CONSORTIUM EDF RENEWABLES - MASDAR - GREEN OF AFRICA

Province of Midelt

Specific environmental and social impact assessment for solar power plant project

NOOR MIDELT I

NON TECHNICAL SUMMARY

Réf : C 330 / R372-04

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CONSORTIUM EDF RENEWABLES - MASDAR - GREEN OF AFRICA

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NON TECHNICAL SUMMARY

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1. Introduction

In order to meet the growing electricity needs and to overcome the dependence on fossil fuels, the Kingdom of Morocco has implemented a large-scale strategy in the electric power sector aimed at increasing the production of renewable energies to 52% : 20% for solar and wind each and 12% for water of the overall capacity.

The first phase of the integrated solar energy program covers the development of the 500 MW NOOR Ouarzazate complexes. The Midelt site covers the next step of the program with the development of two projects: NOOR Midelt I and NOOR Midelt II. The national solar plan's development program has been entrusted to the Moroccan Agency for Solar Energy (MASEN).

MASEN has issued a call for tenders for the completion of the design, development and operation of each site. The EDF EN - MASDAR - GREEN AFRICA consortium was selected to design, construct and operate NOOR Midelt I project. NOOR Midelt I is a 800 MW solar central which consists of two technologies to produce energy, photovoltaic panels and parabolic mirrors.

A framework environmental and social impact assessment (FESIA) was conducted in 2015 on the entire site (Midelt solar complex) and an environmental acceptability was granted.

Following the development of the project, a specific environmental and social impact study (SESIA) is carried out. This document is the non-technical summary of the specific environmental and social impact study of the NOOR Midelt I solar power plant project.

2. Project’s location

2.1 Geographical location

The solar complex site of NOOR Midelt covers a total area of 4141 ha, on a plateau in Upper Moulouya located about 20 km north-east of the city of Midelt. It is administratively related to the municipalities of Mibladene and Ait Ben Yacoub in the province of Midelt. The access road encroaches the territory of Zaida municipality.

The NOOR Midelt I plant is located northwest of the main NOOR Midelt solar complex area.

The site is accessible by a road planned by MASEN about twenty kilometers from the RN13 which connects Meknes to Midelt.

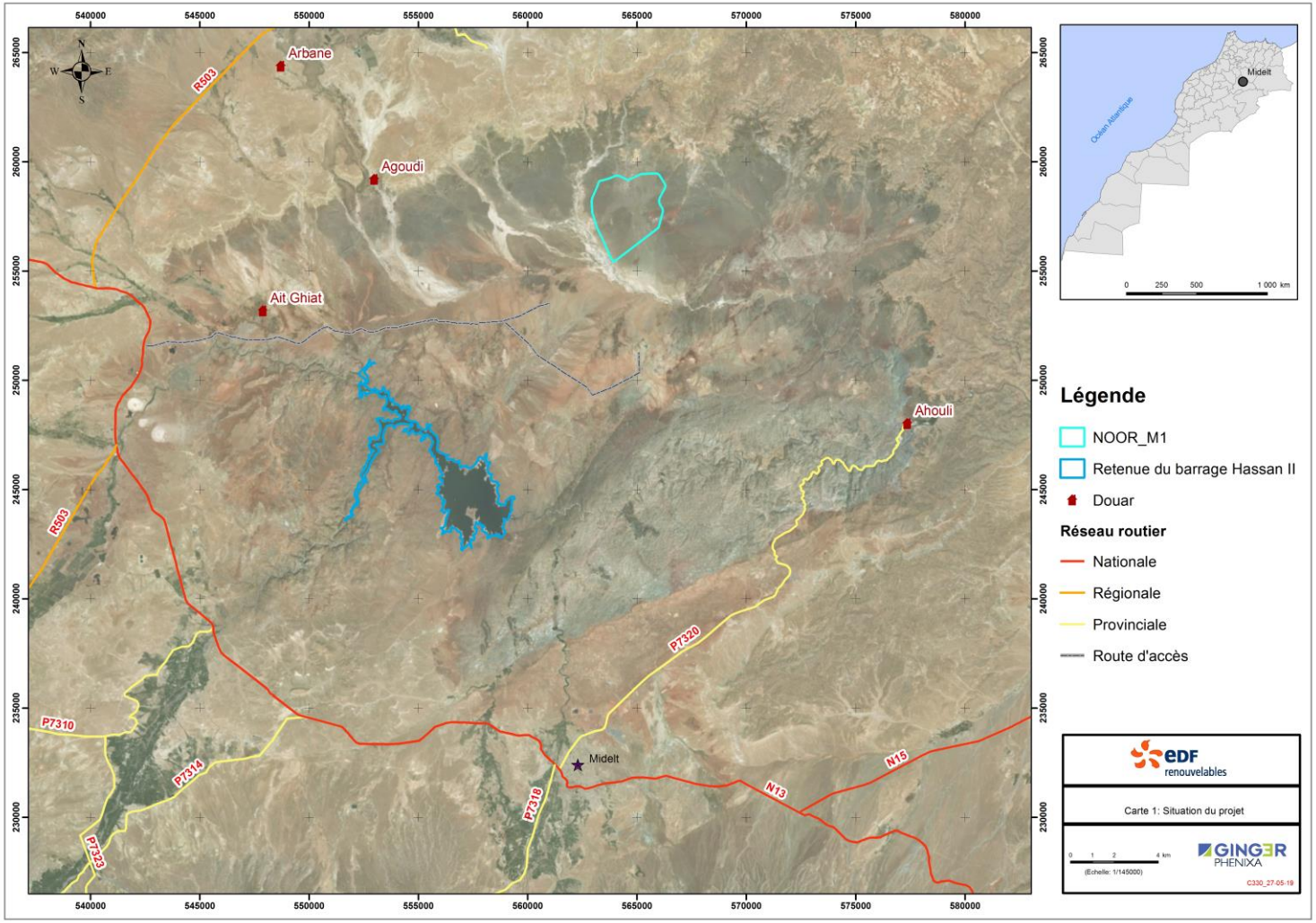

Figure 1 : Site location

2.2 Administrative organization

Administratively, the site is related to the following structures:

- Draa – Tafilelt Region ;
- Province of Midelt ;
- Municipalities of Mibladene and Ait Ben Yacoub in province of Midelt.

