



Qair

Khobna 237 MWp Photovoltaic Power Plant



Non-Technical Summary



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ASF Consulting
Your Sustainability Partner

8 Résidence Essafa Ennasr 2 2001 Ariana
TunisiaAwatef.siala.fourati@asfconsulting.org
www.asfconsulting.org



Project to relocate a 237 MWp photovoltaic power plant in El Khobna – Sidi Bouzid	
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In a global context marked by the energy transition and the fight against climate change, Tunisia has embarked on a proactive policy of diversifying its energy mix through the massive development of renewable energies. This strategy aims to reduce the country's dependence on imported fossil fuels, strengthen its energy security and promote sustainable development that respects the environment. It is in this context that the company Qair Tunisia, a subsidiary of the international group Qair, is proposing the development of a 237 MWp photovoltaic solar power plant in El Khobna, in the delegation of Mezzouna (governorate of Sidi Bouzid). A recognized international player, present in more than twenty countries, Qair designs, finances, builds and operates sustainable projects contributing to the energy transition while promoting local resources.

The project involves the installation of a photovoltaic power plant on approximately 267 hectares, the construction of a 45 km 225 kV overhead power line connecting the site to the STEG substation in Meknassy, as well as the development of the necessary access tracks. From the design phase, particular attention was paid to reducing or even avoiding environmental and social impacts, by integrating local sensitivities (Sebkhet Noual, Bouhedma National Park) and respecting international standards (IFC/SFI Performance Standards, requirements environmental and social policies of the EBRD and the EIB) as well as Tunisian regulations. The Tunisian Electricity and Gas Company (STEG) will ensure the integration of the electricity produced into the national grid, under the supervision of the Ministry of Industry, Energy and Mines. This study, entrusted to ASF Consulting, sets out all the elements of the project, assesses its potential impacts and defines an Environmental and Social Management Plan (ESMP) to ensure responsible implementation in line with the expectations of stakeholders.

1 Context and objectives of the project

The project is part of the national energy transition strategy aimed at reducing greenhouse gas emissions, strengthening the country's energy security, and creating green jobs. With a capacity of 237 MWp, it will be financed by international donors (EBRD, IFC, EIB) and connected to the national grid via a 45 km high-voltage line.

2 Project site location

The site is located in the delegation of Mezzouna (Sidi Bouzid), in the El Khobna sector, on land in the private domain of the State. With an area of 267.74 hectares, it is located approximately 3 km from Mezzouna and 5.5 km from Sebkhat Noual (Ramsar area). The site is currently used for extensive pastoralism, without agricultural cultivation. The local communities consulted did not express any objection regarding its allocation to the project.

3 Project components

- 237 MWp photovoltaic solar power plant (≈267 ha).
- 225 kV overhead line of 45 km to the Meknassy substation.
- 5 km access track from the C205 road.
- Additional infrastructure: internal road network, 225/33 kV delivery station, operating tracks.

A neighbouring project developed by Scatec completes this dynamic, confirming the region's vocation as a renewable energy hub.

4 Technology used

The plant will use bifacial photovoltaic technology. The panels capture sunlight on both sides: the front side absorbs the radiation directly, while the back side uses light reflected by the ground (albedo effect). In arid areas with light-colored soils like El Khobna, this phenomenon allows for an efficiency gain of 8 to 12%, which can reach 14% compared to conventional modules. The electricity produced in direct current (DC) is converted into alternating current (AC) by inverters, then injected into the national grid via transformers and a delivery station.

5 Project activities

Planning phase: Preliminary studies (technical, economic, environmental and social), obtaining authorizations, definition of technical components, logistics planning and human resources.

Pre-construction phase: Installation of the base camp, securing the site with fences and guards, preparation of the land (light clearing, marking, initial earthworks).

Construction phase (≈18 months): Work civil engineering, installation of structures and PV modules, cabling and delivery station, installation of protection and security systems.

Operation phase (≈20 years): Production continuous electricity, monitoring via SCADA system, regular cleaning of panels, equipment maintenance, site security and implementation of the ESHS plan.

Dismantling phase: At the end of the concession, transfer to STEG or complete dismantling: removal of equipment, waste management and restoration of the site.

Main equipment: Bifacial photovoltaic modules, support structures, inverters, transformers, foundation systems, cables, security systems, internal infrastructure (roads, storage, tanks)

6 Workforce

- **Construction:** approximately 450 jobs (100 skilled, 350 unskilled).
- **Exploitation:** approximately 45 jobs (10 skilled, 35 unskilled). The project will favor local labor at all stages.

7 Site condition and land use

The site is flat, homogeneous, and not very fertile (halomorphous gypsum-loam soil). The steppe vegetation is adapted to arid conditions, and the observed wildlife activity is moderate. Six cabins occupied by livestock farmers were recorded as informal occupations. Access will be shared with the neighboring SCATEC photovoltaic project, which represents a logistical advantage.

8 Project area of influence

The area of influence groups together the areas likely to be affected by the project.

- **Direct influence zone:** 500 m perimeter around the power plant, the base camp, the access tracks and the power line. The impacts mainly concern agricultural and pastoral land, as well as the areas crossed by the line.
- **Indirect influence zone:** neighboring areas that may be affected in a diffuse manner. It includes Sebkhet Noual (Ramsar area), Bouhedma National Park, an archaeological

site located near the southern route of the line, as well as neighboring rural communities (Mezzouna, Menzel Habib) and local economic actors. At the regional level, the entire governorate of Sidi Bouzid is affected.

