Major	Minor
National, Local and Regional Economy	Direct & Indirect	Short term	Reversible	Medium	Medium	Minor	-
Employment and management of the workforce	Direct	Short term	Reversible	High	Medium	Moderate	-
Community Development	Direct	Long term	Irreversible	High	Medium	Moderate	-
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Short term	Reversible	Medium	Low	Minor	Not Significant
Waste utilities	Direct	Short term	Reversible & Irreversible	Low	Low	Not significant	-

**Table 8.3 - Summary of Impacts during the Operation phase of the solar plant**

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct & indirect	Long term	Irreversible	Low	Medium	Minor	Not Significant
Flood Risk	Direct & indirect	Long term	Reversible	Medium	High	Moderate	-
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Long term	Reversible & Irreversible	Medium	Medium	Minor	Not Significant
Fauna	Direct & indirect	Long term	Reversible & Irreversible	Medium	Medium	Minor	Not Significant
<b>Impacts on social environment</b>							
Security Personnel	Direct	Long term	Irreversible	Medium	Low	Minor	Not Significant
Occupational Health and Safety	Direct	Long term	Irreversible	High	Low	Minor	Minor
Labor violations within supply chain	Direct	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Local and Regional Economy	Direct & Indirect	Long term	Reversible	Medium	Low	Minor	-
Local Employment	Direct & Indirect	Long term	Reversible	Medium	Low	Minor	-
Community Development	Direct	Long term	Irreversible	High	Medium	Moderate	-
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Long term	Reversible	Medium	Low	Minor	Not Significant
Waste Management	Direct	Long term	Reversible & Irreversible	Low	Low	Not significant	-

**Table 8.4 - Summary of Impacts during the Decommissioning phase of the solar plant**

Impacts	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
<b>Impacts on physical environment</b>							
Landscape and Visual	Direct	Short term	Reversible	Low	High	Minor	Minor
<b>Impacts on biological environment</b>							
Flora	Direct & indirect	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
Fauna	Direct & indirect	Short term	Reversible & Irreversible	High	Medium	Moderate	Minor
<b>Impacts on social environment</b>							
Occupational Health and Safety	Direct	Short term	Irreversible	High	Low	Minor	Minor
<b>Impacts on infrastructure and utilities</b>							
Water Resources	Direct	Short term	Reversible	Medium	Low	Minor	Not Significant
Waste utilities	Direct	Short term	Reversible & Irreversible	Low	Low	Not significant	-

## 9.0 ASSESSMENT OF CUMULATIVE IMPACTS

The Environmental and Social Impact Assessment (ESIA) considered the cumulative impacts that could result from the additional impacts of other existing and/or planned developments in the area.

### 9.1 *Development projects (industrial zones and agricultural projects)*

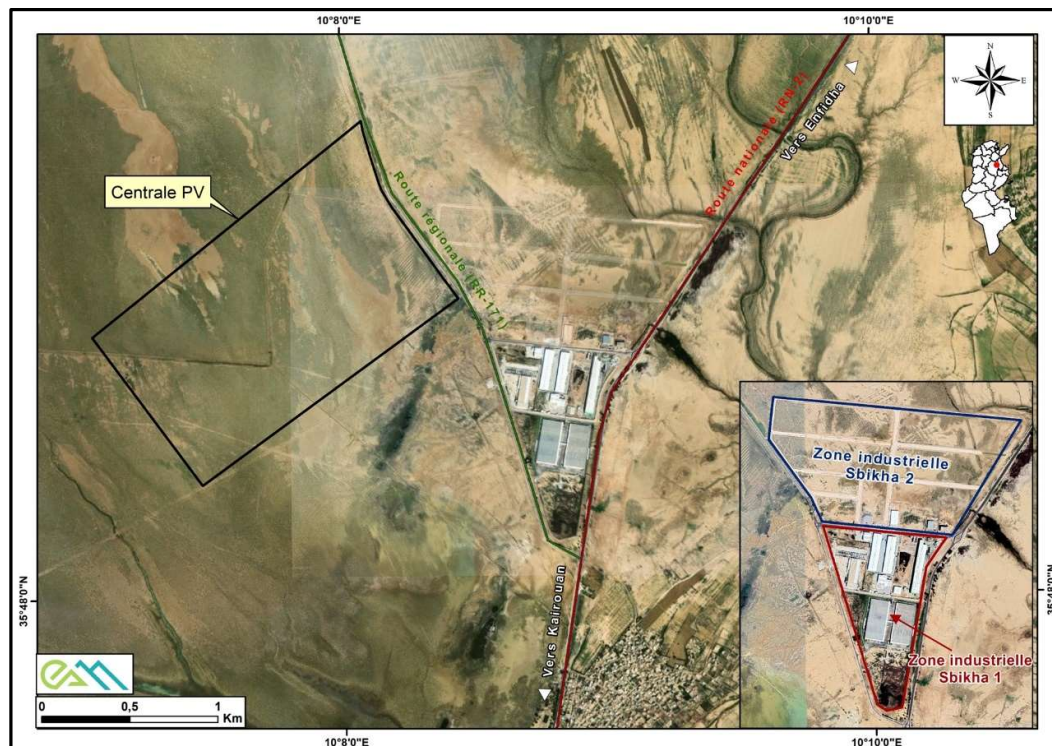
Based on a review of currently available information, known development projects in the area include the existing Sbikha 1 industrial estate and the planned Sbikha 2 industrial estate, both of which are discussed below.

#### **The industrial zone Sbikha 1**

The Sbikha 1 Industrial zone is located approximately at 500 m from the site of the Kairouan photovoltaic power plant. It was carried out by the Industrial Land Agency (AFI) in 2010 on a land of 50 ha and includes 10 functional industries.

#### **The industrial zone Sbikha 2**

The industrial zone Sbikha 2 is located approximately at 100 m from the site of the Kairouan photovoltaic power plant. It is currently under construction phase, over an area of 100 ha.



**Figure 9.1 - Industrial zone Sbikha 1 and Sbikha 2**

### **400 ha Agricultural Project**

The 400 ha agricultural project under development could further reduce the availability of grazing land, increase competition for the remaining grazing land and lead to further degradation.

The table below provides a summary of the anticipated cumulative impacts related to the Project considering the various environmental and social receptors investigated as part of this ESIA.