2.3 Location in Midelt solar complex

The site of the solar complex of NOOR Midelt covers a total area of 4141 ha, of which 950 hectares towards the far west, will be reserved for NOOR Midelt I.

2.4 Land status

As a whole, the site of the complex was initially composed of collective lands, that are now MASEN's property. These collective lands covering about 2714 ha, belonged to the Ait Ouefllа ethnic community and Ait Rahou Ouali. The site also includes forest lands covering about 1427 ha, current property of Water and Forest administration.

MASEN has already finalized the land acquisition procedure for the site of this complex. This acquisition is dealt with as part of the acquisition plan prepared in addition to the FESIA already developed.

2.5 Alternative site

The proposed site has been selected by MASEN for the following reasons :

- Unoccupied land ;
- Significant solar radiation : Direct Normal Irradiation (DNI) or normal direct sunlight, is relatively high and within the range of 2300-2400 kWh / m²;
- The site is located near the Hassan II dam (about 11 km) which will provide water needs for CSP technology;
- The possibilities of electrical connection exist;
- There is a direct access via RN13;
- The flat profile of the land is favorable for the establishment of a solar power station;
- Pastoral activity on and around the site is now very limited due to the lack of available vegetation due to a long over-exploitation by breeders;
- Environmental constraints are minimal;

2.6 Study area – sensitive receptors

Study area

The overall study area consists of two concentric zones around the project site of the NOOR-Midelt solar complex. Thus, from the center to the periphery of this zone, there are: the project's site; the close perimeter; the remote perimeter.

The close perimeter corresponds to a band of around 500m wide around the property boundaries of the project site. This zone corresponds to the areas likely to be affected by the work or the operation of the park (plots for the installation of panels, mirrors, access roads, layout of the buried wiring network, assembly areas and different components of the project).

The remote perimeter corresponds to the area of potential impacts of the project on a larger scale. In the context of this environmental and social impact assessment, the remote perimeter of the study

area will essentially correspond to the area of landscape impacts and particularly socio-economic impacts.

The remote perimeter corresponds to the sub-watershed supplying the Hassan II dam, with an extension to the south, to include the town of Midelt.

3. Project description

The development of NOOR Midelt I project is planned as part of a private power generation contract in the form of IPP (Independent Power Producer), covering the design, financing, construction, operation and maintenance over a period of 25 years.

The Midelt I solar plant is a hybrid solar power plant with two components: PV and CSP parabolic trough.

3.1 Project components

The NOOR Midelt I power plant covers an area of 950 hectares, and will operate in hybrid PV (Photovoltaic) / CSP (Solar Radiation Concentration) - parabolic mirrors. The PV solar field covers 866 ha and the CSP solar field covers about 85 ha. 3.6 km of 225 KV power line will be built to transfer the electricity produced on the site to the substation set up for the complex by MASEN.

The power plant captures solar energy and converts it into electricity using separate processes:

- The photovoltaic (PV) effect, which uses semiconductor materials to convert solar flux directly into electricity. The PV panels in the solar PV field covers about 3,063,100 m² of PV panels.
- The concentration of solar radiation (CSP) using parabolic trough collectors to produce thermal energy. Thermal energy is stored and converted into electricity using a thermodynamic cycle.

During the day, the photovoltaic plant simultaneously injects electricity onto the grid, heats-up molten salts of CSP and charges energy in BESS (Battery Energy Storage System). At the same time, the CSP field produces energy to be stored by a thermal energy storage based on molten salts, for the steam cycle to produce electricity onto the grid during 5 hours after sunset.

3.2 Photovoltaic component :

The PV field comprises about 600MWp photovoltaic panels installed on structures following the sun's path on 1 axis. PV panels are supported by metal piles with shallow foundations (1 to 2 m max).

The PV field total coverage is about 3 063 100 m² for panels and the footprint is 866 ha.

3.3 CSP component :

The CSP solar field consists of an arrangement of parabolic trough collectors in series and in parallel in order to obtain the desired thermal power. Thermal oil travels through the entire CSP field through vacuum tubes (HCE) in order to be heated to the desired temperature. The area covered by CSP solar field is about 85 ha.

The power block is located at the center of the site and includes the components for power generation and auxiliary systems listed here below:

- A thermal storage system with molten salts. This storage system consists of one "cold" salt storage tanks and one "hot" salt storage tanks. These tanks store 26,920 tons of molten salts consisting of 60% Sodium Nitrate and 40% Potassium Nitrate;
- A thermal oil management system (HTF). This oil is a eutectic mixture of biphenyl and diphenyl oxide. 570 tons are required to fill the system;

- A Battery Energy Storage System based on Lithium-ion technology. The batteries will be arranged in containers or in outdoor cabinets. Both will be equipped with fire protection system;
- A steam turbine generator of 190 gross MW ;
- An air-cooled steam condenser that allows for closed loop operation;
- A pretreated water tank providing water to the water demineralization unit and the fire water reserve (total capacity of 2 050 m3);
- A water demineralization unit for the production of water necessary for the water-steam cycle and the washing of the mirrors; the solution is based on Reverse Osmosis and Electro-demineralization (EDI modules). The demineralized water tank storage has a capacity of 700 m3.
- In total, the water stored in the tanks provides an autonomy of more than 5 days of normal operation
- Industrial effluent treatment units: neutralization unit and oil separation unit. The flow rate under normal operation at full load would be approximately 6.5 t / h of effluents, i.e approximately 156 m3 / day.
- Two evaporation ponds (2x15000m^3) will be set up. It receives the different treated water at the power block.

No water discharge outside the site except for uncontaminated storm water.

The power block will occupy an area of approximately 8 hectares. It will be equipped with traffic lanes and car parks for the operational needs.