9 Physical environment

9.1 Geographical framework

The site covers approximately 270 hectares in the El Khobna area (Mezzouna delegation, Sidi Bouzid governorate), on the edge of Menzel Habib (Gabès). It is located near the village of Sidi Mansour and is accessible via a 5 km track from the C205 road.

9.2 Climate framework

The climate is hot arid desert (BWh) according to the Köppen-Geiger classification: long, dry, very hot summers (over 40 °C), mild winters with low to moderate rainfall. The average annual temperature is around 20 °C.

9.3 Air quality and noise

Measurements taken in May 2025 show that air quality meets Tunisian standards, with concentrations of fine particles (PM2.5 and PM10) below regulatory thresholds. The average noise level is less than 50 dB(A), reflecting a calm and stable environment, without significant nuisance.

9.4 Geological and hydrological framework

The site is located on a gently sloping foothills, characterized by Quaternary formations (silts, aeolian sands, gypsum-limestone crusts). The topography is generally flat, with natural drainage towards the Sebkhet Noual.

The risk of flooding is low, but occasional water inflows are possible during heavy rains. The soils are somewhat sensitive (plastic clays, deep gypsum), requiring suitable drainage and additional geotechnical studies.

9.5 Biological environment

9.5.1 Fauna and Flora

The biodiversity study carried out in 2025 confirmed that the project area (PV site and HV line) is dominated by sparse steppe vegetation adapted to arid and saline conditions.

The assessment according to IFC PS6 and EBRD ESR6 standards showed that:

- No Critical Habitat (CH) is triggered in the project's area of influence.

On the other hand, several Priority Biodiversity Features (PBFs) have been identified, grouping together plant, bird, reptile, mammal and bat species of conservation interest. The table below lists these:

Band	Species (scientific name)	French name	IUCN Global Status	National status	Presence / Observation
Flora	<i>Vachellia tortilis</i>	Gum acacia	LC	SEEN	Observed along the route of the HV transmission line (May 2025)

	<i>Stipa tenacissima</i>	Alfa	SEEN	LC	Observed along the route of the HV transmission line (May 2025)
	<i>Searsia tripartita</i>	Sumac tripartite	LC	SEEN	Observed along the route of the HV transmission line (May 2025)
Birds - Raptors	<i>Aquila chrysaetos</i>	Golden Eagle	LC	EN / SEEN	Observed on site and along the route of the HV transmission line (April-June 2025)
	<i>Buteo rufinus</i>	Fierce Buzzard	SEEN	SEEN	Nesting on pylons (April-May 2025)
	<i>Circus gallicus</i>	Short-toed Eagle	LC	SEEN	Observed along the route of the HT transmission line (April 2025)
	<i>Falco biarmicus</i>	Lanner Falcon	LC	CR	Nest on existing pylons (April 2025)
	<i>Falco tinnunculus</i>	Kestrel	NT	IND	Observed (April 2025)
	<i>Neophron percnopterus</i>	Egyptian vulture	IN	CR	Not observed; possible migrant
	<i>Falco cherrug</i>	Saker Falcon	IN	-	Not observed; unlikely migrant
	<i>Falco vespertinus</i>	Red-footed Falcon	SEEN	-	Not observed; possible migrant
Birds - Others	<i>Argya fulva</i>	Tawny Babbler	LC	CR / VU	Observed on site (April-May 2025)
	<i>Circus macrourus</i>	Pallid harrier	LC	NT	Regular passage (April-June 2025)
	<i>Cursorius cursor</i>	Isabelline Courser	NT	LC	Observed (April-June 2025)
	<i>Gallinula chloropus</i>	Moorhen	LC	SEEN	Observed on site (June 2025)
	<i>Lanius senator</i>	Woodchat Shrike	LC	IN	Observed on site & along the HV transmission line route (April-June 2025)

	<i>Melanocorypha calandra</i>	Grille Lark	LC	SEEN	Observed along the route of the HT transmission line (April 2025)
	<i>Pterocles orientalis</i>	Black-bellied Sandgrouse	LC	NT	Observed along the route of the HT transmission line (April 2025)
	<i>Streptopelia turtur</i>	Wood Turtle Dove	NT	LC	Observed along the route of the HT transmission line (April 2025)
	<i>Oxyura leucocephala</i>	White-headed duck	IN	IN	Not observed; probable presence of neighboring wetlands (may cross the project area)
	<i>Aythya ferina</i>	Common pochard	SEEN	-	Not observed; possible in nearby wetlands
	<i>Calidris ferruginea</i>	Curlew Sandpiper	SEEN	-	Not observed; possible in nearby wetlands
	<i>Calidris falcinellus</i>	Glossy Sandpiper	SEEN	-	Not observed; possible in nearby wetlands
	<i>Pluvialis squatarola</i>	Black-bellied plover	SEEN	-	Not observed; possible in nearby wetlands
	<i>Chersophilus duponti</i>	Sirli de Dupont	SEEN	-	Not observed; possible presence in the project area
	<i>Chlamydotis undulata</i>	Houbara Bustard	SEEN	IN	Not observed; probably extinct in the north, presence very unlikely
Reptiles	<i>Daboia mauritanica</i>	Mauritania viper	NT	-	Not observed in the project's area of influence, potential presence in rocky habitats (Bouhedma)
Bats	<i>Rhinolophus euryale</i>	Greater horseshoe bat	NT	-	Not observed; possible in the neighboring National Park/ZICO
	<i>Rhinolophus mehelyi</i>	Mehely's horseshoe bat	SEEN	-	Not observed; possible in the neighboring National Park/ZICO
	<i>Miniopterus</i>	Schreibers's	SEEN	-	Not observed; possible in