**Table 9.1 - Summary of Anticipated Cumulative Impacts**

Attribute	Cumulative Impacts
<b>Landscape and visual</b>	<p>Key impacts are during the operation phase and related to the interaction of each project with the landscape and any potential nearby key and sensitive visual receptors within each project area. Those are considered site-specific impacts and cumulative impacts are irrelevant.</p> <p>There is no key landscape and visual receptors in the projet area. Within the area and surrounding this mainly includes, the industrial zone Sbikha 1 and Sbikha 2, the regional road RR-171 (Metbasta to Sbikha), while the nearest settlement is Metbasta village located 2.3 km south of the project site.</p> <p>The ESIA of the Kairouan Power Solar PV Project included a landscape and visual survey identifying key landscape and visual receptor within the area and based on outcomes appropriate mitigation and monitoring measures were identified.</p>
<b>Land Use</b>	<p>Les impacts sont principalement liés à la phase de planification et de construction, étant donné que chaque développement de projet pourrait entraîner des impacts sur l'utilisation des terres sur chaque site de projet, liés à des déplacements économiques et/ou physiques. Ces impacts sont considérés comme spécifiques à chaque site de projet et les impacts cumulatifs ne sont donc pas pertinents.</p> <p>La zone industrielle de Sbikha 1 est actuellement opérationnelle et ces impacts ne sont donc pas pertinents, de même pour la zone industrielle de Sbikha 2 qui est en cours de construction.</p> <p>Le projet agricole de 400 ha en cours de développement pourrait réduire davantage la disponibilité des pâturages, accroître la concurrence pour les pâturages restants et entraîner une nouvelle dégradation.</p> <p>Il est à noter que l'activité de pastoralisme extensif est entreprise dans les terres ouvertes de la région de Metbasta qui s'étendent sur une superficie qui dépasse les 10 000 hectares qui font l'objet des titres fonciers 20321 Kairouan, 20523 Kairouan, 20323 Kairouan et 33767 Kairouan. Cumulés avec les impacts du projet Kairouan, les pâturages disponibles pour les éleveurs seraient réduits d'environ 6% du total des terres ouvertes dans la région de Metbasta.</p> <p>L'EIES du projet solaire comprenait une étude de l'utilisation des terres identifiant les principales utilisations des terres et, en fonction des résultats, des mesures d'atténuation et de surveillance appropriées ont été identifiées.</p>
<b>Geology, Hydrology and Hydrogeology</b>	<p>Key impact is related to waste management onsite at each project area (solid waste, wastewater, and hazardous waste) during both the construction and operation phase. Such impacts in general are considered site-specific and are related to the overall managements of waste practices by the Developers, EPC Contractors, and Project Operators both onsite and offsite.</p> <p>The ESIA for the Kairouan Project identified proper mitigation and monitoring measure for waste storage onsite, collection and transportation and final disposal (e.g., coordination with relevant local authorities to obtain list of authorized contractors for waste collection, utilization of manifests, allocation of proper areas for storage onsite with measures for construction of such areas, etc.).</p>
<b>Biodiversity</b>	<p>Impacts mainly related to construction phase at each project site, as construction activities could damage/disturb existing habitats and any threatened or endangered species which might be present within each project site. Those are considered site-specific impacts related to each project site and therefore cumulative impacts are irrelevant.</p> <p>The industrial zone Sbikha 1 is currently operational and therefore such impacts are not relevant, similarly for the Sbikha 2 industrial zone which is currently under construction.</p>

Attribute	Cumulative Impacts
	The ESIA of the Kairouan Power Solar PV Project includes a biodiversity survey to identify any key habitats and based on outcomes appropriate mitigation and monitoring measures were identified.
<b>Archaeology and Cultural heritage</b>	Impacts mainly related to construction phase at each project site, as construction activities could damage/disturb potential archaeological remains, as well as potential archaeological remains which could be buried in the ground (if any). Those are considered site-specific impacts related to each project site and therefore cumulative impacts are irrelevant. The industrial zone Sbukha 1 is currently operational and therefore such impacts are not relevant, contrary to the Sbukha 2 industrial zone which is currently under construction. The ESIA of the Kairouan Power Solar PV Project includes an archeology and cultural heritage survey and based on outcomes appropriate mitigation and monitoring measures were identified.
<b>Air Quality and Noise</b>	Impacts mainly related to construction phase as construction activities at each project site will likely result in an increased level of dust and noise level emissions which in turn could impact nearby sensitive receptors. Those are considered site-specific impacts related to each project site and therefore cumulative impacts are irrelevant given the distance between such sites. The industrial zone Sbukha 1 is currently operational and thus such impacts are relevant, similarly to the industrial zone Sbukha 2 which is under construction. The ESIA of the Kairouan Power Solar PV Project identify appropriate mitigation and monitoring measures related to dust and noise control.
<b>Infrastructure and utilities</b>	Key cumulative impacts in relation to infrastructure and utilities is related to the water requirements considered relevant from all 3 development projects (Industrial zone Sbukha1, Industrial zone Sbukha 2 and Kairouan Power Project) during both the construction and operation phase. As the industrial zone Sbukha 1 is currently operational, similarly for the industrial zone Sbukha 2 under construction, it is expected that consultations with CRDA or/and SONEDE have already been established and water requirements for the Project are already secured through an agreed mechanism. Similarly, it is expected that Kairouan Power Project would undertake meetings and consultations with coordinate with CRDA to determine the most feasible and practical approach for securing the water requirements of the Project. In addition, the project site will be connected to the SONEDE network.
<b>Socio-economic conditions</b>	Key impacts in relation to socio-economic development includes the potential for job and procurement opportunities for local communities during the construction and operation phase, which would to some extent enhance the socio-economic conditions of local communities. The industrial zone Sbukha 1 and 2 established their own procedures and systems for local employment and procurement. It is expected that the Kairouan Power project would implement such procedure for their project in specific. The ESIA of the Kairouan Power Solar PV Project recommends the development and implementation of a Community Integration Plan by the EPC Contractor for working with the local community members during the construction phase, and a Community Integration Plan by Project Operator, during operation phase, under supervision of the Developer which considers a local recruitment and procurement procedure.

Attribute	Cumulative Impacts
<p><b>Occupational health and safety</b></p>	<p>Key impacts are related to construction and operation which include generic risks to workers health and safety form working on construction and operational sites, as it increases the risk of injury or death due to accidents. Those are site-specific impacts and each entity as applicable for such development projects (EPC Contractors, Project Operators, etc.) are expected to develop a site and project specific Occupational Health and Safety Plans (OHSP).</p> <p>The EPC Contractor will prepare and implement a Worker Accommodation Plan. The way in which the accommodation camp is to be selected which will take into consideration the nearby proximity of social receptors such as residential housing units and schools, and the road route to be used by vehicles transporting personnel. The ESIA recommends that a site selection study shall be undertaken to justify the location of the camp.</p> <p>In addition, the ESIA recommends the preparation of an Occupational Health and Safety Plan by the EPC Contractor during planning, construction and operation phase and its adoption, and the implementation of its recommendations/provisions.</p> <p>The Sbikha 1 industrial zone is currently operational and therefore such impacts are not relevant, contrary to the industrial zone Sbikha 2 which is under construction.</p>
<p><b>Community health, safety, and security</b></p>	<p>This includes in specific impacts related to: (i) during construction and operation trespassing of unauthorized personnel into each project site could result in potential risk from several hazards; (ii) during construction the influx of project workers could result in certain community health, safety and security impacts such as risk diseases, inappropriate Code of Conduct, increase in social vices; and (iii) during construction and operation inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation.</p> <p>Some of these impacts are considered site-specific (to include in specific trespassing impacts and impacts related to inappropriate management of security issues). Like this ESIA in specific, it is expected that appropriate site-specific security measures are implemented to prevent trespassing of local communities into the project sites and a security management plan is developed and implemented at each project site.</p> <p>Potential impacts for worker influx during the construction phase are relevant for the Kairouan project and the industrial zone Sbikha 2 project (the industrial zone of Sbikha 1 is currently operational and therefore such impacts are not relevant). This could result in cumulative impacts (especially if workers are accommodated in nearby village and may have similar construction timelines). The ESIA recommends that a worker influx plan which should identify procedures to mitigate such risks and impacts and it is expected that Metbasta Power Project would implement such requirements as well.</p>

## **9.2 *Infrastructure development projects***

### **9.2.1 RR171 and RN2 roads**

The planned and identified infrastructure projects are as follows

- Improvement (filling of gaps) of the existing road RR171 located at approximately 20m from the site of the solar power plant;
- Section to be developed of the Tunis Jilma RN2 motorway located within a radius of about 1 km from the solar power plant site. The start date of the works is scheduled for October 2022.

