EDF RENEWABLES CONSORTIUM - MASDAR - GREEN OF AFRICA

Province of Midelt

Specific environmental and social impact assessment of the solar power plant project

NOOR MIDELT I

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GINGER PHENIXA

CONSORTIUM EDF RENEWABLES - MASDAR - GREEN OF AFRICA

Province of Midelt Midelt

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PREAMBLE

The EDF EN-MASDAR - GREEN of AFRICA consortium has entrusted to the Phénixa engineering consultant to carry out the specific environmental and social impact studies (SESIA) of the two NOOR Midelt I and II solar power plants within the NOOR solar complex.

The site of the NOOR Midelt solar complex extends on a plateau in Upper Moulouya about 20 km Northeast of the town of Midelt. It is accessible by a road developed by MASEN about twenty kilometres from the RN13 which connects Meknes to Midelt.

Administratively, the site of the Midelt solar complex as a whole is related to the following structures:

- Daraa - Tafilelt Economic Region;
- Province: Midelt;
- Municipalities of Mibladene and Ait Ben Yacoub in the province of Midelt.

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

As a whole, the site of the complex was composed of collective lands, that are now MASEN 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, 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.

An environmental and social impact study was conducted in 2015 on the entire site (Midelt solar complex) and environmental acceptability has been given.

This document constitutes the specific environmental and social study of the NOOR Midelt I project. The SESIA is compliant with all recommendations and commitments issued from FESIA.

In the context of this SESIA, and following the current national regulations, the Consulting Engineer (CE) must essentially identify the main impacts or the positive and negative effects that may be generated by the realization of the project. A set of compensating and/or mitigating measures must also be proposed for each negative effect. Finally, a monitoring and environmental monitoring program must be developed.

In application of the EIA Law 12.03 and in accordance with the requirements of international lenders, the objectives of this study are:

- To evaluate in a methodical and preliminary manner, the potential impacts, the direct and indirect, temporary and permanent effects of the project on the environment in particular, an on the human, biological and physical environments,
- To Remove, mitigate and compensate for the negative impacts of the project;
- To inform the population concerned about the negative impacts of the project on the environment.

The present report concerns the specific environmental and social impact assessment, of which the overall file will be composed of two volumes:

- Volume 1 - Including the SESIA main report;
- Volume 2 - Including the Environmental and Social Management Plan (ESMP).

This document corresponds to volume 1. It includes the SESIA report of the NOOR Midelt I project and its NTS.

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ABBREVIATION

Abbreviations	Explanation
ABH	Water Basin Agency
BESS	Battery Energy Storage System
CESMP	Environmental and Social Management Plan during Construction phase
CNEIE	National Committee of Environmental Impact Studies
CO	Carbon monoxide
DNI	Direct Normal Irradiation
DPH	Public water domain
EIB	European Investment Bank
EHS	Environment, Health, Security
EPC	Engineering Procurement Construction
EPFI	Signatory financial institutions of EP
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and social management plan
FESIA	Framework Environmental and Social Impact Assessment
GG	Greenhouse gas
HCEFLCD	High Commissioner for Waters and Forests and the Fight against Desertification
IFC	International Finance Cooperation
Km	Kilometre
kV	Kilovolt
M	Meter
MASEN	Moroccan Agency for Sustainable Energy
MEMDD	Ministry of Energy, Mines and Sustainable Development
METLE	Ministry of Equipment, Transport, Logistics and Water
MW	Mega Watt
NOx	Nitrogen oxides
OECD	Organisation for Economic Co-operation and Development
OESMP	Environmental and Social Management Plan during the Operation phase
O&M	Operation and Maintenance
OP	Operational Policy
ONEE-BE	National Office of Electricity and Drinking Water (electricity branch)
NGO	Non-Governmental Organisation
PDAIRE	Master Plan for Integrated Management of Water Resources
PPE	Personal protection Equipment
PS	Performance standard
PSSE	Monitoring and Environmental Follow-up Plan
RN13	National Highway No. 13
SEDD	State Secretariat for Sustainable Development
SESIA	Specific Environmental and Social Impact Assessment
SBEI	Site of Biological and Ecological Interest
SOX	Sulphur oxides
VOC	Volatile organic compound
EU	European Union

1. Introduction

1.1 General Background

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.

Indeed, the kingdom, with its favourable geographical situation, has a very high rate of sunshine and large desert surfaces representing an ideal location to exploit the solar energy.

The first phase of the integrated solar energy programme covers the development of the 500 MW NOOR Ouarzazate complex. The Midelt site represents 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 programme 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 submit an offer on both NOOR Midelt I and NOOR Midelt II projects.

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

This document constitutes the specific environmental and social impact assessment of NOOR Midelt I. This SESIA is compliant with recommendations and commitments issued from FESIA.