	<i>schreibersii</i>	Minioptera			the neighboring National Park/ZICO
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9.5.2 Landscape

The site is located in a vast, flat, and homogeneous semi-arid plain, marked by sparse vegetation. The landscape is structured by the proximity of the Sebkhet Noual and the presence of the nearby SCATEC power plant construction site, which is gradually transforming the area's energy vocation.

9.5.3 Ecosystem services

The site offers limited but notable services:

- **Supply:** extensive seasonal grazing.
- **Regulation:** natural drainage towards the sebkha.
- **Support:** habitats for birds, reptiles and small mammals.
- **Cultural:** moderate aesthetic value, but presence of traditional practices linked to local resources.

9.5.4 Protected areas

The site is not included in a protected area but it is close to:

1. **Sebkha Noual**(ZICO, Ramsar site, saline wetland, habitat for migratory waterbirds).
2. **Bouhedma National Park**(ZICO, 18 km to the north, reserve of rare Saharan fauna and protected steppe flora).

10 Socio-economic context

10.1 Population

The Mezzouna delegation covers 1,136 km² and has approximately 27,748 inhabitants (2024 census), with a low density (24.4 inhabitants/km²). The population is young, with more than a quarter under the age of 15. The territory remains predominantly rural and sparsely urbanized, marked by traditional practices of extensive grazing.

10.2 Economy

- **Agriculture:** pillar of the local economy, representing more than a quarter of the active population, with a predominance of tree crops (olive trees, almond trees, pistachio trees) and market gardening.
- **Industry:** low development, with only 32 manufacturing companies recorded in the governorate in 2016. The Mezzouna delegation does not have any industrial companies. Two industrial zones exist in Sidi Bouzid East and West, which are partially exploited.

11 Alternatives and justification of the project

11.1 “No Project” Variant

The "no project" scenario assumes that the 237 MWp solar power plant is not built. The site would remain in its current state, used for extensive pastoralism and characterized by bare soil and sparse vegetation. The neighboring sensitive ecosystems (Sebkhet Noual, Bouhedma National Park) would not be subject to any pressure. However, this choice would imply the loss of the expected benefits: diversification of the Tunisian energy mix, reduction of greenhouse gas emissions, job creation, and local economic benefits. This option therefore remains a comparative reference, but is not preferred.

11.2 Alternative solar energy production technologies

Several renewable sources were compared for Mezzouna:

- **Photovoltaic solar:** suitable thanks to the high sunshine and flat terrain, despite intermittent production.
- **Wind, biomass, geothermal, hydroelectricity:** poorly adapted or without local potential.

Among solar technologies, the choice of bifacial panels mounted on single-axis trackers appeared to be the most relevant. This configuration takes advantage of the high albedo of desert soils, ensures optimized production throughout the day, and allows for an efficiency gain of 8 to 12% compared to conventional modules. Other alternatives (fixed panels, rooftop, floating, CSP) present technical, economic, or environmental limitations in this arid context.

11.3 Alternative project location and configuration

The plant's layout follows a modular block structure, facilitating operation and maintenance. Associated infrastructure (delivery station, internal network, security) completes the system. Regarding the transmission line, two options were considered:

1. An initial route bypassing Bouhedma Park but crossing more private properties.
2. A revised route, developed in consultation with stakeholders, reduces the crossing of private land and prioritizes state land, while respecting the park's buffer zone. The

second scenario was chosen because it reduces land conflicts and protects the archaeological heritage identified near the initial route.

11.4 Justification of the chosen variant

- **Solar power plant site**

The selected land has several advantages: poor and flat soil limiting impacts, strong sunshine (5 to 6 kWh/m²/day), proximity to the MC205 road and belonging to the private domain of the State, which reduces land conflicts. The site is far from inhabited areas and free of dense vegetation or obstacles.

- **Transmission line route**

The new route minimizes crossing private land and respects local archaeological and ecological sensitivities, particularly the buffer zone of Bouhedma Park.

- **Connection station**

The connection is planned at the nearby Meknassy source station, which limits the length of the line (46 km) and thus reduces costs, land use and environmental impacts.

12 Impact assessment

12.1 Construction phase

Ground: Earthworks, anchoring, and track development cause localized compaction and waterproofing. The main risk remains accidental pollution by oils, fuels, or concrete, which can permanently alter the quality of the agricultural soils crossed.

- **Measures:** limit traffic to what is strictly necessary on stabilized tracks, store products on retention areas, maintain machinery, recover/treat any spills, conserve topsoil and immediately rehabilitate open areas.

Air quality: The work generates dust (excavation, grading, traffic) and exhaust fumes (machinery, trucks, generators). Workers are the most exposed, while local residents, flora and fauna only experience occasional and temporary disturbances.

- **Measures:** targeted watering of tracks, limitation of idling and journeys, preventive maintenance of engines, ban on burning, suitable PPE and cleaning of wheels in agricultural areas.