The RR171 road improvement project and the project to upgrade the RN2 between the cities of Enfidha and Kairouan to 2x2 lanes are part of the vast Road Infrastructure Modernisation Programme (PMIR-2) and are undertaken by the Ministry of Public Works on the country's primary network, the objective of which is to improve travel conditions and the safety of citizens and to ensure better traffic flow on this axis.

In case of concomitant projects, the main cumulative (provisional) impacts that may occur are :

**Table 9.2 - Summary of anticipated cumulative impacts**

Attribute	Cumulative impacts
<b>Landscape and visual appearance</b>	These impacts are considered to be site specific and cumulative impacts are not relevant.
<b>Land use</b>	<p>Impacts are mainly related to the planning and construction phase, as each project development could result in land use impacts at each project site, related to economic and/or physical displacement. These impacts are considered to be specific to each project site and cumulative impacts are therefore not relevant.</p> <p>The RR171 road is already built and therefore no impacts on land use are expected.</p> <p>The construction of the RN2 road will require the acquisition of bare or agricultural land and property. This will result in either a loss of income or property. The people affected by the project (221, including 57 PAPs to be resettled) also include informal plot owners (20), wooded land, cultivable land, constructions and sebkha (1,743,474 m<sup>2</sup>, 41.65% of which is on private land for a right of way of 25 m).</p> <p>The number of plots to be acquired: 312 (88 plots in the state domain and 224 private).</p> <p>Compensation budget: The overall cost of the RAP is estimated at TND 8,187,850, i.e. 5.7% of the cost of the works (Report on the provisional RAP-July 2021).</p>
<b>Geology, hydrology &amp; hydrogeology</b>	The main impact is related to on-site waste management in each project area (solid waste, wastewater and hazardous waste) during the construction and operation phase. These impacts are generally considered to be site specific and are related to the overall management of the project's waste management practices on and off site.
<b>Biodiversity</b>	Impacts are primarily related to the construction phase at each project site, which could damage/disturb existing habitats and any threatened or endangered species that may be present at each project site. These impacts are considered to be site specific and therefore cumulative impacts are not relevant.
<b>Archaeology and cultural heritage</b>	Impacts are primarily related to the construction phase at each project site, which could damage/disturb potential buried archaeological remains (if any). These impacts are considered to be specific to each project site and cumulative impacts are therefore not relevant.
<b>Air quality and noise</b>	<p>If simultaneous construction of more than one project were to occur, particulate matter from construction vehicle use on unpaved roads could be increased when existing access roads are used for multiple projects in the same corridors.</p> <p>Work on the RR171 road will generate dust during construction. The RN2 route passes mostly through rural areas. Only the larger settlements served by this road may experience some inconvenience from air pollution.</p> <p>During the construction phase, noise pollution is generated by construction machinery, tools and equipment and the movement of material and personnel vehicles.</p> <p>It is recommended that an air quality and noise management plan is put in place to control and reduce temporary cumulative emissions.</p>

Attribute	Cumulative impacts
<b>Road traffic</b>	<p>Ongoing and planned development projects using the RR171 and RN2 roads could place pressure on the local road network, particularly during the construction phases of the projects, and therefore there is an increased potential for accidents and disruption to the road traffic network for local users associated with increased traffic movements from overlapping construction works.</p> <p>It is recommended that a road traffic management plan is put in place before the works begin. In coordination with the relevant administrative and municipal authorities, this plan will manage the fluidity of possible routes and access roads.</p>
<b>Infrastructure and public services</b>	<p>The main cumulative impacts related to infrastructure and utilities concern water requirements during the construction phases. It is recommended to coordinate with CRDA and/or SONEDE to ensure that water requirements for the project are already provided through an agreed mechanism.</p>
<b>Socio-economic conditions</b>	<p>Key impacts in relation to socio-economic development include employment and service opportunities for local communities during the construction and operation phase, which would improve the socio-economic conditions of local communities to some extent.</p> <p>It is important to note that all of these infrastructure projects will (1) strengthen (leverage) the capital stock of the Kairouan region, (2) improve the attractiveness of the region to foreign investment and (3) contribute to the socio-economic development of the region.</p>
<b>Health and safety at work</b>	<p>The main impacts are construction-related, including generic health and safety risks to workers on construction sites, as they increase the risk of injury or death from accidents. These are site-specific impacts and each entity involved in such development projects (contractors, project operators, etc.) should develop site and project-specific occupational health and safety plans (OHS plans).</p>
<b>Health, protection and safety of communities</b>	<p>These include specific impacts related to: (i) during construction, the intrusion of unauthorised personnel at each project site could lead to potential risks related to several hazards; (ii) during construction, the influx of project workers could lead to certain health, safety and security impacts on the community, such as risky diseases, inappropriate code of conduct, increase in social vices; and (iii) during construction, inappropriate management of security issues and incidents by security personnel towards local communities could lead to resentment, mistrust and conflict.</p> <p>It is recommended that a worker influx plan be put in place</p>

In addition, a specific analysis of the cumulative impacts generated by these projects still needs to be carried out before and during construction. The Promoter will ensure to further investigate the presence of concurrent projects to verify any potential cumulative impacts not identified at this stage; and to include appropriate mitigation measures and follow-up actions in the relevant ESMPs to be implemented before and during the construction phase. It is also recommended to plan regular meetings with the relevant authorities during the construction phase to update the list of concurrent projects and the revision of the project ESMP to also take into account the concerns of local residents and any additional cumulative impacts arising from these potential new projects.

### **9.2.2 Kairouan-Enfidha railway line**

The project to extend the Kairouan-Enfidha railway line (48 km), located within a radius of about 2 km of the solar power plant, is under study. No construction is planned at this stage. According to the provisional plan, the railway line crosses the OHTL at the S4 summit. It is recommended that a meeting be scheduled with SNCFT to discuss the potential cumulative impacts associated with the construction of the double track metre line.

**10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

**10.1 Institutional Framework and Procedure Arrangements for ESMP Implementation**

Generally, two main pillars govern the successful implementation of any Environmental and Social Mitigation and Monitoring Plan (ESMP) as well as the Environmental, Social, Health and Safety Management System (ESHS-MS) for the project that will be developed at a later stage (as discussed in further details in below). These pillars include:

1. Proper identification of roles and responsibilities for the entities involved and the cost; and
2. Effective control of the process and periodic reporting.

All management practices are interlinked, and this section describes how these two pillar criteria could be fulfilled, which in turn helps ensure that the overall objectives are met.

**Staffing Requirements**

Defining roles and responsibilities of the involved entities identifies where and when each entity should be engaged, their degree of involvement, and the tasks expected of the entity. This in turn eliminates any overlap of jurisdiction or authority and ensures proper communication and effective management of ESMP and ESHS-MS components.

The table below identifies the staffing requirements that are expected for the Project. This should be expanded further in the Environment, Health, and safety (EHS) Manual that is required as part of the ESHS-MS (as discussed in further details below). This should include an organizational structure that identifies the lines of authority and roles and responsibilities of all involved entities.