3.4 Others facilities

- 225 KV power line (3.6 km) to transfer electricity from the power block to the substation set up by MASEN south of the site;
- Roads including an access road to the factory block, a peripheral road, lanes and internal circulation roads;
- Perimeter fence;
- Administrative offices.

3.5 Works description, resources needs and effluents in construction phase

3.5.1 Earth works

The leveling works are limited to the areas requiring earthworks for the operation of the equipment. For the entire plant, the volume of land moved is estimated at about 1. M m^3. The Excavation/ Filling works ratio will be balanced. Explosives will be used for part of earthworks (about 14% of the total site area).

3.5.2 Water and energy needs

During the construction phase, which will last 32 months, water consumption is estimated at 300 000 m^3. These needs are divided in concrete (6%), earthworks / compaction (16%), temporary facilities (toilets, showers, canteens, machinery washing facilities, etc.) (20%), dust control (40%), commissioning (18%). Water will be supplied from the Hassan II dam reservoir by truck.

During the construction phase the hydrocarbon requirements are: the fuels necessary for the operation of the different vehicles. The electricity needs are about 7,500 MWh. They will be provided by the temporarily installed power line that twill be decommissioned at the end of the works.

3.5.3 Wastewater and solid waste management

Stand-alone sanitation systems (chemical toilets) will be installed on site for domestic wastewater. These chemical toilets will be regularly drained to a suitable system under the agreement of the authorities. Contaminated water (washing water of the machines, runoff on storage areas of different products) will be sent to a de-oiler before storage tank. It could be reused for dust control or soil compaction under quality control and MASEN approval.

Sanitary waters from canteens, showers, would be treated in biological reactor. Treated water could be reused for dust control or soil compaction according to quality and MASEN approval.

Oily water will be treated in oil separator and then stored in tank. It could be reused according to quality and MASEN approval (for dust control or soil compaction).

A solid waste management plan approved by MASEN will be prepared in order to sort, recycle and clear out the solid waste through authorized operators.

3.6 Main resources needs and effluents in operation phase

3.6.1 Water needs during operation phase

In operation dry cooling enables to reduce strongly water needs less than 70 000 m^3/an. This water is mainly used to top up the steam cycle and wash the parabolic mirrors. Dry brushes system will clean PV panels without water. The pre-treated water will be treated through a demineralization process (Reverse Osmosis and deionization) in order to get required quality for steam cycle and mirrors washing.

3.6.2 Hydrocarbons needs

In the operation phase hydrocarbons needs are very low. They are used mostly by vehicles for maintenance and for the occasional operation of the boiler which is necessary to maintain the temperature of the thermal oil in case of low temperatures, and for emergency generators. The needs are about 150 m3/year.

3.6.3 HTF and molten salts needs

The thermal oil undergoes dilation and contraction effects according the temperature. A dilatation and vessels system manage these effects. Variations in oil temperatures also lead to VOC emissions. A event at the expansion vessel allows evacuation to a secure area after being treated through carbon filters. A filtration system also ensures the purification of the oil. So to ensure a constant volume of oil an annual supplement < 1% of the volume is needed.

No supplement or renewal is required for molten salts during all the operation phase.

3.6.4 Li-ion batteries

The BESS system is designed for 25 years. During this period, some batteries could be replaced or added. Failed or used batteries will be sent back to the manufacturer that will recycle them.

3.6.5 Effluents during operation phase

- Waste water will be treated in the industrial water station in the power block. Treated water will be sent to the evaporation ponds.
- Solid waste management plan will be prepared to sort, recycle and clear out all the solid waste through authorized operators.
- VOC emission from thermal oil system will be treated through carbon filters.

3.7 Investment amount

The investment of the project is around 800 MUSD.

3.8 Construction schedule and employment

The construction and operation phases will employ:

- In the construction phase: more than 1000 people for around 32 months for labour jobs but also, welders, assemblers, machine operators etc.
- In operation phase: around 60 people will operate the power plant.

4. Summary of environmental and social conditions and aspects, impacts and preliminary management measures

4.1 Air quality

Whole study area does not include significant sources of air pollutant emissions. Only, the remote perimeter is exposed to a weak air pollution from RN13 and RR503 traffic. Air quality baseline was however carried out in order to develop a benchmark for the site. The parameters monitored were SO2, NOx, VOC (Benzene) and PM10. These parameters were selected, as they are the typical emissions resulting from construction and operation of the proposed Solar Power Plant. The data obtained will be used for comparative assessment purposes during the routine air quality monitoring program which is to be implemented at the construction and operational phases. The results of the monitoring campaign show that the ambient air quality conditions within the NOOR Midelt I are well within the national ambient air quality guidelines for SO2, Benzene, O3 and PM10. According to these parameters, the air quality on the site can be considered good.

◗ Impacts and mitigation measures in construction phase

During construction, the ambient air quality on the project site may potentially be affected by increased dust, particularly during the earthworks phase and by gaseous exhaust fumes resulting from construction activities, equipment and additional vehicle movements to and from the site.

Vehicles and machines must be kept in good working order. Dust emissions will have to be reduced by watering heavily emitting areas (earthworks areas, circulation tracks) and by covering all trucks transporting powdery materials.

◗ Impacts and mitigation measures in operation phase

Generally, solar power plants are zero emission facilities since they use renewable and clean sources to generate power. Vehicle emissions due to trips to/from and around the site will result in limited pollutants. The typical air emissions resulting from these activities include: particulate matter (PM_{10} and $PM_{2,5}$), nitrogen oxides, Sulphur dioxide and BTEX. The operation of the HTF heater auxiliary boiler will also be a source of emissions. However, considering both the low vehicle traffic necessary for the operation of the plant and the very small number of operating hours of the HTF heater auxiliary boiler (a few hours maximum per year), the atmospheric emissions from hydrocarbon combustion will be very low. The results of the modelling dispersion study demonstrated that the emissions from the NOOR Midelt I power plant are well below the national and IFC maximum limits thresholds for point source emissions. Furthermore, ambient concentrations of the pollutants quickly dissipated to background levels 280m from the point source. As a result, no impact to the ambient air quality at the closest sensitive receptors is identified, since they are several kilometers from the site.