Noise and vibrations: The passage of trucks, the use of heavy machinery and the lifting of pylons cause constant noise on the site and occasional nuisances along the route. These effects cease with the completion of the works.

- **Measures:** plan noisy activities during daytime hours, maintain silencers, avoid unnecessary maneuvers and inform local residents in advance.

Unfathomability and runoff: Excavations and levelling intercept rainwater runoff, causing runoff laden with sediment or pollutants, with a risk of local flooding, particularly from the north-west upstream.

- **Measures:** install the trapezoidal drainage ditch in accordance with the hydro study, maintain the natural flow direction, clean regularly and avoid earthworks during rainy periods.

Water resources: Concreting pylons, washing and accidental discharges can occasionally contaminate agricultural soils and local water tables if no measures are taken.

- **Measures:** areas dedicated to concreting with retention, prohibition of washing outside sealed areas, separate management of effluents, storage of products/waste in closed premises and reinforced floors.

Biodiversity: The habitats crossed (steppes, wadis, sebkhas) risk being fragmented. Local fauna (reptiles, birds, small mammals) may be disturbed, and certain sensitive plant species (Vachellia, Searsia) require specific protection.

- **Measures:** mark the site to avoid sensitive habitats (stations 5 & 7), reduce noise/night light, avoid the bird breeding season, mark/protect Vachellia tortilis and Searsia tripartita, train teams on wildlife risks (vipers/scorpions), ensure ecological monitoring and, if necessary, small wildlife passages under tracks.

Landscape: The construction site temporarily alters the landscape through the presence of machinery, stockpiles, and base camps. The plots crossed by the high-voltage line will undergo a lasting change in the landscape, marked by pylons and cables.

- **Measures:** limit visual impact (compact storage areas), light green screens around buildings, reduced lighting and rapid stabilization of runway edges.

Socio-economic impacts: Construction employs approximately 450 workers, creating local employment opportunities. However, increased traffic brings dust, noise, and road hazards.

Temporary land use restrictions on agricultural land and the risk of gender-based violence (GBV/SEA-SH) require specific measures to protect vulnerable people.

- **Measures:** priority local recruitment, secure traffic plan (particularly during school hours), confidential gender-sensitive complaint mechanism, code of conduct and GBVH awareness, fair identification/compensation of PAPs according to CATR, continuous information and supports adapted to vulnerable groups.

Health and safety at work: Workers are exposed to dust, noise, lifting work, electrical risks, falls, heat and dangers linked to accidental intrusions on construction sites.

- **Measures:** strict HSE plan, signage and access control, mandatory PPE, targeted training (electronics/lifting/rescue), occasional ventilation/sprinkling for dust control, systematic maintenance, heat risk management (staggered hours, shading, water, symptom monitoring), first aid system and emergency protocol.

Waste management: The work generates inert waste (rubble), household waste (DIB) and hazardous waste (oils, solvents, batteries). Their dispersal along the route and on site represents a risk to the soil, wildlife and local residents if strict management is not put in place.

- **Measures:** sorting at source, covered skips, sealed storage of hazardous materials, evacuation via approved channels, regular cleaning of rights-of-way and prohibition of prolonged storage on agricultural land; awareness raising among all subcontractors.

12.2 Operational phase

Ground: In operation, the pressures remain occasional: traffic on the runways and storage of some maintenance products (oils, greases). The risks of pollution are limited but require continuous vigilance to avoid accidental infiltrations.

- **Measures:** circulation on designated tracks, storage of oils on retention, management of cleaning water via controlled drainage.

Air quality: The plant's operation does not generate any direct emissions. Only maintenance vehicles and equipment produce small amounts of exhaust gas. Overall, air quality remains unchanged, and the impact on local residents and wildlife is negligible.

- **Measures:** reduced speed and occasional watering of dry tracks, maintenance of groups, favour wet/semi-wet cleaning of modules.

Noise and vibrations: Equipment (inverters, transformers) and maintenance operations produce low noise, which is only heard in the immediate vicinity. Vibrations are non-existent or imperceptible.

- **Measures:** plan noisy operations outside sensitive hours, preventive maintenance of equipment, soundproofing if necessary.

Water resources: Water is used for cleaning panels and for personnel sanitation. Although volumes are modest, uncontrolled discharges (dirty water, cleaning products) may temporarily affect soil or nearby water points if no measures are taken.

- **Measures:** collection/control of wash water, biodegradable products, training and quality control of discharges.

Biodiversity: The main risk concerns birds: migratory and nesting birds can collide with the HV line cables. Maintenance of rights-of-way (weeding, traffic) can also locally disturb flora and small fauna, but these effects remain manageable.

- **Measures:** anti-collision/spiral beacons, non-nesting vegetation management, controlled development of steppe cover under panels, limitation of herbicides, internal

traffic plan to avoid trampling, team awareness and targeted ecological monitoring (PBF species).

Landscape: Solar panels and pylons permanently change the perception of the landscape. However, the distance from inhabited areas and main roads greatly limits the visual impact felt.

- **Measures**: light landscaping (local species), night lighting as strictly necessary.

SST: Workers are exposed to risks related to electrical installations (high voltage, transformers), working at height, summer heat and, occasionally, electromagnetic fields (EMF). These risks require strict procedures, medical monitoring and the use of suitable equipment.

- **Measures**: regular training (electrics/height), dedicated PPE, breaks/shade/water, maintenance of toilets/waste, emergency plan and medical monitoring of those exposed.