**Table 10.1 - Roles and Responsibilities of Entities Involved in ESMP**

Project Role	Entity	Responsibilities	Staffing Requirements
Project Owner and Developer	AMEA-TBEA	Selection of the EPC contractor and project operator ; Establish a Project Management Unit with adequate resources for the implementation and monitoring of the prepared E&S instruments Ensure overall compliance of the EPC contractor and project operator with the requirements of the ESMP and ESMS; Prepare monthly reports to the investment banks; Prepare the annual E&S audit on 15 March from the second year of implementation	During construction, the Promoter will appoint: 1) Site Manager ; 2) QHSE Manager 3) Project Manager 4) Social Specialist 5) Environmental Specialist 6) Community Liaison Officer During the O&M, the staff employed by the Promoter will consist of 1) a QHSE engineer, able to visit the site at least once a month
EPC Contractor	TBD	Appoint a competent onsite HSE team.	The EPC Contractor will be required to provide the

Project Role	Entity	Responsibilities	Staffing Requirements
		Implement mitigation and monitoring requirements as detailed in the ESMP and ESHS MS requirements	following staff permanent based on site: 1) Site HSE Manager. 2) HSE officers (1 or 2) depending on of workforce volume); 3) Social Specialist.
Project Operator	TBD	Appoint a competent team. Implement mitigation and monitoring requirements as detailed in the ESMP and ESHS MS requirements	For the nature and duration of the project, the operator shall provide the following personnel: 1) Site HSE Manager, permanently based on site; 2) 1 environmental specialist and 1 social specialist, resourced to visit the site at least once a month..

**Training and Awareness**

An EHS training plan must be developed and maintained onsite which identifies the type of training that is required for each worker onsite. In addition, signed attendance sheets and training material must be always maintained onsite. This should be completed by the EPC Contractor and Project Operator as applicable.

Training should include the following as applicable and as highlighted in the table that follows.

- Basic visitor HSE induction training
- Security training
- Worker HSE induction training for all workers onsite to include for example EPC Contractor and subcontractor crew
- Emergency response training for all workers onsite to include for example EPC Contractor and subcontractor crew
- EPIs training
- Visual signs training to avoid incidents during the construction phase.
- Specialized training: there are other specific training requirements that must be adhered to and which are related to specific topics as applicable. This includes for example specific training for Occupational Health and Safety (OHS) issues such as electrical works, working at heights, also any relevant training that should be included as per Tunisia's good practice and recommendations for construction sites, etc.
- Exploitation, Abuse and Sexual Harassment.
- Toolbox Talks (TBT): regular TBT meetings must be undertaken with for example EPC Contractor respective crews and subcontractor crew. Topics and frequency are developed and distributed regularly.

<b>Training</b>	<b>Contractor EPC</b>	<b>Project Operator</b>	<b>Frequency</b>
Basic HSE induction training for visitors	✓	✓	On each visit to the site
HSE induction training for workers	✓	✓	At the start of the work
Emergency response training	✓	✓	At the start of the work and then once a month
Specialised training	✓	✓	To be studied according to the training
Discussions on toolkits (TBT)	✓	✓	1 time/month depending on the number of workers

**Monitoring and surveillance plan**

EHS inspection and monitoring must be undertaken to ensure compliance of involved entities with the mitigation and monitoring requirements as detailed in the ESMP and ESHS-MS requirements. This should be completed by the Developer, EPC Contractor, and Project Operator as applicable.

Inspection and monitoring should include the following as applicable and as highlighted in the table that follows.

- Daily HSE inspection and monitoring at the site and preparation of a daily observation report stating therein the corrective measures on observed safety deficiencies, unsafe acts and conditions.
- Weekly site inspections to be carried out using the weekly site inspection checklists template based on requirements of the ESMP and EHSS-MS.
- HSE Audits to be undertaken by Developer on EPC Contractor to ensure compliance with ESMP requirement and EHSS-MS. HSE audits should be undertaken monthly during the construction phase and quarterly during the operation phase.

<b>Inspection and monitoring</b>	<b>Promoter</b>	<b>Contractor EPC</b>	<b>Project operator</b>	<b>Frequency</b>
Daily HSE inspection and monitoring		✓		Every day
Weekly site inspections		✓	✓	Weekly
HSE audits	✓			Each month

**Meetings**

Regular EHS meeting must be undertaken to discuss EHS performance onsite, outstanding issues, key issues of concern and other as applicable. Signed attendance sheets and Minutes

of Meeting (MoM) must be always maintained onsite. This should be completed by the Developer, EPC Contractor, and Project Operator as applicable.

Meetings should include the following as applicable and as highlighted in the table that follows:

- Weekly HSE meetings
- Monthly HSE meeting
- Quarterly management HSE reviews

Meetings	Developer	EPC Contractor	Project Operator
Weekly HSE Meetings		✓	
Monthly HSE Meeting	✓	✓	
Quarterly Management HSE reviews	✓	✓	✓

**Reporting**

HSE reporting will be required to summarize the following:

- Progress in implementing the ESMP and EHSS MS plans as required.
- Findings of the monitoring programs, with emphasis on any breaches of the control standards, action levels or standards of general site management.
- Outstanding incident report forms.
- Relevant changes or possible changes in legislation, regulations, and international practices.
- Reporting on Key Performance Indicators (KPI).

Reporting should be submitted to the Developer as applicable by the relevant entities as identified below.

Reporting	EPC Contractor	Project Operator
Reporting	Monthly	Monthly

**10.2 Environmental, Health, Safety and Social Management System (EHSS-MS)**

The ESIA is considered a key document in the assessment and management of environmental and social risks associated with the project. The main output of the ESIA is the ESMP, which aims to provide high-level mitigation measures and requirements for managing the environmental and social risks foreseen by the project.

Throughout the construction and operation phase of the project, an Environmental and Social Management System (ESMS) must be implemented by all parties involved (i.e. the Promoter, the EPC contractor and the project operator). The ESMS should be project and site specific and should build on and take into account the requirements of the ESMP. The development and implementation of an ESMS is considered a key requirement of the IFC's and the AfDB's SO1, and the ESMS should also be consistent with the IFC's LOS. The general framework, structure and key requirements of the ESMS for the main entities involved in the project are summarized below.

### **Promoter (AMEA) and STEG**

The documents listed below must be submitted to the donors for non-objection and published and the work started:

- HSE Manual which should include: (i) HSE policy; (ii) human resources policy and procedures; (iii) organisational structure and HSE responsibilities; and (iv) HSE training, monitoring and reporting plan.
- Stakeholder engagement plan and community grievance mechanism.
- Abbreviated Resettlement Action Plan (ARAP).
- Community development plan.
- Panel disposal plan for the decommissioning phase.

### **EPC Contractor**

- HSE Manual (in agreement with the Promoter) which should include: (i) the HSE policy; (ii) the human resources policy and procedures; (iii) the organisational structure and HSE responsibilities; (iv) the HSE training, monitoring and reporting plan
- Water management plan
- Waste management plan
- Air quality and noise management plan
- Traffic and transport plan
- Worker accommodation plan
- Worker influx plan
- Occupational health and safety plan
- Emergency preparedness and response plan
- Safety management plan
- Incidental discovery procedures

- Employee grievance mechanism
- A code of conduct against sexual harassment, abuse and exploitation
- Local employment plan
- Worker flow management plan

**Project operator**

- HSE Manual (in agreement with the Promoter) which should include: (i) HSE policy; (ii) human resources policy and procedures; (iii) organisational structure and HSE responsibilities; (iv) HSE training, monitoring and reporting plan.
  - Water management plan
  - Worker flow management plan
  - Waste management plan
  - Occupational health and safety plan
  - Emergency preparedness and response plan
  - Safety management plan
  - Avian mortality monitoring plan
  - Local employment plan
  - Community Development Plan
  - Decommissioning master plan

**10.3 *Compilation of Environmental and Social Management Plan (ESMP)***

The tables below present the ESMP for the: (i) planning and construction, (ii) operation phase, and (iii) Decommissioning Phase respectively and which include the following:

- The environmental attribute (e.g. air quality) that is likely to be impacted;
- A summary of the potential impact and/or likely issue.
- The identified management measures that aim to eliminate and/or reduce the potential impact to acceptable levels. Management measures include mitigation actions, further requirements, additional studies, etc.
- Monitoring actions to ensure that the identified mitigation measures are implemented. Monitoring actions include inspections, review of reports/plans, reporting, etc.
- The frequency for implementing the monitoring actions, which include once, continuously throughout the construction/operation period (depending on the mitigation measure identified this could include daily, weekly, or monthly), or upon occurrence of a certain issue.
- Parameters and location of monitoring actions as identified and applicable; and

- Responsible entity for implementing the mitigation measures and monitoring actions identified.
- (EPC Contractor, Project Operator).
- Cost related to each management action identified.