1.2 Structure of documents

In order to comply with the requirements of the environmental assessment and international best practices, this report is organised as follows:

- Volume 1: Main Report
- Volume 2: Environmental and Social Management Plan (Environmental Monitoring and Follow-up plan – ESMP)

Volume 1 is the main text of the report containing the identified issues on which the Noor I - Midelt plant can have an impact. The report is structured as follows:

- Introduction and project background;
- Project objectives, location and alternatives
- Regulatory and institutional framework;
- Project's design
- Impact assessment method;
- Public consultation process
- For each of the environmental elements:
  - Information on the baseline conditions;
  - Methodology;
  - Assessment of effects / impacts, mitigation measures and residual impacts during Construction phase;
  - Assessment of effects / impacts, mitigation measures and residual impacts during the operation phase;
  - Assessment of effects / impacts, mitigation measures and residual impacts during the decommissioning phase when relevant;

Volume 2 represents the Environmental Monitoring and Follow-up Plan the framework for the implementation of the Environmental and Social Management Plan during the construction phase (CESMP) by the main contractor and all its subcontractors; and the Environmental and Social Management Plan during the operation phase (OESMP) to be put in place by the Project Proponent and the Operations and Maintenance Team. The CESMP and the OESMP include the environmental

and social monitoring plan. The ESMP includes procedures that ensure the implementation and monitoring of the performance of mitigation measures and other elements.

2. Project objectives, location and alternatives

2.1 Key objectives of the project

The NOOR Midelt I power plant project with 800 MW is aligned with the national energy policy objectives set out in the Renewable Energy Act No. 13-09. This renewable energy project is on line with the key objectives of this law as follows:

- Reduce the Moroccan Kingdom's dependence on oil and its energy imports;
- Diversify sources of energy production while meeting growing demand;
- Promote a competitive energy market;
- Avoid CO2 emissions into the atmosphere. The NOOR Midelt I project will avoid the production of 675 360 tons of greenhouse gases, thus helping to offset the effects of global warming;
- Create a sustainable local industry;
- Generate local job offers.

2.2 Geographical location of the project

The solar complex site of NOOR Midelt covers a total area of 4 141 ha, on a plateau in Upper Moulouya located at 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 on the territory of Zaida municipality.

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

The total area of the NOOR Midelt I site is 950 hectares and is located on a flat and rocky plateau with low vegetation. The site is in the form of a plateau with an almost uniform and regular slope which decreases from north to south in the order of 2%. The site is located at an altitude ranging from 1307 to 1477 m and is crisscrossed by gutters resulting from erosion caused by the flow of water and which ensure the natural drainage of rainwater towards the watercourses bordering the plateau.

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

All equipment, vehicles and temporary materials required during the construction phase of the project will be placed within the project's limits.