Low sulfur fuel (<10 ppm) will be used. The thermal oil management system is a source of VOC emissions (essentially Benzene). A treatment system is implemented before the release of VOCs and

the VOC content emitted into the atmosphere will be very low and far below the threshold of Moroccan regulation and compliant with IFC standards

NOOR Midelt I solar plant will help to offset Global Warming, as it will prevent over one 675 360 tons /year of CO2 from being emitted, if a conventional power generation facility had been developed instead.

4.2 Noise and vibration

. No remarkable source of noise has been identified and the measurement that has been done on site show a very calm soundscape.

The proposed site is located in an isolated area, with no significant developments or commercial activities located within a 25 km radius. The only identified source of noise is the RN13. The closest human constructions are 10 km north-east project's site (Douar Agoudi).

In order to develop a benchmark of the onsite noise conditions, a noise monitoring campaign was carried out in the day and night-time in July 2018. The data obtained will be used for assessment purposes during the routine noise monitoring program. The results of the monitoring campaign show that both the day-time and night-time noise levels at the boundaries of the site, reflect a quiet, undeveloped area. The measured average values are below the threshold values recommended by the IFC in residential areas, with the exception of the evening measurement of one. The higher value is explained by the presence of a strong wind blowing at 36 km/h. The study area is in a quiet ambient noise.

◗ Impacts and mitigation measures in construction phase

Construction activities involving noise and vibration are likely to involve earthworks, piles, leveling, installation of structures and services, use of diesel generators, etc. Explosive use will also increase occasionally noise level. The increase in traffic during construction may also lead to an increase in noise levels, particularly in the city of Midelt and in other non-bypass roadside habitat centers.

Only the land construction area will be impacted and employees will be more specifically concerned.

During the construction stage and in accordance with the typical Health and Safety requirements, no employee should be exposed to a noise level greater than 80 dB (A) for duration of more than 8 hours per day without hearing protection. Hearing protection should be provided for all employees working in close proximity to equipment with noise levels >85 dB(A).

Vehicles and machines must be kept in good working order. Transport activities, including the delivery of materials and equipment, will have to be observed at daytime if possible, in order to limit the nuisance of the habitat areas crossed, particularly along the RN13.

◗ Impacts and mitigation measures in operation phase

.The most important sources of noise emanating from the equipment are the steam turbine, the main pumps, the air condenser, the auxiliary cooling fans, the relief valve discharges and the air compressors.

The majority of the equipment would be static and would not involve interaction with the ground or other surfaces that could result in significant vibration.

The turbine and / or any other potentially noise-generating equipment will be acoustically protected by means of devices that reduce the impact of noise on the environment, thereby ensuring that noise levels are not exceeded.

Buildings containing workers will be designed to minimize noise emissions and to ensure that permitted noise limits are not exceeded. If necessary, soundproofing materials will be installed on partitions and enclosures to ensure that noise limits are not exceeded

The results of the models indicate that the noise emissions from the project will not exceed the 45 dB(A) target level along boundary of the facility which is compliant with IFC standard.

4.3 Soil and ground water

The NOOR Midelt I plant is located northwest of the main NOOR Midelt solar complex area. There are vast dominant plateaus that are divided into two contrasting E-W bands: one northern, the other southern. The topographic slope, almost uniform and regular, of the order of 2%, decreases from north to south. The project's site is at an altitude ranging from 1319 to 1462 m. It is crisscrossed by chaâbas resulting from the erosion caused by the flow of water and which ensure the natural drainage of the storm water supply to the rivers bordering the plateau.

The study area is sterile from a hydro-geological point of view

The site is a greenfield and no commercial or industrial activities are located in close proximity to the site. Soil sampling and analysis was carried out for heavy metals and hydrocarbons and the results indicate that the soils onsite are not contaminated.

◗ Impacts and mitigation measures in construction phase

Construction phase can increase the risk of contamination through poor site management practices and inadequate waste disposal management. General risks of contamination are associated with product handling and processing of products where liquid waste and hazardous material can escape into the soil. Spillage and leakage of hazardous liquid substances to the soil can occur. There are related to the transport, handling and storage of these materials and the potential threat of releases and spills into the soil. The only hazardous materials on the site will be diesel and oils / lubricants, paints, thermal oils. No groundwater will be used.

The aim of the mitigation measures is to properly manage the storage of the different products, which are potential sources of soil contamination. The proper management includes: sealed, covered storage areas equipped with holding tanks. All wash water must also be sent to an oil separator treatment system, it cannot be sent to the natural habitat but instead must be stored in the evaporation basins. For all accidental leaks of HTF contaminating soils an on-site bioremediation treatment system will be implemented. Finally, an emergency response plan will identify the procedures to be implemented in the event of pollution or accidental spills.

◗ Impacts and mitigation measures in operation phase

During the operation phase, certain products mishandled during accidental spillage can lead to accidental pollution of the soil: HTF oil, oils, lubricants, hydrocarbons. Sanitary / wastewater from the site have the potential to contaminate soils. The quantities of these products remain very low and the impact is considered minor. No groundwater will be used.

The main soil contamination risk at the operational phase will be leaks or spills of HTF at the various process systems. The potentially weak points at these systems are the tubing, flanges, valves and other such connection points. However, routine inspections and maintenance will help to prevent and minimize any incidents. The facilities have been designed to include leak detection systems and containment structures to prevent spreading of the HTF and facilitate collection and treatment. In addition, the management plans will include spill response and cleanup plans to address any potential incident. Furthermore, the soil bio-remediation facility implemented in construction phase will always operate.

4.4 Storm water

The site of NOOR Midelt I is located less than 200 m from an ephemeral river (wadi Bou Arich), bordering it to the west. The latter joins wadi Ait Ayad towards the south of the site. The latter joins Aouli, and goes down to the Moulouya, to feed the Hassan II dam's reservoir. There is no permanent surfaces water inside project site, only few chaâbas flowing from the north to the south of solar plant site.