**Table 10.2 - ESMP for the Planning and construction phase**

Designation	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (TND)
General		Prepare and submit a site ESMP or ESMP-E to the donors (IFC/AfDB) for validation before the installation of sites and the start of any work.	Additional requirements	Submitting a plan	Once, before construction commences	EPC Contractor	20,000
		HSE Manual (in agreement with the Sponsor) to include: (i) HSE policy; (ii) human resources policy and procedures; (iii) organizational structure and HSE responsibilities; (iv) HSE training, monitoring and reporting plan	Additional requirements	Submitting a plan	Once, before construction commences	EPC Contractor	20,000
		Undertake in writing to scrupulously respect this commitment and submit to the donors (IFC/AfDB) a description of the procedures it will put in place to achieve this in collaboration with the EPC Contractor	Additional requirements	Submitting a plan	Once, before construction commences	Developer	-
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the construction site is left in an orderly state at the end of each work day, (ii) proper handling of waste streams, (iii) ensure all areas are fully restored after they have been used for construction works, (v) ensure that all artificial lights adopt a down-lighting strategy so that artificial lights will not escape outside the project site.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
Land Use	The project will reduce grazing lands available for pastoralists	Undertake consultations with such land users prior to commencement of any construction activities to inform them about the project schedule, construction of the boundary fence, construction activities to be undertaken, expected impacts, and emphasize that grazing can be undertaken in surrounding areas Prepare and implement the Abbreviated Resettlement Action Plan (including compensation measures).	Additional Requirement	Submission of plan	Once, before construction commences	Developer	-
Geology, Hydrology and Hydrogeology	Risk of soil and groundwater contamination during the various construction activities from leaks and	Ensure spill kits are available at specific locations on site including the refueling area.	Mitigation	Inspection	Continuous	EPC Contractor	10,000
		The base camp and construction site shall be located at more than 100 meters from the closest stream to reduce risk	Mitigation	Inspection	Continuous	EPC Contractor	-

	spills from the use of construction machinery, and from refueling activities, as well as discharge of wastewater from the worker accommodation camp. In addition, the use of construction machinery will degrade soils and modify local drainage flows through a combination of compaction, physical disturbance, creating trenches along tire tracks, and from excavations and stockpiling material. This could result in the turbidity of nearby surface water receptors.	of direct pollution from sanitation facility, the few hazardous materials storage, and the concrete area.					
		A dedicated refueling area will be used and fitted with an impermeable surface, boundary sumps to catch any localized spills before they are able to escape into the environment. This area will also be protected from rainwater.	Mitigation	Inspection	Continuous	EPC Contractor	10,000
		Prohibit off-road driving of construction machinery	Mitigation	Inspection	Continuous	EPC Contractor	-
		Ensure regular maintenance of machinery, to decrease the risk of accidental pollution.	Mitigation	Inspection	Continuous	EPC Contractor	15,000
		The first 20-30 cm of soil should be excavated and stored for later reuse to preserve the arable layer during excavation works. This soil will be stored apart on a dedicated area, in 1-2 m high, non-compacted windrows to maintain the quality of the soil. Arable soil will be reused for the restoration and rehabilitation.	Mitigation	Inspection	Continuous	EPC Contractor	50,000
Risk of local flood hazards especially during rainy seasons and flash flood events due to the presence of three wadi systems	Undertake a flood risk assessment that should identify engineering measures will be identified to eliminate such risks and which are to be implemented as part of the detailed design. It is recommended to perform a climate change risk assessment over the project area and implement flood scenario to predict and quantify future flood risk changes. Projected flood hazard (extent and water level rise) in addition to potential affected areas can be modeled under current and for future these scenarios.	Additional Study	Submit Flood Risk Assessment	Once before construction commences	EPC Contractor	50,000	
<b>Biodiversity</b>	Construction activities to include land clearing, circulation of construction vehicles, construction of roads could disturb existing habitats (flora, fauna, avifauna) and any species which might be present	Undertake an additional species inventory during the wet season to verify the absence of protected flora that might present around Boushkima water course and temporary stream in the south.	Additional Study	Submit Species Inventory	Once, before construction commences	EPC Contractor	10,000
		Undertake an additional species inventory during the wet season to detect birds and amphibians in order to avoid sensitive areas or species, propose additional mitigation measures and to better understand fauna circulation on site	Additional Study	Submit Species Inventory	Once, before construction commences	EPC Contractor	10,000

within the Project site.	and usage of Boushkima water course and wet area by local fauna (amphibians, birds, and mammals). Prepare a Critical Habitat Assessment Study (CHA).					
	Carry out clearing works and earthworks during the dry period (July - September) in order to limit the impact on biodiversity (bird nesting period extending from mid-March to mid-July) and manage flooding risk as much as possible.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	In order, not to introduce invasive plant species during the works, it is recommended to clean the machines before their arrival on the site. Quality controls of materials brought to the site will also be carried out.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	Mark out and fence of the construction activities.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
	Plan site preparation and construction to cause the least impacts to vegetation ground cover & cause the least disruption to topsoil.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Make gaps designed into fencing to allow fauna to pass.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
	Select wildlife-friendly design for infrastructures, e.g., elevated fencing to allow small mammals movements, properly designed drainage channels to avoid animals being trapped inside.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Plan infrastructures layout avoiding natural habitat features as much as possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Limit vehicle movements to only be on designated paved/unpaved roads to reduce impacts to surrounding natural vegetation.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.	Mitigation	Inspection	Continuous	EPC Contractor	-
	Ensure appropriate management of pollution risks to prevent any impact of wildlife and in particular batrachian.	Mitigation	Inspection	Continuous	EPC Contractor	-

		Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading	Mitigation	Inspection	Continuous	EPC Contractor	5,000
		Hire an ecologist to monitor environmental measures during the construction phase for clearing and earthwork	Mitigation	Inspection	Continuous	EPC Contractor	30,000
		Restoration and revegetation (ecological restoration) of temporary use areas and lay down areas and areas distributed during construction of the PV Array as soon as reasonably practicable after construction activities are complete. Restoration method design will be done by a competent specialist;	Mitigation	Inspection	Continuous	EPC Contractor	30,000
		Restoration of the natural habitats that will be disturbed during the development of the PV array to meet the NNL aim;	Mitigation	Inspection	Continuous	EPC Contractor	50,000
		The natural habitat temporary pond area for <i>Gomphus lucasii</i> will be protected as far as possible. The sensitivity of this area will be communicated to all workers on site. No vehicle activity will be permitted in this area. Restoration of vegetation will occur immediately, should vegetation be damaged in this area;	Mitigation	Inspection	Continuous	EPC Contractor	-
		It is recommended that eco-design features are incorporated to provide temporary wetlands within the boundary ditches as habitat for <i>Gomphus lucasii</i> .	Mitigation	Inspection	Continuous	EPC Contractor	5,000
		The dike will be constructed to replicate a natural stream channel, allowing for areas of ponding and with banks of varying gradients.	Mitigation	Inspection	Continuous	EPC Contractor	10,000
<b>Archaeology</b>	Construction activities could damage/disturb potential archaeological remains, as well as potential archaeological remains which could be buried in the ground (if any).	Implement chance find procedures for potential unearthing of any archaeological sites during construction. This includes that construction activities be halted, and the area fenced, while immediately notifying the National Heritage Institute and follow the applicable procedures. No additional work will be allowed before the Institute assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found.	Mitigation	Inspection/ report Submission to National Heritage Institute	Upon Occurrence	EPC Contractor	5,000

<b>Infrastructure and Utilities</b>	Water requirements – water requirements of the Project could entail constraints on existing users.	Prepare a water management plan	Additional Requirement	Submit proof for coordination with authorities	Once, before construction commences	EPC Contractor	2,000
		Document water consumption of the Project		Submit monthly report	Continuous	EPC Contractor	2,000
		Minimization by abatement controls, involving acting for water conservation and wastewater management measures (e.g., water recycling facility).	Mitigation	Inspection	Each quarter	EPC Contractor	15,000
	Waste utilities – it is important to ensure that existing utilities would be able to handle the amount solid waste, wastewater, and hazardous waste	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.	Additional Requirement	Submit proof of coordination with authorities	Once, before construction commences	EPC Contractor	2,000
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if any.	Additional Requirement	Submit proof of coordination with authorities	Once, before construction commences	EPC Contractor	50,000
		Final disposal will be checked for compliance with IFC/AfDB and GIIP standards.	Mitigation	Inspection	Continuous	EPC Contractor	5,000
		Develop a waste management plan which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal. and provide measures for the temporary management of hazardous waste during the temporary closure of the Jeradou centre.	Additional Study	Submit Waste Management Plan	Once, before construction commences	EPC Contractor	10,000
		Provide adequate sanitary facilities, i.e. toilets and showers for the construction workforce;	Mitigation	Inspection	Each quarter	EPC Contractor	Included in project cost
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be	Mitigation	Inspection	Each quarter	EPC Contractor	5,000

		collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Sbikha, or other location.					
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the final destination of waste. A detailed register will be held to record and document all waste streams.	Mitigation	Review chain of custody records/register to ensure consistency	Each quarter	Project Operator	2,000
<b>Air Quality and Noise</b>	Construction activities will likely result in an increased level of dust and particulate matter emissions which in turn will directly impact ambient air quality.	Minimize the storage of spoil and other of fine material.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Apply basic dust control and suppression measures which could include regular watering of roads, and proper planning of dust causing activities.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Regular inspection and covering of stockpiles and excavated material if this material cannot be readily used elsewhere.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Proper covering of trucks transporting aggregates and fine materials.	Mitigation	Inspection	Continuous	EPC Contractor	20,000
		Adhering to a speed limit of 15-20km/h for trucks on the construction site.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit the idling of vehicles so that fuel usage and air emissions are minimized to the greatest extent possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit solid waste burning on site.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Develop a regular fit-to-work inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant emissions, before being allowed to be deployed/used on site.	Mitigation	Inspection	Continuous	EPC Contractor	2,000
		Optimization of the itineraries to reduce the number of vehicles for the transport of personnel and materials.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Inform the nearby industrial plant about the start date of construction works and the potential generation of air and dust emissions. This shall include details of the Project's grievance mechanism.	Additional Study	Stakeholder Engagement Plan	Continuous	EPC Contractor	-

		assessment of the initial air quality status	Recommendation	Inspection	Once before construction	EPC Contractor	5,000
Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers and compressors and other activities.		Only well-maintained equipment should be operated on-site to avoid the generation of unnecessary sources of noise.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Adhering to a speed limit of 15-20km/h for trucks on the construction site.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Prohibit the idling of vehicles to the greatest extent possible.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Optimization of the itineraries to reduce the number of vehicles for the transport of personnel and materials.	Mitigation	Inspection	Continuous	EPC Contractor	-
		No work shall be carried out at night to avoid important disturbance for the surroundings communities. Equipment generating high noise levels (pile driving, blasting, hydraulic hammer, earthwork and grading) will only be used between 8AM and 6PM.	Mitigation	Inspection	Continuous	EPC Contractor	-
		Inform the nearby industrial plant about the start date of construction works and the potential impacts on Noise. This shall include details of the Project's grievance mechanism.	Additional Study	Stakeholder Engagement Plan	Continuous	EPC Contractor	-
<b>Socio-economic</b>	The Project will positively influence the regional and national economy during construction from the direct procurement and supply of materials and services from companies based in the governorate of Kairouan and elsewhere in Tunisia.	It is recommended that the EPC Contractor adopt and implement a Local Content Policy that seeks to procure goods and services from SMEs based in Kairouan to enhance the economic impacts that will result from the Project development on the Governorate level. The Plan should be developed under the supervision of the Developer.	Recommendation	Submission of Policy	Once, before construction commences	EPC Contractor (under supervision of the Developer)	15,000
	The Project is expected to provide job opportunities for local communities. This could contribute to enhancing the living environment for its inhabitants and bring social economic prosperity to the local community including	It is recommended that the EPC Contractor adopt and implement a Construction Local Employment Plan for working with the local community members during the construction phase. The plan must aim to support the local community stating its aims and objectives and should acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program. The plan must be developed under supervision of the Developer.	Recommendation	Submission of Plan	Once, before construction commences	EPC Contractor (under supervision of the Developer)	15,000

	vulnerable groups such as women.						
	The project will provide a range of benefits for local communities in the vicinity of the Project.	The project company will develop and implement a voluntary Community Development Plan (CDP).	Recommendation	Submission of Plan	Once, before construction commences	Developer	30,000
<b>Occupational Health and Safety</b>	There will be some generic risks to workers health and safety form working on construction sites, as it increases the risk of injury or death due to accidents.	Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	15,000
		An HSE management and performance report on the ongoing work at the project site shall be submitted monthly and quarterly. Each report shall be submitted to the project owner and the responsible HSE branch by the 5th of the month following the end of the relevant quarter and shall contain the following data in accordance with the project's corporate HSE monitoring and reporting procedures: Summary of accidents/incidents during the past month; Summary of daily and cumulative work hours; Lost time due to accidents/incidents; First aid data; Near misses/hazardous conditions reported; Emergency drills conducted; Number of training hours, including toolbox training; Safety audit and meeting information; Waste collected and disposed of; Water consumption; Electricity consumption; Fuel consumption; Environmental monitoring data	Additional requirements	Inspection	Each month and each quarter	EPC Contractor	15,000
		Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency. The gas pipeline shall be considered in the Emergency Preparedness and Response Plan in coordination with STEG and relevant authorities.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	15,000
<b>Potential labor violations within supply chain of photovoltaic solar panels (Child labor /</b>	The use of a supply chain introduces the potential for labour violations to occur. (Child labor / forced labor / modern slavery in the solar photovoltaic supply chain).	Take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the construction of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors	Additional Study	Inspection	Before construction phase Continuous	Developer / EPC contractor	15,000