Socioeconomic: The plant creates permanent jobs (operation, maintenance, HSE), but in limited numbers. The nuisance for neighbouring communities is very low, mainly linked to the occasional passage of maintenance vehicles.

- **Measures**: continuous dialogue via GRM, local hiring (maintenance/security), regional purchasing, partnerships with local stakeholders and monitoring of impacts for adjustments.

12.3 Dismantling phase

Soils: Machinery and removal operations can leave traces of oil or fuel and compact the soil. On exposed areas, wind and rain can carry away the soil (erosion), creating ruts or micro-holes-ravines and making the restoration state more difficult.

- **Measures**: demarcate the rights of way, store on waterproof tarpaulins, liquid retention, anti-dust watering, backfilling/reprofiling and checking for the absence of pollution before closing.

Air quality: Dismantling raises dust (cutting, removal, loading) and emits exhaust gases (trucks/machinery). This can cause brief disturbances to workers (irritation, coughing) and, to a lesser extent, to residents located near transport routes; nearby flora and fauna may suffer occasional disturbances. Dismantling generates dust and gases (machinery/trucks) with brief effects on workers and local residents, and occasional disturbances to flora and fauna.

- **Measures**: watering, reduced speed, avoid dusty work in strong winds, maintained machines, dust masks and limitation of operation of the groups.

Waste management: Construction sites generate a lot of waste: rubble and concrete, cables and metals, wood, plastics, oils and batteries, as well as PV modules that can be recycled. Without sorting or suitable waste streams, these flows can clutter up landfills, dirty the ground, and create environmental and safety risks.

- **Measures**: rigorous sorting at source, secure storage areas, approved channels for DMA, recovery/recycling (PV/metals), systematic cleaning of rights-of-way and awareness-raising among teams.

Water resources: Rainfall can carry sediment and construction waste to low-lying areas or temporary water points. Near storage areas, oil/product leaks can mix with runoff and degrade the quality of groundwater and surface water.

- **Measures**: temporary collection/drainage devices, slope stabilization, ban on storing polluting products near sensitive areas, oil retention, anti-spill kits, regulated management of wastewater (sanitary).

Noise and Vibration: Cutting, lifting, and moving machinery produces intermittent noise and localized vibrations. The effect is temporary and is most noticeable in the immediate vicinity of the work and transport routes.

- **Measures:** regulatory timetables, silent/maintained equipment, prior information for local residents and adaptation if nuisances are reported.

Landscape: During construction, the stockpiles of dismantled materials and machinery impair the view and give an impression of disorder. This impact is reversible: it diminishes as the evacuations progress and disappears after restoration and re-vegetalization.

- **Measures:** limit the duration/dispersion of storage, temporary visual screens, re-vegetation with local species.

Biodiversity: The repeated passage of machinery and the noise disturb small wildlife, which moves temporarily. The removal of fences and the gradual restoration of environments then facilitate the return of local wildlife and vegetation.

- **Measures:** restrict access to machinery, remove obstacles/traps, phase work to allow for ecological rest periods, avoid peaks in plant growth, do not use weedkillers, rehabilitate continuously.

SST: The main risks are related to lifting and electrical work, high heat, falls and handling dangerous products. They require strict procedures, suitable PPE and trained teams.

- **Measures:** safety plan and first aid, specific training, complete PPE, signage and access control.

Socio-economic: Dismantling provides temporary jobs and local orders, but also generates nuisances (dust, traffic) and marks the end of permanent jobs linked to operations. Proper information for local residents and local hiring help maximize benefits and limit negative impacts.

- **Measures:** regular communication on schedule, temporary local hiring, consultation on restoration and future uses, support for employee retraining, local purchasing

13 Significant risks

13.1 Pre-construction phase

Fire hazard: In the preparatory phase, the risk of fire is high due to the presence of temporary housing, the storage of flammable materials and dry vegetation. This risk will be reduced by preventive measures including clearing brush, secure storage of combustible products, a ban on smoking in sensitive areas, the provision of fire extinguishers and staff training.

Collision/rollover for workers: There is a high risk of collision or overturning of vehicles when operating on temporary runways or in areas with reduced visibility. This risk is controlled through a clear traffic plan, runway stabilization, appropriate signage, driver training, and support by a ground guide in sensitive areas.

13.2 Construction phase

Fall from height / falling objects: The assembly of structures and modules exposes workers to a high risk of falling from heights or falling objects. This risk is controlled by the use of protective equipment (harnesses, lifelines, helmets), securing lifting areas, and specific training for fitters in working at height.

Electrocution: The installation of cables, inverters, and transformers poses a high risk of

electrocution. This risk is reduced by strictly enforcing lockout procedures, wearing insulating protective equipment, signalling and marking live areas, and training and accrediting specialized electricians.

Accidents and disruptions to communities related to the movement of machinery: The construction phase exposes local communities to the risk of road accidents linked to the intensive traffic of trucks and heavy machinery. To reduce this risk, safe traffic plans, clear signage and speed limits will be implemented, with specific awareness campaigns for drivers.

Noise and air pollution for communities: Residents, particularly schoolchildren, may also experience noise pollution and a deterioration in air quality due to the passage of machinery and construction work. These impacts will be limited by regular maintenance of equipment, watering of tracks and adapting the schedules of the noisiest activities.