◗ Impacts and mitigation measures in construction phase

The development of the project will modify the topography of the site. Unusual strong rainfall will result in increased erosion and flows with sediments. A north-south and east-west grid of ditches and canals will drain rainwater to the east and south of the site. The drained water will be discharged into the drainage channel set up by MASEN and will not be discharged along the wadi Sidi Ayad bordering the site.

During construction one of the main environmental issues for storm water is potential contamination from wastewater or spills of hazardous fluids or contaminated soils.

Rainwater that may be contaminated during the construction phase will be sent to an oil separator tank before being stored before reuse for dust reduction if the quality is compliant with Moroccan regulation and under MASEN authorization. Rainwater drainage during the construction phase will be given special attention in order to limit the possible erosive effects of runoff.

◗ Impacts and mitigation measures in operation phase

The implementation of the drainage system favours the infiltration of rainwater and greatly reduces erosion. Erosion is already an important phenomenon on the site, the drainage system will not aggravate it. The impact is therefore minor.

The design of the drainage system will separate potentially contaminated water from clean rainwater. Contaminated water will be sent to the industrial water treatment system

Routinely check the storm water system and drainage system to ensure that water flows (volume and velocities) are adequate and are not contributing to erosion.

Regular inspection for HTF spills and verification of drainage to treatment system.

4.5 Biodiversity

All protected areas under the Master Plan are located at a great distance from the plant site, at least 30 km from the site and won't be affected by the project . Ornithological and fauna and flora surveys were carried out in March and April 2019 to identify the main biodiversity issues of the site.

The site itself is poor in species (fauna and flora), due to a long over-exploitation by the breeders resulting in a sharp decline in Halfah grass. There is no natural habitat in the study area, only modified habitat.

Power plant site is on the living space of Houbara Bustard. This is the main ornithological issue of the project. This species (Vulnerable globally and Endangered in Morocco) is quite common. The female use the site as feeding grounds, and breeding (surveys of the local population confirmed nesting and spawning throughout the area). A male courtship area is located 6 km south the site and won't be affected by the project. Only one Large Migratory Raptor (Black Kite) has been identified during the ornithological surveys. However migration flows do not cross the site; the identified migration corridor is much further west.

◗ Impacts and mitigation measures in construction phase

On a site where biodiversity is very poor, the major general impacts during construction phase are :

- Loss of flora on the site and disturbance of wildlife at and / or near the site following earthworks;
- Reduction of seed quantities for future growth of vegetation, by removing soil for terracing;
- Contamination of soil and water and attraction of harmful species and spread of disease, in cases where the design and storage of waste is not carried out properly;
- Mortality of terrestrial animal species by the equipment and machines used on the site.

Construction works will certainly cause an inconvenience and disruption during the breeding season for the birds on the site's periphery. All other local breeding species will also be affected but these species are not as threatened as the Houbara Bustard. The courtship area won't be affected. The project's site won't be available for laying and breeding. However, the Houbara Bustard living area includes the whole Midelt Plateau. Therefore impacts on Houbara Bustard avifauna are medium.

The main biodiversity measures are related to the living space of the Houbara Bustard. The rehabilitation of the Alfa or Sagebrush steppe around the space occupied by the solar park is recommended subject discussion and all stakeholders agreement. If construction starting after laying season, eggs should be collected in coordination with ECWP project which manage Houbara Bustard rehabilitation program. Adding high viz tape to any fences to make them more obvious to flying or running birds should be implemented to avoid collision. The works and engine traffic areas must be strictly delimited so as not to encroach on adjacent land. Vegetation actions with local species

(herbaceous vegetation and no invasive species) should be initiated as much as possible. Awareness-raising actions will have to be carried out with the personnel in order to reduce the risks of fauna destruction especially for the Houbara Bustard. Whenever possible, night work will be avoided to prevent excessive human disturbance to wildlife.

◗ Impacts and mitigation measures in operation phase

In operation phase the impacts on biodiversity are the same as in construction phase for the loss of habitat especially for Houbara Bustard. However the development of interstitial vegetation at the field level could represent a favorable environment for some species

The luminous reflections associated with PV panels and parabolic trough collectors could disturb the water birds frequenting the Hassan II dam reservoir. This impact is not proven and requires monitoring to evaluate the potential effect. The presence of the power line could also cause direct mortality of birds due to Collision / electrocution with the power line. However, considering the reduced length <5 km, these impacts are weak.

Maintenance activities carried out by the staff will be a source of inconvenience, with a risk of wildlife destruction.

Revegetation of the site started during the construction phase may help to develop favorable environments to wildlife and birdlife. To limit the potential impacts of the power line, signage will be installed, and pylons will be in line with international best practices to reduce electrocution. Awareness-raising actions staff will have to be organized regularly. A monitoring of birds' mortality during the operation phase will have to be set up.

4.6 Solid waste management

◗ Impacts and mitigation measures in construction and operation phase

The construction and operation of the NOOR Midelt 1 project will result in the generation of a number of waste streams that will require appropriate waste management techniques to be employed to ensure compliance with national regulation and international requirements and best practice.

A detailed waste management plan should be established before the start of works. The developer will ensure that the waste reduction policy is implemented along with waste reduction actions upon the purchase of materials and equipment, and will promote the recycling of materials on-site. The waste flows will be separated to make recycling easier. All storage areas must be well organized and waste appropriately managed through segregation of hazardous and non-hazardous waste. A register of waste listing the quantities and different flows by category, will be kept on- site. The waste storage areas will have to be adapted to each type of waste in order to avoid contamination of the environment. Training courses on waste management will be provided to all staff on-site.