<b>forced labor / modern slavery)</b>		(AfDB and IFC) that categorically prohibit and ban (i) child labor or abusive employment of vulnerable persons and (ii) the practice of forced labor, human trafficking, and modern slavery. Use the AfDB's Risk Self-Assessment Form					
<b>Community Health and Safety</b>	Trespassing of unauthorized personnel into the Project site could result in potential risk from several hazards.	Install a fence around the project boundary to restrict public access to the site.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
		Security guards will be used to prevent unauthorized access.	Mitigation	Inspection	Continuous	EPC Contractor	50,000
		Ensure fences have warning signs (in Arabic and English) to deter people from entering the site.	Mitigation	Inspection	Continuous	EPC Contractor	Included in project cost
	Influx of Project workers could result in certain community health, safety, and security impacts such as risk diseases, inappropriate Code of Conduct, increase in social vices, etc.	Prepare and implement a worker accommodation plan in accordance with the applicable content of the IFC/EBRD publication entitled: "Workers' accommodation: processes and standards - A guidance note (2010).	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000
		prepare a worker accommodation plan, which should provide details of the accommodation needs of the workforce, including location, facilities, transport needs, etc	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	5,000
		Prepare and implement a worker influx plan.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	5,000
	Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events.	Prepare security management plan which must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000
The use of transport vehicles could introduce significant community health and safety risks	Prepare and implement a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed.	Additional Study	Submission of Plan	Once, before construction commences	EPC Contractor	10,000	
Training and awareness							50,000

<b>Cost of the ESMP construction phase in Tunisian Dinars</b>	<b>785,000</b>
<b>Cost of construction phase ESMP equivalent in dollars</b>	<b>245,000</b>

**Table 10.3.** Environmental and Social Management Plan (ESMP) for the operational phase

Designation	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (TND)
Biodiversity	Disturbance of existing habitats (flora, fauna, avifauna) which might be present within the Project site. In addition, other impacts could be from improper management of the site (e.g. the use of pesticides).	Implement and undertake a bird mortality program during the operation phase that includes a bird fatality search survey. Use of the increasing fragmentation of polarizing surfaces within PV panels by a white grid to reduce their attractiveness to polarotactic insects.	Additional Requirement	Submission of annual bird mortality monitoring report	Three years of operation at least (to be revised after)	Project Operator	85,000
		Utilization of increasing fragmentation of the polarizing surfaces of the PV panels with a white grid to reduce their attractiveness to polarotactic insects. Implementing and undertaking an insect monitoring program, particularly for <i>Gonphus luscasii</i> , will be implemented during the operational phase, including an invertebrate survey to ensure that mitigation measures have been successfully implemented.	Additional Requirement	Submission of annual report	Once, before operation commences	Project Operator	5,000
Infrastructure and Utilities	Water requirements – water requirements of the Project could entail constraints on existing users.	Preparation of the water management plan taking into account the implementation of a dry cleaning method	Additional Requirement	Submit proof for coordination with authorities	Once, before operation commences	Project Operator	15,000
		Document water consumption of the Project.	Additional Requirement	Submit monthly report	Continuous	Project Operator	5,000
	Waste utilities – it is important to ensure that existing utilities would be able to handle the amount solid waste, wastewater, and hazardous waste.	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other location, which will be inspected before use.	Additional Requirement	Submit proof of coordination with authorities	Once, before operation commences	Project Operator	-
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is	Additional Requirement	Submit proof of coordination with authorities	Once, before operation commences	Project Operator	-

		available on the ANGED website). Provide a temporary area for hazardous waste storage, if necessary.					
		Final disposal will be checked for compliance with IFC/AfDB and GIIP standards. Provide for the temporary management of hazardous waste during the temporary closure of the Jeradou facility.	Mitigation	Inspection	Continuous	Project Operator	15,000
		Develop a waste management plan which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal.	Additional Study	Submit Waste Management Plan	Once, before operation commences	Project Operator	50,000
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Sbikha, or other location.	Mitigation	Inspection	Continuous	Project Operator	-
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the final destination of waste.	Mitigation	Review chain of custody records to ensure consistency	Continuous	Project Operator	15,000
Socio-economic	The Project will positively influence the regional and national economy during operation from the direct procurement and supply of materials and services from companies based in the governorate of Kairouan and elsewhere in Tunisia.	It is recommended that the Operator adopt and implement a Local Content Policy that seeks to procure goods and services from SMEs based in Kairouan to enhance the economic impacts that will result from the Project development on the Governorate level. The Plan should be developed under the supervision of the Developer.	Recommendation	Submission of Policy	Once, before operation commences	Project Operator (under supervision of the Developer)	Included in operation cost
	The Project is expected to provide job opportunities for local communities. This could contribute to enhancing the living environment	It is recommended that the Operator adopt and implement an Operation Local Employment Plan for working with the local community members during the operation phase. The plan must aim to support the local community stating its aims and objectives and should acknowledge the importance of building a strong socio-economic	Recommendation	Submission of Plan	Once, before operation commences	Project Operator (under supervision of the Developer)	Included in operation cost

	for its inhabitants and bring social economic prosperity to the local community including vulnerable groups such as women.	relationship with the local community through a participatory planning program. The plan must be developed under supervision of the Developer.					
	The project will provide a range of benefits for local communities in the vicinity of the Project.	The project company will develop and implement a voluntary Community Development Plan (CDP).	Recommendation	Submission of Plan	Once, before operation commences	Developer	10,000
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on operational sites, as it increases the risk to injury or death due to accidents.	Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Additional Study	Submission of Plan	Once, before operation commences	Project Operator	15,000
		Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency.	Additional Study	Submission of Emergency Preparedness and Response Plan	Once, before operation commences	Project Operator	15,000
<b>Potential labor violations within supply chain of photovoltaic solar panels (Child labor / forced labor / modern slavery)</b>	The use of a supply chain introduces the potential for labour violations to occur. (Child labor / forced labor / modern slavery in the solar photovoltaic supply chain).	Take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used for the construction of the solar plant so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors (AfDB and IFC) that categorically prohibit and ban (i) child labor or abusive employment of vulnerable persons and (ii) the practice of forced labor, human trafficking, and modern slavery. Use the AfDB's Risk Self-Assessment Form	Additional Study	Inspection	Before construction phase	Project Operator	Not required
Community Health and Safety	Inappropriate management of security issues and incidents by security personnel towards local communities	Prepare security management plan which must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues.	Additional Study	Submission of Security Management Plan	Once, before operation commences	Project Operator	15,000

<b>Cost of the ESMP exploitation phase in Tunisian Dinars</b>	<b>250,000</b>
<b>Cost of the ESMP operational phase equivalent in dollars</b>	<b>77,500</b>

**Table 10.4 .:** Environmental and Social Management Plan (ESMP) for the decommissioning phase

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
<b>Landscape and Visual</b>	Visual and landscape impacts due to presence of elements typical of a decommissioning site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the site is left in an orderly state at the end of each workday, (ii) proper handling of waste streams, (iii) ensure all areas are fully restored after they have been used for decommissioning works, (v) ensure that all artificial lights adopt a downlighting strategy so that artificial lights will not escape outside the project site	Mitigation	Inspection	Continuous	Project Operator	50,000
		Submit a decommissioning plan that identifies the following: (i) dismantlement methodology and activities for each project component; (ii) disposal methodology for each project component (taking into account measures identified under infrastructure and utilities below); (iii) site rehabilitation plan that should aim to restore the area similar to pre-construction characteristics including identification any landscaping measures as applicable; (iv) monitoring activities to be undertaken e; (iv) roles and responsibilities.	Additional study	Submission of Plan	Once, before decommissioning commences	Project Operator	50,000
<b>Biodiversity</b>	Decommissioning activities to include dismantling and removal of security perimeter fencing, buildings	Reviewing the monitoring dataset accumulated over the project lifecycle and undertaking field surveys, if needed, to confirm the sensitive species for consideration during decommissioning.	Mitigation	Inspection	Once, before decommissioning commences	Project Operator	20,000
		Establish a schedule of work that will consider the seasonal nature of the					