A map of the site of the project is presented here after

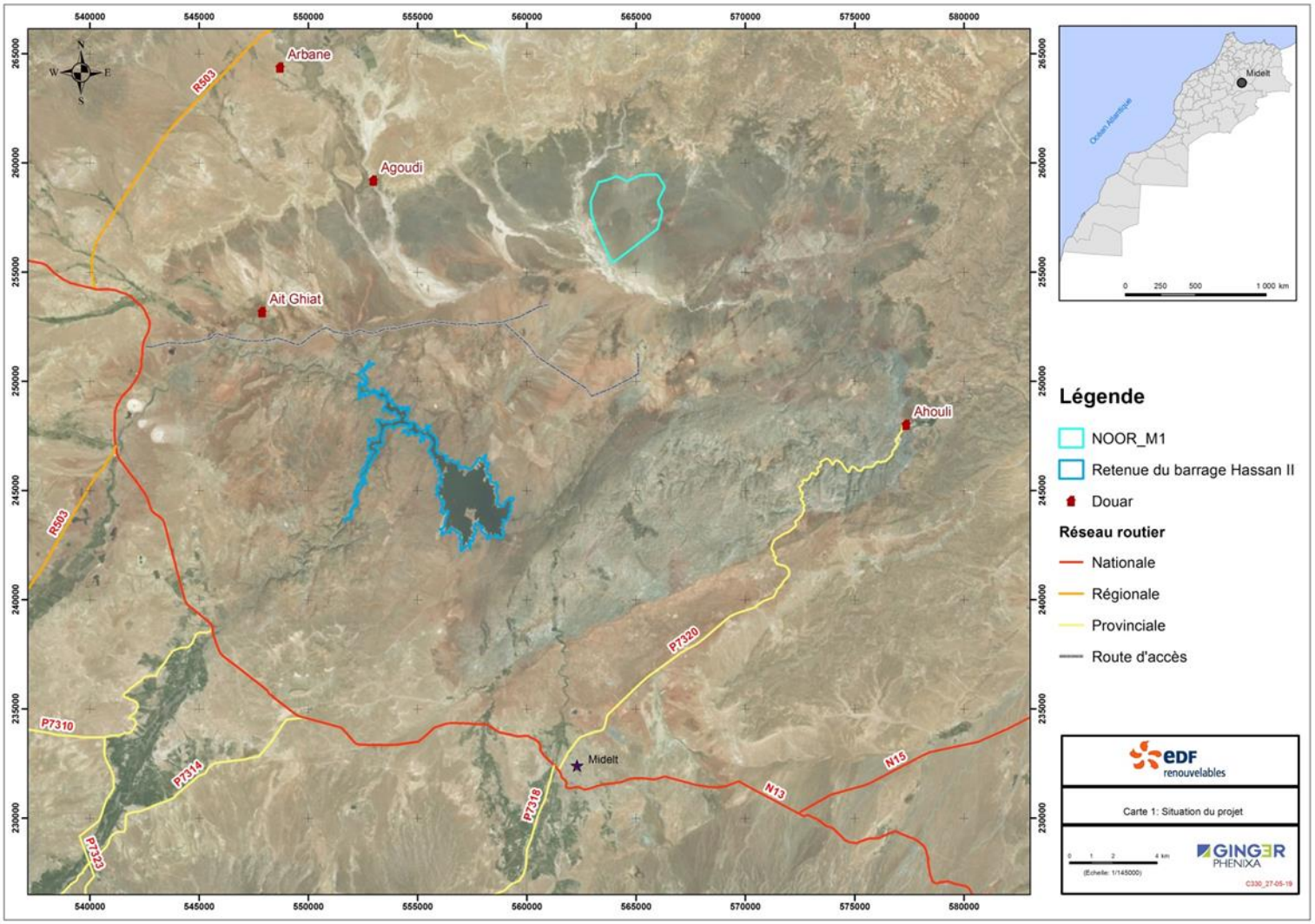


Figure 1 : Location of Midelt I project

2.3 Site conditions and land use

The NOOR Midelt I site is located on a bare ground. There are no residential, agricultural, industrial, archaeological or biological sites of particular interest in or near the project area. There is no groundwater or surface water in the proposed site or in the immediate vicinity of the project. The site is heavily degraded, bovine animals graze there.

2.4 Potential sensitive receptors

Sensitive socio-economic receptors would include the nearest city, resident communities, villages, arable land and other private or communal land uses that could be positively or negatively affected by the project development. The nearest village is Agoudi located 9 km west of the site from the western boundary of the Midelt I site.

There is no permanent surface water within the project boundary, but some chaabas (ephemeral stream that flows after the rains) flush the site from north to south of the power plant's site. These Chaabas are sensitive receptors.

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.

Within a radius of 500 m, no village is established. The nearest village is Agoudi, located about 9 km west of the plant. Beyond 10 km, we found Douar Arbane in the north-west (14 km), Ait Ghiat, south-west (13 km).

Ecological sensitivities include the physical, biological and ecological aspects of the site and surrounding areas that could be positively or negatively affected by the development of the project. These sensitivities will be identified and presented in detail in the specific sub-chapters of this SESIA.

The RN 13 road and the localities crossed from Meknes constitute sensitive receivers for the transport aspects.

Figure 12 identified the study area identified for the SESIA.The project's alternatives

As part of the Moroccan and international guidelines on environmental impact assessments, the assessment of various design variants and activities was considered in order to ensure that the objectives of the proposed project take into account social, ecological, economic and technological options.

2.4.1 "No Project" option

The "No Project" option is not a viable alternative because the law's objective on renewable energies is to diversify the sources and measures of production of energy for the Kingdom of Morocco. Therefore, the development of the NOOR Midelt I project will contribute to achieving the objective of providing 10% of national production of 2,000 MW by 2020. The project will avoid the production of 675 360 tons of greenhouse gas emissions. The "no project" alternative would have a greater contribution to global warming since other polluting sources would have to be used to generate about 1000 GWh per year that the project will produce.

In addition, the "No Project" option would not promote a competitive energy market that will diversify sources of energy production while meeting the growing demand for electricity, which will prevent the national oil dependency and energy imports from improving.

Finally, from a local point of view, the "No Project" option would neither create the necessary local sustainable industry nor the local employment opportunities that would allow in terms of solar energy production for a more attractive and sustainable economy in the region.

2.4.2 Alternative solar technologies

FESIA examined 4 alternatives of solar technologies:

- Photovoltaic solar (PV)
- Concentrated photovoltaic solar
- Solar with cylinder-parabolic concentration (CSP)
- Concentrated solar power (CSP)- Solar Tower

PV is a competitive technology, unlike concentrated PV, which is not a competitive technology. The CSP makes it possible to develop energy storage parameter important to cope with the peak needs. Also, the

solutions adopted for Midelt's NOOR projects are of the CSP / PV Hybride type allowing the production of electricity from a renewable source, with storage that would meet the constraints of ONEE - Electricity Branch, while ensuring a low cost per kWh.

Both CSP technologies (Tower and parabolic trough collectors) have comparable levels of performance and cost. CSP technologies require cooling system. Two technologies are available: wet cooling or dry cooling. The latter consumes about 3 times less of water than a wet cooling power plant. Given the high pressure on Morocco's water resources, dry cooling has been adopted even if the overall efficiency is reduced (cold source temperature significantly higher).

TheNOOR Midelt I plant will operate in hybrid mode: PV / CSP (–Parabolic Trough);

2.4.3 Site alternatives

In addition to meeting the needs of the project in terms of available space, several technical and socio-economic criteria contributed to the choice of this site:

- The implementation area benefits from strong sunlight: 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 access via RN13;
- The flat profile of the land is favourable for the establishment of a solar power station;
- The site does not house any dwelling;
- 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;
- No historical monument is registered within 3 km of the site;
- The site is located outside any protected natural or tourist area.