4.7 Wastewater management

◗ Impacts and mitigation measures in construction phase

During the construction phase, water consumption is estimated at 300 000 m3 for the total duration of the work. The main wastewater contamination risks arising during construction relate to sanitary waste and to contaminated wastewater generated by storm water events washing oil spills from construction vehicles and machinery. The quantities of sanitary wastewater can be estimated at approximately 57 000 m^3 for 32 months . During construction phase chemical toilets will be distributed around the area in a sufficient number for all the workers on site. The toilets shall be cleaned each day by cleaning staff and emptied periodically by an authorized manager. For temporary offices, canteen and other possible temporary buildings with showers, a biological reactor shall be installed. Treated water could be reused, in particular for dust control if the treated water is compliant with Moroccan regulations and subject to MASEN authorization. An authorized manager shall empty the sludge accumulated in the septic tank periodically.

◗ Impacts and mitigation measures in operation phase

The water requirements of the plant during the operation phase will be less than 70 000 m3 /year. The supply is made from the common raw water storage tank belonging to MASEN. This tank is fed from the reservoir of Hassan II dam.

The plant will produce different types of wastewater: industrial wastewater from the production process (water from the steam cycle, water from the demineralization process, wash water from parts of the power block, contaminated rainwater) and domestic wastewater from administrative premises. The wastewater will be collected via a segregated network according to the various production sources in order to limit the mixing phenomena and to be able to ensure a treatment that is adapted to the quality of the effluents. Wastewater from the industrial process is sent to a treatment plant (neutralization and homogenization) before being sent to the evaporation basins. Rainwater / contaminated wash water are cleaned from oil before being sent to the treatment plant. A septic tank will be installed to treat domestic wastewater. Thus no polluted water will be rejected to the outside environment. The impact of wastewater is therefore very low.

4.8 Traffic and transportation

◗ Impacts and mitigation measures in construction phase

Transportation during construction phase is source of impact for transportation of labor force and transportation of equipment to the site. Three itineraries have been identified for equipment delivery: from Nador harbor, or Tanger harbour, or Casablanca harbour.

- From Tanger or Casablanca, each routes used for transport may go through a major motorway section as far as Meknes. Then the route taken will take national roads to the junction with the N13, which will be followed until the junction with the new road under construction on the NOOR Midelt I project site.
- From Nador, the itinerary mainly goes through RN 19 and RN 15.

A management and transportation plan will be developed before the works begin. It will take into account the different routes identified for the supply and will recommend measures providing information, speed restrictions, traffic time slots in order to restrict disturbance in the areas crossed.

◗ Impacts and mitigation measures in operation phase

The traffic will be little disturbed by the presence of employees working in the power station, or by the vehicles and machines' activities related to the maintenance and management of inputs and outputs.

During the operating phase, transport activities will be very limited. However a transport plan will be developed to manage the different traffic flows inside the site.

4.9 Archeology and cultural heritage :

For the reasons outlined in the baseline conditions, it is considered unlikely that potential impacts of cultural or archaeological value will occur during the construction phase of the plant.

The measures relate to the obligation to inform the authorities concerned in case of discovery of cultural or historic heritage remains, and no action is necessary during the operation phase

4.10 Landscape and visual impact :

◗ Impacts and mitigation measures in construction phase

During the construction of the plant and associated facilities, several construction vehicles will move to and from the site, and several buildings will be temporarily located on site, including offices and premises to store equipment. Also, some construction materials and equipment will be located on site during the entire construction program. The construction site will be very poorly visible from the N13 road. Only people walking/driving through the neighboring areas will be likely to notice the construction site. The impact is very weak.

◗ Impacts and mitigation measures in operation phase

The installation of PV panel fields and parabolic trough collectors will modify the landscape from afar.

Consideration of the architectural requirements established by MASEN will enable to have the best integrated site possible within the local landscape. The plant will be visible from the RN13 without creating any particular inconvenience.

4.11 Socio-economic

Project site does not include any house. Within a radius of 500 m, no village is established. The nearest village is Agoudi, located about 10 km west of the plant. Beyond 10 km, we found Douar Arbane in the north-west (14 km), Ait Ghiat, south-west (13 km).

MASEN has already finalized the land acquisition procedure for the plant's site. There is no physical displacement and all rights holders are compensated according to the law in force.

Solar plant construction works will have temporary positive impact on employment, activities construction companies, as for local, regional and national economy. The labour force that will be employed during the construction phase would be around 1000 workers. This project will also ensure socio-economic development through the creation of direct (60) and indirect employment.

The project as a whole is expected to be a major structuring economic element that will have significant repercussions throughout the sub-region characterized on the one hand by an austere physical environment and on the other hand by the great weakness of its economic bases and structures. It should be noted, however, that despite its location in the immediate geographical proximity of the Province of Boulemane, most of the project's activities will be directed towards the Province of Midelt.

Most of the economic activities of the Midelt Province revolve around the agricultural, forestry and mining economic sub-sectors. As a result, the industrial base is presently reduced to a bare minimum with only 2 companies: making clay tiles and bricks; and, sawing, planning and wood processing. The main handcraft activities characterizing the province are wood works that are made possible thanks to the presence of trees such as cedar, pine and olive trees, the manufacture of urban and traditional carpets, textiles with decorative objects and beautiful embroidery, etc.

◗ Impacts and mitigation measures in construction phase

Notwithstanding the foregoing, it is likely that the lack of necessary skills within the immediate local population will require that some of the on-site work be done by the non-local population. This could lead to the repatriation of wages, and the benefits for the local economy may be reduced.

Actions promoting the recruitment of local staff will have to be undertaken. Similarly, preference may be given to local companies for the different works if they fulfill the requirements of the contractors. Information measures will be provided to the population allowing their proper integration as well as that of the local institutions during the development of the project thus ensuring

◗ Impacts and mitigation measures in operation phase

The operation of the solar power plant will mainly have positive effects on socio-economic activities.

During the operation phase, local recruitment and mobilization of local companies will be favored. Information actions will be organized with the population.

5. Implementing and monitoring

An environmental and social management plan in the construction and operation phases is developed to ensure the correct implementation of the mitigation measures as well as the identification of the responsibilities and role of each stakeholder, the human and material resources used.