Disruption of groundwater resources for communities: Another critical risk is the potential contamination of groundwater, an essential resource for domestic and agricultural uses. Safe storage of fuels and chemicals, the use of retention tanks, and regular monitoring of water quality will help limit this danger.

Chemical risk: The chemical substances used on the construction site (oils, solvents, lubricants) also present a health and environmental risk. This will be controlled by proper storage, the use of suitable PPE and the disposal of waste through approved channels.

Risk of bites or stings: The presence of dangerous wildlife (scorpions, vipers, cobras) poses a risk to workers. Specific training, protective equipment, and the implementation of emergency protocols with antivenom kits will help reduce the severity of this risk.

Burn / electric shock: the installation of photovoltaic modules carries a particular risk of electrocution, as the panels produce electricity as soon as they are exposed to the sun. This risk will be mitigated by temporarily grounding the equipment, providing specific training to teams, and wearing insulating PPE.

Risk of contamination of surface and groundwater during foundation work on the HT line pylons near the Sebkha: Foundation work on the high-voltage line pylons, particularly near the sebkha, may lead to temporary contamination of surface and groundwater by oils or concrete. To prevent this, systems for retaining, collecting, and treating runoff water will be put in place, along with close monitoring.

Waste management: Hazardous waste management is a critical risk during the construction phase. Used oils, solvents, paints, or batteries may be improperly stored, handled, or transported, leading to a risk of leaks and contamination of soil or groundwater. These situations also represent a direct danger to the health of workers and a potential nuisance for local residents. To mitigate this risk, the project plans to develop specific, waterproof, and covered storage areas with retention tanks for any hazardous liquids. Waste will be clearly identified, labelled, and regularly removed through approved channels, with a tracking log. Staff will be trained in good handling practices, and regular inspections will ensure compliance with procedures, thus ensuring the prevention of accidental pollution.

13.3 Operational phase

The operation of the photovoltaic power plant exposes workers to certain major risks, mainly related to electrical maintenance operations and cleaning of the modules.

Electrocution: constitutes the most critical risk: any negligence in the application of lockout procedures or the absence of suitable equipment can cause a serious or even fatal accident. To reduce this danger, the project imposes strict power-off procedures, specific authorization of workers, the use of insulating tools and protective equipment, as well as marking out sensitive areas. These measures guarantee a level of safety in accordance with international standards. A second major risk concern lays during the cleaning of photovoltaic panels. Inclined or wet surfaces can lead to loss of balance and serious injuries if collective or individual protection is not in place. To limit this risk, the project includes a safe cleaning plan (adapted time slots, HSE supervision), the mandatory use of fall protection equipment (harnesses, helmets, non-slip shoes), and training for teams in good practices for working at height.

13.4 Dismantling phase

Electrical risk: Dismantling electrical equipment carries a high risk of electrocution due to cables or transformers that may remain live. Without strict lockout, a handling error can have fatal consequences. This risk will be controlled by the rigorous application of lockout procedures (LOTO), systematic verification of the absence of voltage, the use of insulating PPE and constant supervision by a qualified electrician.

Risk of falling and collapse: The dismantling of structures, fences, and buildings exposes workers to falls from heights and heavy objects. This danger is compounded if the structures are not stabilized. Sequenced deconstruction plans, the mandatory use of harnesses, cradles, and safety nets, and continuous monitoring of operations will help reduce this risk to an acceptable level.

Fire hazard: Cable cutting and disconnection operations can generate sparks or short circuits that could cause a fire, particularly in the presence of combustible materials. This risk will be reduced by checking and isolating circuits beforehand, training operators, prohibiting flammable materials in the vicinity and ensuring fire extinguishers and appropriate emergency procedures are in place.

Dangerous wildlife risk: As during the construction phase, the presence of scorpions, vipers, and cobras poses a real risk of bites or stings for workers. To anticipate these risks, specific awareness campaigns will be organized, workers will be equipped with appropriate protection (high-top shoes, gloves), and anti-venom kits will be available on site with an emergency protocol coordinated with health services.

14 Environmental and Social Management Plan

14.1 Construction phase

Designation	Main impacts	Essential mitigation measures	Estimated cost (DT)
Ground	Traffic and earthworks: erosion, compaction, pollution	Limit traffic, store topsoil, rehabilitate disturbed areas	55,000
Air	Work and traffic: dust, harmful gases	Water tracks, limit engine idling, maintain equipment	25,000
Noise & vibrations	Machinery, trucks, lifting pylons: noise pollution	Restrict hours (8 a.m.-6 p.m.), silent vehicles, inform local residents	10,000
Water & wastewater	Sanitary discharges and machine washing: pollution and runoff	Septic tanks, sealed wash areas, quick cleanup in case of leaks	40,000
Waste	Solid and hazardous waste produced on site	Selective sorting, covered bins, disposal via approved channels	25,000
Transportation	Heavy vehicle traffic: congestion, accidents	Traffic plan, speed limit, driver training	25,000
Wildlife	Works and lines: habitat disturbance, birds disturbed	Avoid breeding period, anti-collision beacons, ecological monitoring	28,000
Flora	Earthworks and opening of tracks: destruction of vegetation	Limit land clearing, revegetation program	15,000
Social	Disruption of local farms and agricultural access	Dialogue, information, complaints mechanism and compensation	10,000 + CPR compensations
Economy	Temporary agricultural losses	Compensation, employment and local purchasing	Included in CPR
Health & Safety	Worker risks (falls, heat, products) and local residents (accidents, dust)	Provide PPE, safety training, hazardous product management, first aid	20,000
Estimated Total			253,000 DT