3. Legal and institutional environment

3.1 The legal context

3.1.1 Moroccan legislation applicable to the project

Table 1 : Moroccan regulations applicable to the project

Text	Content	Implementing regulation	Applicable for the project
GENERAL ENVIRONMENTAL LEGISLATION			
Law 12-03 on EIE (dahir 1-03-06 of May 12, 2003)	Sets the realization process, the contents of an EIA and the types of dependent projects	✓ Decree 2-04-564 (November 4, 2008) laying down the rules for the organization and conduct of the public inquiry related to projects submitted to environmental impact studies. ✓ Decree 2-04-563 (November 4 2008) on the attributions and operation of the national committee and regional environmental impact's committees. ✓ Joint Order of the Secretary of State to the Minister of Energy, Mines, Water and Environment, in charge of Water and Environment and the Minister of Economy and Finance, 636-10 (Feb. 22, 2010) fixing the rates of remuneration for services rendered by the administration relating to the public inquiry on projects submitted to environmental impact studies	Solar power projects are subject to Law 12-03 and must receive environmental acceptability. The solar complex received environmental acceptability in 2015 (FESIA report) and specific projects are subject to Law 12-03 and must also receive environmental acceptability. Public inquiry has been carried out for the solar complex and a new public inquiry for each project isn't necessary.
Framework Law 99- 12 with Global National Charter for Environment and Sustainable Development (March 2014)	Integrates environmental and sustainable development's considerations in all sector-based programs. Identifies legislation to implement especially on uncovered areas(noise, soil) Systematically integrates the right to reliable information for every citizen	Applicable to the project	Law applicable to the solar program and the project in general. The completion of the FESIA and SESIA are compliant with this law.
Law 11-03 on the protection and enhancement of the environment (1-03-59 Dahir of June 19, 2003)	Sets the general framework for the protection of the environment and principles (polluter pays, setting standards releases, etc.).	Lack of Enforcement Decree	Not applicable to the project because there is no Enforcement Decree

Text	Content	Implementing regulation	Applicable for the project
Law 36-15 published in August 2016 (replaces Law 10-95 on Water (Dahir 1-95-154 of August 16,1995)	Sets the framework for the proper management of water resources and the generalization to water access (water use, quantitative and qualitative resource management). The Enforcement Decrees define authorization procedures of levies and spills in the environment, and the delimitation of protected areas and perimeters of backup and prohibition. The decrees also set the threshold limits for the discharge of liquid waste	✓ *Decree2-04-553(January 24,2005)on the discharge of wastewater(collection methods of the fee) and its joint orders ;* ✓ *Decree 2-07-96 (January 16, 2009) fixing the procedure for granting authorizations and concessions relating to public water ;* ✓ *Decree 2-97-414 (February 4, 1998) related to terms of assessment and collection of the fee for the use of public water ;* ✓ *Decree 2-97-224 (November 6, 1997) fixing the conditions for the artificial accumulation of waters ;* ✓ *Order 1607-06 (July 25, 2006) fixing specific limit values on households rejections (table 3 hereafter);* ✓ *Decree 2-97-787 (February 4, 1998) related to standards of water quality and its joint orders;* ✓ *Decree 1277-01(October 17, 2002) setting quality standards for surface waters used for the production of drinking water;* ✓ Decree 1276-01 (October 17, 2002) laying down standards of water quality for irrigation (standards are in the table 2 hereafter) ; ✓ Decree 1275-01 of October 17, 2002 defining the quality scale of surface waters ;	The decrees mentioned remain applicable to the project: Water requirements are related to the construction phase and the operation phase. During the construction phase, water consumption is estimated at 300 000 m3. During the operation phase, the water requirements of the plant will be less than 70 000 m3 / year (all uses combined). Applicable to stormwater drainage approval by Basin Agency, to quality wastewater for reuse, to quality for discharge wastewater and authorizations.
Standard NM 03.7.001 relating to the quality of water for human consumption, approved by Order No. 359-91 of 23 rejeb 1411 (February 8, 1991)	Sets quality standards for feed water	-	Applicable to the project. Water quality for drinking water supply must meet the requirements of the standard
Law 28-00 on waste management and disposal(Dahir1-06-153of	Defines the different types of waste Sets the framework for the management of solid waste, the type of the discharge, the	Implementations decrees	Applicable to the project. Solid waste management has to be compliant with the law and decrees for collecting, and waste disposal.