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
	and access tracks, electrical infrastructure and solar panel arrays and their associated structural components could disturb existing habitats (flora, fauna, avifauna) and any species which might be present within the Project site.	<p>project climate. In this sense, it is recommended to carry out decommissioning work during the dry season (July to September) to limit as much as possible the impacts on fauna as birds nesting period extends from mid-March to mid-July and to avoid managing water during earthworks.</p> <p>Limit vehicle movements to only be on designated paved/unpaved roads and maintain a speed of vehicles to 15-20 km/h to surrounding natural vegetation.</p> <p>Avoid Boushkima stream vicinities to preserve wet habitat especially during the wet season to reduce impacts on birds, batrachian, and mammals.</p> <p>Minimising habitat disturbance during infrastructure removal.</p> <p>Minimising noise impacts on fauna associated with infrastructure removal procedures;</p> <p>Ensure appropriate management of pollution risks to prevent any impact of wildlife and in particular batrachian.</p> <p>Ensuring good practice for reuse, recycling, or disposal of decommissioned components.</p> <p>Establish and train workers on a proper code of conduct to be respected to include prohibition of cutting of trees, hunting, off-roading, etc.</p> <p>Development of Framework Decommissioning Plan including all disposal options and relevant costs. End-of-life solar plant infrastructure components including solar panels and</p>			Continuous		

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
		aluminium and copper cables will need to be recycled or otherwise disposed of responsibly.					
		Restoration of the site to its original state as far as feasible. In addition, internal road network will be restored, and gates and fences will be removed. Restoration measures following good environmental practices should be the focus during this phase.	Additional Study	Submit Framework Decommissioning Plan	Once, before decommissioning commences		Inclus dans les coûts de démantèlement
		Given that at this stage there is a great deal of uncertainty at the decommissioning phase of the Project (with regards as to whom is the responsible party, prospects on waste disposal facilities in Tunisia, etc.), it is recommended that before any decommissioning activities take place a Disposal Plan for the PV Panels is prepared. The plan should consider the following options and compare the costs/benefits of each: (i) it is recommended that the Plan first opt for disposing the panels at the end of their lifetime as part of international recycling programs for PV Panels (such as PV CYCLE's recycling program); and (ii) if the above could not be achieved, as a last option the plan must investigate the disposal of the Panels at existing waste facilities in Tunisia through coordination with ME.	Mitigation	Inspection	Continuous		Inclus dans les coûts de démantèlement
<b>Infrastructure &amp; Utilities</b>	Waste utilities – it is important to ensure that	Coordinate with ANGED for the collection of non-hazardous waste from the site to the Kairouan landfill or other	Additional study	Submission of Plan	Once, before decommissioning commences	Project Operator	30,000

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
	existing utilities would be able to handle the amount of solid waste, wastewater, and hazardous waste	location, which will be inspected before use					
		Use of the services of specialized companies authorized by the Ministry of the Environment (ME) for the management of hazardous waste (the list of companies authorized for the management of hazardous waste is available on the ANGED website). Provide a temporary area for hazardous waste storage, if necessary.	Additional Requirement	Submit proof of coordination with authorities	Once, before decommissioning commences	Project Operator	10,000
		Develop a waste management plan which includes measures to avoid, minimize, re-use and recycle waste before it is sent for treatment/disposal.	Additional Requirement	Submit proof of coordination with authorities	Once, before decommissioning commences	Project Operator	-
		Final disposal will be checked for compliance with IFC/AfDB and GIIP standards.	Additional Study	Submit Waste Management Plan	Once, before decommissioning commences	Project Operator	Inclus dans les coûts de démantèlement
		Any third-party waste management facility or transport/handling company shall be inspected prior to use to ensure that it is being operated in compliance with national legislation and GIIP. Sanitary wastewater will be collected in a watertight pit and evacuated by vacuum tank to the ONAS station in Kairouan, or other location.	Mitigation	Inspection	Continuous	Project Operator	-
		All waste transfers shall be accompanied by chain of custody documentation that records where the waste is generated from, the type of waste, the waste transporter, and the destination of waste.	Mitigation	Inspection	Continuous	Project Operator	50,000
		Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations/provisions of the Occupational Health and Safety Plan.	Mitigation	Review chain of custody records to ensure consistency	Continuous	Project Operator	20,000

Environmental Attribute	Potential Impact	Management Action	Type of Management	Monitoring Action	Frequency	Responsible Entity	Cost (DT)
<b>Occupational Health and Safety</b>	There will be some generic risks to workers health and safety from working on decommissioning site, as it increases the risk to injury or death due to accidents.	Prepare an Emergency Preparedness and Response Plan which considers a series of organizational, operational, and preventive measures in the event of an emergency	Additional Study	Submission of Plan	Once, before decommissioning commences	Project Operator	15,000
			Additional Study	Submission of Emergency Preparedness and Response Plan	Once, before decommissioning commences	Project Operator	10,000
<b>Cost of the ESMP dismantling phase in Tunisian Dinars</b>							<b>260,000</b>
<b>Total Cost - ESMP Decommissioning Phase in dollars</b>							<b>78,000</b>

**Tableau 10.5 - Global cost of the ESMP of the solar Project (solar plant and the OHTL)**

<b>Cost of mitigation measures</b>	<b>Cost in Tunisian Dinars</b>	<b>Cost in US Dollars</b>
Cost of the ESMP Construction phase of the Solar Power Plant	<b>785000</b>	<b>261667</b>
Cost of the ESMP Operation phase of the Solar Power Plant	<b>250000</b>	<b>83333</b>
Cost of the ESMP Dismantling phase of the Solar Power Plant	<b>255000</b>	<b>85000</b>
Cost of the ESMP Construction phase of the OHT	<b>635000</b>	<b>211667</b>
Cost of the ESMP Operation phase of the OHTL	<b>195000</b>	<b>65000</b>
Cost of the ESMP OHTL decommissioning phase	<b>255000</b>	<b>85000</b>
Cost of the Stakeholder Engagement Plan	<b>60000</b>	<b>20000</b>
Grievance Mechanism	<b>30000</b>	<b>10000</b>
Cost of Abbreviated Resettlement Action Plan for the solar power plant	<b>450000</b>	<b>150000</b>
Cost of OHTL's Abbreviated Resettlement Action Plan (ARAP)	<b>450000</b>	<b>150000</b>
Cost of the Community Development Plan (To be negotiated and determined before starting)	<b>To be determined</b>	<b>To be determined</b>
Cost of hiring an environmental safeguards specialist	<b>30000</b>	<b>10000</b>
Cost of hiring a social safeguards specialist	<b>30000</b>	<b>10000</b>
Cost of hiring a community liaison officer	<b>40000</b>	<b>13333</b>
Cost of (03) Annual E&S Compliance Audits (2023 and 2024 and 6 after completion)	<b>60000</b>	<b>20000</b>
<b>TOTAL COST OF THE ESMP</b>	<b>3,525,000</b>	<b>1,175,000</b>

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