14.2 Operational phase

Designation	Main impacts	Essential mitigation measures	Estimated cost
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			(DT / 20 years)
Ground	Maintenance vehicle traffic: compaction and pollution in the event of leaks	Limit traffic to runways, secure storage of oils, controlled drainage	60,000
Air quality	Traffic, generators, panel cleaning: dust and gas	Limit speed, maintain generators, favor wet cleaning	30,000
Noise & vibrations	Vehicles, maintenance, technical equipment: noise pollution	Plan schedules, maintain equipment, soundproofing hoods if necessary	20,000
Water & wastewater	Cleaning panels and toilets: risk of soil/water table pollution	Controlled drainage, biodegradable products, quality monitoring, staff training	40,000
Waste	Ordinary and hazardous waste (maintenance, cleaning): pollution	Selective sorting, secure storage areas, approved channels, monitoring and training	80,000
Transportation	Vehicle movements: dust, compaction, accidents	Internal traffic plan, parking zones, speed limit, awareness	40,000
Landscape	Visible structures (signs, fences): visual degradation	Perimeter vegetation, anti-reflective materials, limiting night lighting	25,000
Wildlife	Reflections of signs and lines: disturbance of migratory birds	Artificial perches, limited maintenance during sensitive periods, anti-collision beacons	20,000
Flora	Excessive maintenance: loss of plant cover	Promote local vegetation, limit herbicides, annual monitoring, awareness	20,000
Social	Low staff presence: lack of dialogue with local residents	Continuous communication, occasional involvement of local stakeholders	Details in CPR
Economy	Few permanent jobs, loss of agricultural land	Promote local hiring, regional purchasing, economic partnerships	30,000
Health & Safety	Electrical, heat, dust and sanitation risks poorly managed	Safety training, PPE, shaded areas and drinking water, medical monitoring, emergency plan	70,000
Estimated Total			435,000 DT

14.3 Dismantling phase

Designation	Main impacts	Essential mitigation measures	Estimated cost (DT / 6 months)
Ground	Excavation, removal of structures, movement of machinery: soil overturning, dust, risk of contamination (leaks)	Limited intervention areas, secure storage (tarpaulins, retention tanks), anti-dust watering, backfilling and stabilization	6,000
Air quality	Works and machinery: dust, exhaust gases	Humidification, reduce speed, maintain machinery, avoid work in strong winds, masks for workers	4,000
Noise & vibrations	Machinery, dismantling, digging: nuisances to residents/wildlife	Limit hours, efficient silencers, machine maintenance, inform local residents	3,000
Water & wastewater	Digging, earthworks, oil/product storage: runoff, groundwater pollution	Controlled drainage, stabilized slopes, retention tanks, compliant toilets, anti-leak kits	5,000
Waste	Solid and hazardous waste (metals, panels, oils): soil/water pollution	Selective sorting, secure storage areas, approved channels	8,000
Transport & Logistics	Heavy machinery traffic: dust, soil compaction, congestion	Traffic plan, stabilizing runways, regular monitoring and rapid repairs	4,000
Landscape	Removal of structures and storage: temporary visual disturbance	Limited storage, gradual restoration, local re-vegetation	2,000
Wildlife	Noise, machine movements, removal of structures: disturbance of local birds	Avoid work during sensitive times, limit access areas, secure removal of structures, raise worker awareness	3,000
Flora	Removal of structures, earthworks: destruction of spontaneous vegetation	Demarcate work areas, avoid growth periods, progressive restoration, limit chemical products	2,000
Social	More machinery/workers: inconvenience to local residents; reduced activity: loss of local jobs	Communication plan, consultation for site reuse, worker support	3,000
Economy	End of operation: loss of local	Temporary local hiring, local purchasing, economic	2,000

	benefits, temporary jobs only	transition support	
Health & Safety	Dismantling, cables, machines: accidents, dust, noise, fatigue	Safety training, PPE, strict procedures, dust management, medical monitoring, first aid	5,000

15 Monitoring and follow-up program

Phase	Component	Essential follow-up action	Indicators	Estimated cost (DT)
Construction	Ground	Inspection of tracks, storage of topsoil, erosion prevention	Track condition, storage protection	15,000
	Air	Dust measurement, track watering control	PM10/PM2.5 levels, watering register	12,000
	Noise	Respect for timetables and monitoring of noise levels in sensitive areas	< 70 dB, no nighttime noise	10,000
	Waters	Checking tanks, basins, runoff	Waterproofing, traces of runoff	9,000
	Waste	Selective sorting monitoring and hazardous waste disposal	Traceability, clean areas	12,000
	Social & security	Complaint management, signaling, PPE control	Number of complaints, wearing PPE	8,000
Exploitation	Soil & Water	Control of storage areas, drainage, septic tanks	Waterproofing, no overflow	9,000
	Air & noise	Dust monitoring, machine maintenance, occasional noise	Visible dust, measured dB	10,000
	Waste	Sorting control and evacuation of approved channels	Output registers, clean areas	5,000
	Fauna & flora	Bird observation and vegetation monitoring	Dead birds, vegetation cover	6,000
	Social & health	Complaint monitoring, community visits, medical monitoring	Number of complaints, health checks	8,000
Dismantling	Soil &	Inspection of excavated	Disturbed surface,	10,000

	landscape	areas, restoration, revegetation	leveled ground	
	Air & noise	Dust and noise level control	Visible dust, measured dB	8,000
	Waste	Sorting and disposal of metals, oils, concrete	Quantity sorted, evacuation conformity	12,000
	Transport & Logistics	Monitoring of vehicle traffic and signaling	Runway condition, traffic safety	6,000
	Social & security	Resident communication, PPE control, safety training	Number of complaints, rate of PPE use	9,000
Estimated Total				149,000 DT