Text	Content	Implementing regulation	Applicable for the project
December 7, 2006)	organization of landfills.		
Law 13-03 on Air Quality on air quality (Dahir 1-03-61 of May 12, 2003)	Sets the framework for air emissions	✓ Decree 2-09-286 (December 8, 2009) setting standards for air quality and the procedures for air monitoring ✓ Decree 2-09-631 (July 6, 2010) setting limits for clearance values, emission or discharge of pollutants into the air from stationary sources of pollution and the methods of their control	Applicable to the project by defining quality standards for ambient air: - During work phase (vehicles, construction machinery, etc.). - During operation phase (dust, vehicles emissions, emissions from auxiliary HTF Heater and Fire system diesel pump).
Decree2-97-377 on emissions from exhaust gas(January 28, 1998)	Sets a threshold emission limit for motor vehicles powered by gasoline or diesel: limit is 4.5%carbon monoxide and 70% opacity.	Not applicable	Applicable to the project for vehicle emissions during the construction phase and vehicles on the site during the operations phase
Law no 58-15 amend and supplementing Law No. 13-09 Relative to renewable energy	The main principles of this law are: Increased power line installed to the hydraulic source of energy projects from 12 to 30 MW; Possibility of selling the surplus renewable energy produced; Opening of the electricity market renewable sources of low voltage (BT); Taking into account the opinion of the Agency of the basin in the authorization process.	No implementing decree.	EIA is required to deliver the authorization.
Law 42-16 approving the Paris Agreement on Climate Change	As stipulated in its single article, this law approves the Paris agreement on climate change adopted in Paris on December 15, 2015.		Applicable to the project. Midelt project is in line with Moroccan commitment..
Moroccan Climate Change	Morocco's climate change policy is organised around transversal and sectoral	N/A	NOOR Midelt 1 project is in line with the Moroccan

Text	Content	Implementing regulation	Applicable for the project
Policy (2014)	strategic axes. The transversal strategic axes are: 1. Strengthening the legal and institutional framework 2. Improvement of knowledge and observation 3. Territorial decline with the preparation of Territorial Plans to fight Global Warming 4. Prevention and reduction of climate risks 5. Awareness raising, empowerment of key players and capacity building 6. Promotion of research, innovation and technology transfer The sectoral strategic axes are related to the mitigation and adaptation aspects. The mitigation component includes the development of renewable energies, which aim to cover 52% of the total electricity production capacity in 2030.		climate change policy.
Law n°47-09 relating to the energy effiency	Law No. 47-09 on energy efficiency sets the following objectives: Sustainable integration of energy efficiency techniques into sector development programmes. Encourage industrial companies to rationalise their energy consumption. Generalisation of energy audits. Establishment of energy efficiency codes	Enforcement of the law on construction through article 7 of the Decree of Application No 2.13.874 of October 15th, 2014, published in the Official Bulletin No 6306 dated November 6th, 2014 (Thermal regulations in construction - "RTC").	Applicable to the project for the set-up of premises is planned during the development of the project

Text	Content	Implementing regulation	Applicable for the project
	for all sectors. Generalisation of the use of low-energy lamps and equipment adapted to the level of public lighting. Development of solar water heaters		
Dahir 1-60-063 (25 June 1960) for the development of rural communities	Applies to all rural character to towns outside the perimeters defined in Article 18 of Law No. 12-90 relating to urban planning.	Not applicable	Applicable for this project because the site is located on 3 rural communes.
Law 22-80 (Dahir 1-80-341 of December 25, 1980)on cultural and historical heritage as amended and supplemented in 2006 by the Law 19-05(1-06-102 Dahir ofJune8, 2006)	Law that regulates the exploration, discovery, preservation of cultural and historical heritage	Decree 2-81-25 (October, 22 81) on the classification, registration (protection of registered buildings) and decommissioning(of which the request should be addressed to the government authority in charge of Cultural Affairs)	Applicable in case of fortuitous discovery of objects at the time of the works
Organic Laws 111-14, 112-14, and 113-14 relating to respectively the Region, the Provincial Assembly / Prefectural and the Commune (August 2015)	Establishes the legal framework, organization and competence of the various structures of territorial organization.	Not applicable	Applicable for the project which is located on the territory of three communes concerned by the project.
Law 12-90 related to urban planning (Dahir 1-92-31 of June 17, 1992)	Defines the various tools of urban planning as well as the regulations of construction.	Decree 2-92-832 (October 14, 1993) taken for the law enforcement Decree 2-02-177 (February 22, 2002) Approving the regulation of earthquake-resistant construction (R.P.S in 2000) applicable to buildings fixing the seismic regulations and establishing the National Committee for Earthquake Engineering.	The Planning Act applies as it regulates the construction. Construction permit is required.
Law 66-12 on control and repression of offences in matters of urban planning	Text relating to the control and the repression of the infringements in urban planning, it is a referential in the matter of	-	Applicable to the project

Text	Content	Implementing regulation	Applicable for the project
and construction supplementing and amending law 12-90 on town planning	the organization of the building sites in Morocco.		
Decree No. 2-14-499 of 20 hija 1435 (October 15, 2014) approving the general building regulations laying down the safety rules against fire and panic hazards in buildings and establishing the national committee for risk prevention fire and panic in buildings	Definition of construction criteria for fire protection	Without object	Applicable to the project
Law 29-05 on the protection of species of wild flora and fauna and control of business activities related to them.(1-11-84 Dahir of July 21, 2011)	Protection of fauna and flora	Lack of Enforcement Decree	Applicable to the project.
Explosive regulations			
Dahir of 14 January 1914 (BO n ° 66 of 30/01/1914) regulating the importation, circulation, sale of explosives in Morocco and fixing the conditions of installation of the deposits, modified and completed by the dahirs of March 14 1933 (BO n ° 1069 of 21/4/1933), of May 9th, 1936 (BO n °	Identification of the conditions, authorizations, obligations for the fabrication, deposit, selling and monitoring for explosives in Morocco. Identify the process to get the authorizations Identification of sentences in case of no regulations respect.	Various decrees : Vizierial decree of January 2, 1932 (cf below) Order of the Director of Industrial Production and Mines dated 29 December 1954 (BO No. 2203 of 14/01/1955) regulating the technical conditions for the storage of explosives, detonators and devices for firing explosives, such as it has been modified and supplemented by the decree of the Minister of Industry, Trade, Energy and Mines No. 167-01 of 16 January 2001 (BO n ° 4918 of 19/07/2001)	Applicable in construction phase