An environmental monitoring and follow-up plan will also be provided. This plan includes a monitoring program focused on various parameters to ensure the reduction of environmental impacts and possibly identify additional mitigation measures in case of new unidentified impacts.

This monitoring and follow-up plan will be regularly reported to the various competent authorities and funding parties.

6. Environmental impacts and mitigation measures summary table

The following table provides a summary of the identified environmental impacts, their significance, the main mitigation measures proposed, the responsibilities for the implementation of the mitigation measures and the main monitoring activities. This table only outlines what are considered to be the main mitigation measures and monitoring activities.

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
Soil					
Spillages	Moderate to Minor	Preparation of the CESMP and OESMP.	Contractor and Operator	Minor Negative	Conduct remediation monitoring following a spill incident.
		Appropriate material and waste storage design and handling procedures.			
		Soil protection measures.			
		Establish a spill response contingency plan			
Material storage	Moderate to Minor	Provide staff training			
Water and Wastewater					
Construction a. Water use b. Wastewater	a. Minor b. Moderate	Preparation of wastewater management plan in the CESMP	Contractor	a. Negligible b. Minor	Site inspections will be carried out regularly to ensure that all wastewater generated is properly managed, and no leakages or spill overs occur.
		Oily wastewater from vehicle maintenance will be collected via interceptors.			
		Construction of a specific area for basic site machinery maintenance work.			
		Chemical toilets will be distributed around the area in a sufficient number for all the workers on site.			
		For temporary offices, canteen and other possible temporary buildings with showers, a biological reactor shall be installed. Treated water could be reused, in particular for dust control if the treated water is compliant with Moroccan regulations and subject to MASEN authorization.			
Operation a. Water use b. Wastewater	a. Minor b. Moderate	Preparation of a wastewater management plan within the OESMP	Operator	a. Negligible b. Minor	Routine testing of the effluents to verify compliance with technical specifications, national legislation. Routine inspection of drainage
		the process will use less than 70 000 m3/year			

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
		Industrial waste water plant will treat 156m3/day. Treated water will be sent to the tight evaporation ponds			wells located under the evaporation ponds.
Air quality					
Dust	Minor to Moderate	Preparation of the CESMP and OESMP	Contractor and Operator	Construction: Minor Negative Operation: Negligible	Routine monitoring of the dust levels and wind conditions at the site will be conducted, in order to verify that on site operational activities are not contributing to any potential increases in dust levels. Air point emission control after carbon filter. Quarterly for VOC concentration and mass flow and individual VOCs (Benzene, phenols and others if applicable)
		Dust control measures should be implemented for transport activities and earthworks.			
		All machinery should be inspected for good operation			
		Burning of waste is forbidden			
Point Source	Minor	Low Sulphur Fuel (<10ppm) will be used.			
VOC	Minor	The vent of the condensation tank will be equipped with an active carbon filter to avoid emissions of volatile compounds to the atmosphere. (Operator)			
Noise and Vibration					
Construction Site preparation, civil works, construction and installation	Minor to Moderate Vibration is negligible	Preparation of the CESMP	Contractor	Minor	Independent noise monitoring as appropriate, at the site boundary.
		Using silencers on noisy equipment			
		Ensure optimum operation of Plant (following the manufacturer specifications, tightening adequately different pieces of equipment, lubricating the equipment)			
		Use of sound barriers and ear protection.			
Operation Balance of Plant (fans, pumps, turbines, compressed air)	Minor Vibration is negligible	Preparation of the OESMP	Operator	Negligible	monitoring level of noise at boundaries after operation starting
		Noise performance testing will be conducted to validate any modelled observations.			
		Equipment to be operated and maintained as per manufacturer's specifications			

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
		Areas of high noise will be designated as such, and protective equipment will be worn.			
Solid and Hazardous Materials					
Construction a. Non Hazardous b. Hazardous	a. Moderate b. Moderate	Preparation of a waste management plan within the CESMP	Contractor	a. Minor b. Minor	Undertake regular inspection, audits and monitoring of waste streams generated to ensure that all necessary mitigation measures are being implemented.
		Promotion and implementation of material re-use and recycling.			
		Promotion of resource use minimisation			
		Provision of storage facilities for segregated wastes			
		Adequate design of hazardous waste storage facilities			
		Provision of spill response kits			
		A bioremediation tank will be built on site to process soil contaminated by HTF.			
		Procedures and rules for hazardous waste handling			
		Training of staff			
Operation a. Domestic b. Non Hazardous c. Hazardous	a. Minor b. Moderate c. Minor	Preparation of a waste management plan within the OESMP	Operator	a. Minor b. Minor c. Negligible	
		A bioremediation tank (implemented in construction phase) will always operate.			
		Segregation and storage of different types of waste in separate labelled containers, to promote the re-use and/or recycling of materials			
		Same as contractor mitigation measures			
Stormwater					
a. Stormwater contamination b. Erosion	a. Minor b. Moderate	The storm water drainage system and ditch and channel design will minimise and control surface run off and erosion.	Contractor and operator	a. Negligible b. Minor	Routinely check the stormwater system and drainage system to ensure that water flows (volume

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
		Reduce cuttings as much as possible ((the volume of cuttings / embankments should be balanced)			and velocities) are adequate and are not contributing to erosion. Regular inspection for HTF spills and verification of drainage to treatment system (operator).
		Access roads will be defined so as to avoid gradients in excess of 15% and existing topography will be adopted so as to facilitate surface drainage by way of gutters.			
Ecology					
Biodiversity Flora and Fauna	Minor to Moderate	The rehabilitation of the Halfah or Sage bush steppe around the space occupied by the solar park is recommended subject to discussion and agreement of all stakeholders	Contractor and Operator	Negligible to Moderate	Monitoring activities for ecological status of the site, avifauna mortality and Houbara Bustard population.
		In case of potential presence, eggs collection before works in coordination with Missour ECWP project that has implemented a rehabilitation programme for The Houbara Bustard			
		Adding high viz tape to any fences to make them more obvious to flying or running birds			
		Pesticides will be avoided as much as possible. If they are required, they will be strictly limited and carefully managed;			
		(Biodiversity) No trees, large shrubs, or other vegetation that could attract insects or birds will be used for landscaping onsite. Invasive species will be avoided			