16 Stakeholder Engagement Plan (PEPP)

The Stakeholder Engagement Plan (PEPP) for the Khobna – Sidi Bouzid solar power plant provides a set of structured measures to ensure inclusive, transparent and continuous dialogue with the stakeholders involved in the project.

- **Regulatory and institutional framework:** the PEPP aligns with Tunisian legislation on public participation and with the requirements of donors (EBRD PR10, EIB ESS10, IFC PS1), by integrating a complaint management mechanism and inclusive consultations throughout the project cycle.
- **Identification of stakeholders:** a detailed mapping was carried out, covering institutions (Governorate, CRDA, municipality, STEG, Forestry Directorate, INP), local communities (Arch Jenf families, farmers, breeders, residents of Khobna and Douara), and vulnerable groups (rural women, unemployed youth, households without land titles, elderly and disabled people). Specific arrangements are planned to ensure their inclusion.
- **Consultations conducted and planned:** several institutional meetings, field visits and community meetings have already helped to identify local concerns (access to land, pastures, protection of archaeological sites, risks of erosion and flooding, expectations in terms of employment). The plan provides for the continuation of these exchanges in the form of public meetings, focus groups for women and young people, and targeted consultations with affected families.
- **Information and Disclosure Strategy:** Information will be disseminated in French and Tunisian dialect, via local radio stations, posters in town halls, health centers and schools, digital platforms (Qair website, social networks) and community meetings. Simplified and oral materials will be used for populations with low literacy levels.
- **Complaints Management Mechanism (MGP):** a free, multi-channel system is in place (Community Liaison Officer, complaint boxes, community relays, telephone, SMS, email). Complaints are recorded, acknowledged, and processed within a maximum of 30 days, with a preference for amicable settlement. A specific, confidential mechanism is provided for complaints related to gender-based violence (GBV/SEAH).
- **Monitoring and updating:** performance indicators will measure the quality of engagement (number of consultations, complaint resolution rate, inclusion of vulnerable groups). Periodic reports will be produced and shared with donors and local authorities, and the PEPP will be updated based on stakeholder feedback and project progress.
- **Organization and budget:** the implementation of the PEPP is ensured by Qair and its design office, with a dedicated Community Liaison Officer, under the supervision of the project's E&S Manager. A specific budget is provided to finance consultation activities, communication and the operation of the complaints management mechanism.

17 Complaints Management Mechanism (MGP)

17.1 Key features

Elements	Description
Goals	Provide a clear, accessible and confidential channel for receiving and handling complaints; prevent conflicts; strengthen project accountability and meet donor requirements.
Types of complaints	Environmental (noise, dust, pollution); Social and land (access, disputes, occupation); Working conditions (wages, safety, discrimination); Indirect impacts (traffic, paths); Inappropriate behavior (abuse, harassment); Lack of information or inclusion (vulnerable groups).
Principles	Free and adapted accessibility; Confidentiality and anonymity guaranteed; Protection against reprisals; Transparency and traceability; Fairness; Defined deadlines (30 days max); Continuous improvement.
Process	1. Reception via community relays, NGOs, ACL, complaint boxes, SMS, email, website or donors. 2. Registration in a dedicated register. 3. Acknowledgment of receipt. 4. Evaluation (simple or complex complaint). 5. Response and resolution (amicable priority). 6. Closure and follow-up with validation by the complainant.
Specificities	Special mechanism for complaints related to gender-based violence (GBV/SEAH), guaranteeing confidentiality, security and referral to specialized structures.

17.2 Stage deadlines

Mechanism step	Recommended deadline
Reception	Complaints admissible at any time
Registration	Within 5 working days of receipt
Acknowledgment of receipt	Within 7 working days after registration
Assessment	Completed within 10 to 15 business days
Amicable treatment (preferential)	To be initiated immediately after the assessment is completed, to be finalized within 10 working days (included in the 30 days)
Formal Response and Resolution	Within a maximum of 30 working days after registration
Closure and archiving	Within 7 business days after acceptance or closure
Post-resolution follow-up (if applicable)	For a minimum period of 3 months for sensitive cases

18 Environmental and Social Action Plan (ESAP)

The Environmental and Social Action Plan (ESAP) has been developed in accordance with the Performance Standards of various funding institutions, translating each of these standards into a set of concrete actions, for a total of 42 actions. For each action, the ESAP identifies the associated environmental and social risks, highlighting both potential liabilities and expected benefits. It also specifies the regulatory and institutional requirements, the resources and investments needed, as well as the responsibilities assigned to the different stakeholders.

A detailed timeline has also been established, with defined objectives and evaluation criteria to measure progress and ensure effective implementation. This approach was adopted in order to provide a practical framework, enabling a precise definition of how each action will be carried out.