Text	Content	Implementing regulation	Applicable for the project
1233 of the 12/6/1936), of February 24th, 1940 (BO n ° 1431 of the 29/3/1940) and of the 30th January 1954 (BO No. 2154 of 05/2/1954);			
Vizierial decree of January 2, 1932 regulating the use of explosives in the quarries and works, modified by the decree vizier of the 24/2/40 (B.O n ° 1005 of the 29/01/1932)	Including explosive laying techniques, lighting explosives, and actions for prevention and safety for employees and community.	Not applicable	Applicable in construction phase
Joint Circular of the Minister of Energy and Mines and the Minister of the Interior No. 4546 of 21/7/2006 on the strengthening of security and safety measures related to explosive products for civil use.	Strengthening of safety measures related to explosives for civil use, Identification of the requirements for explosive transport	Not applicable	Applicable in construction phase
OTHERS REGULATIONS			
law 7-81 on eminent domain and the temporary occupation (6 May 1982)	Regulates the expropriation and the temporary use of land	✓ 2-82-382 Decree (16 April 1983)	Applicable to the project in that it states that all persons holding rights in land are entitled to compensation (owners, occupants, tenants, tree owners, etc.) The procurement plan must meet the elements of this law.
Law 65-99 on the Labor Code (Dahir 1-03-194 of September 11, 2003)	Fixes labor regulations and the rights of employers and employees in all industries	Decree No 2-04-422 of 16 kaada 1425 (December 29, 2004) sets the mentions that the work card must indicate. Decree N° 2-04-423 of 16 kaada 1425 (December 29, 2004) sets the conditions and the forms of presentation of a statement of start of a company, an establishment or a	Applicable to the project in its work and operation phase

Text	Content	Implementing regulation	Applicable for the project
		building site. Decree No. 2-4-426 of 16 kaada 1425 (December 29, 2004) sets the list of paid holidays applicable to industrial and commercial companies, liberal professions and agricultural and forestry exploitations. Decree No. 2-04-469 of 16 KAADA 1425 (29 December 2004) is related to the notice period for the unilateral termination of an employment contract of indefinite duration. Decree No. 2-04-513 of 16 Kaada 1425 (December 29, 2004) organises the weekly rest Decree No. 2-04-570 of 16 Kaada 1425 (December 29, 2004) sets the employment conditions of employees beyond normal working hours Decree No. 2-04-682 of 16 kaada 1425 (December 29, 2004) sets the prohibited types of work for minors under 18, women and disabled employees. Decree No. 2-12-236 of 25 November 2013 sets the conditions of use of apparatus or machines likely to affect the health of employees or compromise their safety. Decree No. 2-10-183 of 16 November 2010 sets the list of works that are prohibited to certain categories of people. Order of the Minister of Employment and Social Affairs No. 4576-14 of 24 December 2014 sets the occupational exposure limit values for certain hazardous chemicals.	
Law No. 27-14 of 25 August 2016 on combating trafficking of human beings.	The text includes broad definitions of trafficking in human beings and the concepts of exploitation and the victim, in line with international guidelines, including the Palermo Protocol. It includes also convictions and a procedure, in addition to preventive measures which adopt the principle of protecting the victims instead of prosecuting them, while condemning the	Decree No. 2-17-740 of 6 July 2018 establishing the composition and modalities of the National Commission for the Coordination of Measures for the Fight against and Prevention of Human Beings.	Applicable to the project

Text	Content	Implementing regulation	Applicable for the project
	perpetrators and increasing the penalties against the perpetrators of crimes against children, pregnant women and persons in difficult situation. The project provides the protection of victims, witnesses, experts and whistleblowers.		
Decree 2-06-388 (5 February 2007) laying down the conditions and forms for the award of state contracts and certain rules for their management and their control.	Regulates procurement of state	Not applicable	Applicable to the project
Decree 2-70-510 (October 8, 1970) related to preventive measures to be taken on construction sites	Regulates construction sites	Not applicable	Applicable to the project during the construction phase
Order (November 23, 1950) on medicines and medical equipment to be provided onsite for a 100 workers permanently or projects located more than 10 km away from a supply center	Plans the safety on construction sites in terms of medicine and medical equipment	Not applicable	Applicable to the project during the construction phase
Law 08-01 (June 2002) on quarrying (Dahir 1-02-130)	Sets careers, career management exposes patterns and regulates the operation.	No implementing decree	Not applicable
Dahir about careers (5 May 1914)	Regulates the establishment, operation and supervision of quarries.	Not applicable	Applicable to the project during the construction phase for EPC and subcontractors.