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
		(Biodiversity) Ensure that wastes from sites are cleared and workers are informed of the requirement to not hunt or injure local wildlife such as raptors; (Fauna and Flora) Establish procedures for the occasion any species are found on the construction site including procedures for reporting, identification and potential relocation.			
Traffic and Transport					
Highways and national roads	Minor	Schedule major material supply for off-peak hour traffic. Clearly identify truck routes and entry points for heavy vehicles entering the site. Designate parking/staging areas. Provide adequate parking stations for the estimated numbers of visitors to the site (workers and suppliers). Encourage car pooling by site workers.	Contractor	Minor	Site operations will be monitored to ascertain that congestion is minimised outside the site, and to minimise traffic impacts on local roads networks
Local Roads	Moderate	Develop a Traffic Management Plan (construction and operation). Clearly post on-site speed limits, recommended 20 km/hr during construction and operation.	Contractor and Operator	Minor	
Socio-economic					
a. Financial b. Cultural Heritage	a. Moderate positive	Develop a labour management plan.	Contractor and Operator	a. Moderate positive	

Environmental Issue	Impact Significance	Mitigation Measure	Responsibility	Residual Impact	Monitoring
	b. Negligible	The EPC/O&M must address all complaints and comments from stakeholders through a Grievance Mechanism, and responses will be prepared within an adequate time frame.		b. Negligible	
		Employment from local community			
		Development of technical skills.			

7. Stakeholder engagement activities and grievance mechanism

7.1 Stakeholder engagement activities

Stakeholders are persons or groups of communities who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.

Stakeholder engagement is an on-going process that starts at the SESIA phase and should extend through the lifetime of the project. Stakeholder engagement involves a range of activities such as public disclosure of appropriate information, consultation with stakeholders, and mechanisms by which people can make comments and raise grievances.

Activities and timeline are presented in the table below.

Table 1: Stakeholder Engagement Plan - Activities and Timeline

Phase and process	Activity	Targeted stakeholders	Information disclosure	Timing/detail	Responsibility
1) Project preparation					
Framework Environmental Impact Assessment	Public enquiry according law 12-03	All stakeholders (communities, habitants, institutions, NGO, etc;)	Non Technical Summary in French and Arabic available at the communes headquarters	June 30 to July 20, 2015	MASEN

Phase and process	Activity	Targeted stakeholders	Information disclosure	Timing/detail	Responsibility
	Approval Process by the National Committee for Environmental Impact Assessment	Ministries, Local authority, representatives of communes	Minutes of public inquiry FESIA and ESMP	October – December 2018	MASEN
	Public consultation meeting	Local authorities Representatives of ethnic communities Representatives of population Local governmental institutions	Slide presentation in Arabic Hard copies of slides submitted to all the participants Information of the meeting disclosed in newspapers Discussion with participants	March 2016	MASEN
SESIA	Approval Process by the National Committee for Environmental Impact Assessment	Ministries, Local authority, representative of communes	SESIA hard copies delivered to CNEIE members Hard copies submitted to local stakeholders : local authorities, commune representatives, regional environmental direction	July 2019	Project Company and MASEN
	Public Consultation meeting on the project	Local authorities Representatives of ethnic communities Representatives of population Local governmental institutions	Slide presentation in Arabic Hard copies of NTS (French and arabic) submitted to all the participants Information of the meeting disclosed in newspapers Discussion with participants	July 2019	Project Company/ MASEN
	SESIA disclosure	All stakeholders	Final SESIA and related documents disclosed on website MASEN and EDF Renewables	July 2019	Project Company/ MASEN

Phase and process	Activity	Targeted stakeholders	Information disclosure	Timing/detail	Responsibility
			Lenders Disclosure		
2) Construction Phase Engagement					
Construction phase start	Disclosure of the start date of the construction phase	CNEIE Local authorities Commune representatives	Information letter	Before starting of construction phase	Project Company
Grievance mechanism	Grievance mechanism activities	All stakeholders	Flyer for grievance mechanism description Information on grievance mechanism disclosed on site construction entry and local authorities sites	On-going from the start of the construction phase	MASEN / Project Company / EPC
Construction activities	Information on construction project progress	Local authorities and communities	meeting	Regularly (twice a year) and whenever needed	Project Company / MASEN
3) Operation Phase Engagement					
Grievance mechanism (described below)	Grievance mechanism activities	All stakeholders	Flyer for grievance mechanism description Information on grievance mechanism disclosed on site construction entry and local authorities sites	On-going from starting operation phase	MASEN / /Project Company / O&M
Operation activities	Information on operation project	Local authorities and communities	meeting	Regularly (once a year) and whenever needed	Project Company / MASEN
Operation	Environmental and social reporting	Regional Direction for Environment Local authorities Communes Lenders	Annual reporting	Every year	Project Company/ MASEN

7.2 Grievance mechanism

The aim of the grievance mechanism is to establish a system to receive and facilitate resolution of the stakeholder's concerns and grievances about the Project's environmental and social performance

The grievance mechanisms will be publicized in the following ways as a minimum:

- Posters at the site entrance; and
- Local authorities site
- On the SEP disclosed online.

The information provided online and on posters will be available in all the relevant languages (i.e. Arabic, Tamazight, French and English) and will include at least the following:

- Who can raise grievances (i.e. all stakeholders);
- Where, when, and how community members can file grievances (to agree during the stakeholder engagement process);
- Who is responsible for receiving and responding to grievances;
- What sort of response complainants can expect from the company, including timing of response; and
- What other rights and protection are guaranteed.

Complainant could deposit their grievance in a box at the site construction entrance or send by mail to MASEN. The grievance will be treated by a committee included MASEN/EDF Renewables and the EPC within 30 days.