Text	Content	Implementing regulation	Applicable for the project
Circular 87 (8 June 1994) about careers	complete the Dahir about careers (5 May 1914), including aspects related to the rehabilitation of exploited quarry sites. The circular of the Ministry of the Interior, Agriculture, and Infrastructure and Transport set up a specification for quarrying.	Not applicable	Applicable to the project during the construction phase for EPC and subcontractors.
Law 67-15 amending and supplementing the Dahir Law No. 1-72-255 of 18 Moharram 1393 (February 22, 1973) on the Importation, Refining, Refinery and Filling Center, Storage and Distribution of Hydrocarbons .	In particular, the operations subject to approval or authorization. The import business of refined hydrocarbons such as super fuel, unleaded super, gasoline, kerosene, jet fuel, diesel, fuels oils and liquefied petroleum gases is subject to approval. Administrative authorization is required for the creation of processing and packaging workshops, as well as for the implementation of new storage capacity.	Decree 2-72-513 (April 7, 1973) taken for the application of the Law 1-72-255	Applicable to the project in case of hydrocarbon storage required on the site (to supply vehicles), especially during the construction phase. Applicable also in the exploitation phase of the fact of the storage and use of hydrocarbon.
Decree No. 2-03-169 of 22 Moharram 1424 (March 26, 2003) on the carriage of goods by road	Regulates the transport of goods for own account or third party account	Without object	Applicable for the project for all companies providing transport
Law No. 30-05 concerning the transport of hazardous materials by road.	Defines the specific rules applicable to the transport of hazardous materials by road. Determines conditions for materials, vehicles and responders.	Not yet published	Applicable to companies involved in the project that carry hazardous materials. Applicable for explosive transport
Order of the Minister of Public Works No. 127-63 of 15 March 1963 determining the technical conditions to be met by the distribution of electrical energy as	This order classifies energy distribution projects into three categories: Category 1: Structures for which the greater of the voltages does not exceed 430 V in alternating current or 600 V in		Applicable for the project

Text	Content	Implementing regulation	Applicable for the project
amended and completed, including its Article 1	direct current; Category 2: Structures for which the greater of the voltages exceeds the above limits without reaching 57,000 V; 3rd category: Structures for which the greatest of the voltages is equal to or greater than 57,000 V		
Law No. 116-14 Supplementing and Amending the Highway Traffic Act	The purpose of this law is to improve and improve traffic regulations.		Applicable for the project
Transportation Law No. 16-99 (Dahir 1-63-260 on Road Motor Transport)	This law defines the devices relating to the different types of transport (passengers, goods, ...)	Decree No. 2.03.169 on the road transport of goods for hire or for hire or for own account Decree implementing Decree No. 2-03-169	Applicable for the project

Table 2 : Water standards for irrigation

PARAMETERS	UNITS	VALUE	SPECIFICATIONS
Biological Parameter			
Faecal Coliform	ml	1000/100	100ml for agricultural products eaten raw
Salmonella		Absence	in 5 litres
Vibrio cholera		Absence	in 450ml
Parasitological Parameter			
Pathogenic parasites		Absence	
Parasite cysts		Absence	
Larvae of Ankylostomides		Absence	
Fluococercaires of Schistosoma haemotobium		Absence	
Toxic Parameters			
Mercury	mg/l	0.001	
Cadmium	mg/l	0.01	

Arsenic	mg/l	0.1	
Total Chromium	mg/l	1	
Lead	mg/l	5	
Copper	mg/l	2	
Zinc	mg/l	2	
Selenium	mg/l	0.02	
Fluorine	mg/l	1	
Cyanides	mg/l	1	
Phenols	mg/l	3	
Aluminium	mg/l	5	
Beryllium	mg/l	0.1	
Cobalt	mg/l	0.5	
Iron	mg/l	5	
Lithium	mg/l	2.5	
Manganese	mg/l	0.2	
Molybdenum	mg/l	0.01	
Nickel	mg/l	2	
Vanadium	mg/l	0.1	
Physical and Chemical properties			
Salinity			
Total salinity	mg/l	7680	
Electrical conductivity	mS/cm	12	at 25°C
Infiltration			
- Sodium Absorption Ratio 0-3	EC	< 0.2	
- Sodium Absorption Ratio 3-6		< 0.3	
- Sodium Absorption Ratio 6-12		< 0.5	
- Sodium Absorption Ratio 12-20		< 1.3	
- Sodium Absorption Ratio 20-40		< 3	
Toxic Ions (affecting sensitive agricultural product receptors)			
Sodium			
- Surface Irrigation	mg/l	69	
- Overhead irrigation	mg/l	9	
Chloride			
- Surface Irrigation	mg/l	350	
- Overhead irrigation	mg/l	15	
Boron	mg/l	3	
Effect drivers (affecting sensitive agricultural product receptors)			
Temperature	°C	35	Temperature
pH		6.5 to 8.4	pH

Suspended solids			Suspended solids
- Gravitational Irrigation	mg/l	200	- Gravitational Irrigation
- Localised overhead irrigation	mg/l	100	- Localised overhead irrigation
Nitrate (N-NO3-)	mg/l	30	Nitrate (N-NO3-)
Bicarbonate (HCO3) [overhead irrigation]	mg/l	518	Bicarbonate (HCO3) [overhead irrigation]
Sulphates (SO42-)	mg/l	250	Sulphates (SO42-)

Table 3 : Domestic discharge standards

PARAMETERS	UNITS	VALUE
BOD5	O2/l	120
COD	O2/l	250
Suspended Materials	mg/l	150

In the absence of national regulations, donor guidelines (IFC standards and world bank guidelines) will be favoured over other regulations. This particularly concerns noise and soil quality.

- **Noise**

There is currently no regulation on noise. Therefore, the proposed power plant must comply with noise limits as specified by the guidelines of the IFC General EHS (2007) Recommendations on noise are:

Table 4 : Exposure limits for noise[1]

Zone	Leq[2] maximum	
	Day : 7h-22h	Night : 22h-7h
Residential, education, institutions	55	45
Industrial, commercial	70	70

Source: EHS directives on noise

The site is not classified as an industrial zone. The maximum limits are therefore at least those of residential areas in Table 2. For this project, MASEN requirements are more stringent for daytime value : 50 dB (A).

Noise impact should not exceed the limits shown in the table or must not resulting an increase of ambient levels to exceed 3dB in the nearest reception offsite. The nearest receptors off site are facilities and employees in Midelt II site. The nearest village is Agoudi located 9 km west of the site.

- Soil

There is no standard on Moroccan soil protection. The IFCEHS guidelines do not contain pollutant standards for soil. According to directives on polluted sites and soils, land is considered contaminated when it contains concentrations of hazardous substances or oil above ground or at natural levels. Soil contamination should be avoided through preventing or limiting spills of hazardous materials, hazardous waste or oil. When land contamination is suspected or confirmed during any phase of the project, the cause should be identified and necessary remedies should be put in place in order to avoid future spills and their adverse impacts.

In the Netherlands, environmental quality values have been established based on the philosophy of protecting ecosystems, environmental functions and ensuring the multi-functionality of soil and groundwater quality. These are discussed below:

- Target Value: average background concentration or detection limit; exceeding this value indicates a possible diminishing of the functional abilities of the soil for humans, plants or animals.
- Intervention Value: concentration level above, which there is a serious or threatening diminishing of the functional abilities of the soil for humans, plants or animals.

The following Table provides a list of the Dutch Soil and Groundwater standards that the proposed project will be required to comply with.

1 The values correspond to noise levels measured outside.

2Leq : equivalent sound energy level

Table 5 : Dutch Soil Standards

Contaminant	Dutch Soil mg/Kg dry weight	
	Target	Intervention
Beryllium	1.1	30
Cadmium	0.8	12
Chromium (total)	100	220
Cobalt	20	180
Copper	36	96
Lead	85	530
Nickel	35	100
Mercury	0.3	10
Molybdenum	3	190
Selenium	0.7	100
Thallium	1	15
Vanadium	42	250
Zinc	140	350
Benzene	0.05	2
Total PAH	1	40

The values listed above will be adapted to the soil type at the site. It will be noted that the target values are not specific clean up criteria. They represent targeted objectives. Also, in the latest (2009) version of the Dutch Standard, Target values for soils have been removed for all compounds except Metals.

3.1.2 Main international conventions applicable to the project

Table 6 : International conventions

Text	Content	Signature date, ratification[3] or entry into force in Morocco	Applicable to the project
The 1992 Rio Convention	Protection of biological diversity	Ratified in 1995	Applicable as it treats diverse aspects of biodiversity Article 14: EIA to realize for the projects having a likely negative effect on the biodiversity to avoid or minimize these effects.
The 1979 Bern Convention	Preservation of the wildlife and natural environment	Ratified in 2001	Several specific action plans drafted for the protection of species having priority such as the Bonelli Eagle, the little bustard, the lesser kestrel or the Corncrake that reproduce in Morocco.
The 1979 Bonn Convention	Preservation of the migratory species belonging to the wildlife	Signed in 1983	2annexes list migratory species that require conservation measures. Morocco represents a strategic territory for these migratory species. - Appendix 1 Includes species in danger of extinction, as for example the Audouin's Gull which nests in zones isolated along the Rif and winters in large numbers on the Atlantic coast of Morocco, or still the slender-billed Curlew, one of the rarest birds in the world for which Morocco has a patrimonial responsibility. - Appendix 2 Enumerates the migratory species that necessitate an international agreement of cooperation for their preservation. The white and black Storks, the white-headed Duck, the white Spoonbill, the Osprey and several kinds of bats belong to this category. Under the Bonn Convention, Morocco has signed several agreements including the Agreement on the Conservation of Migratory Waterbirds of Africa-Eurasia(AEWA). To this end, the contracting parties " study problems that arise because of human activities and try hard to implement corrective measures including measures of restoration and rehabilitation of habitat environments and compensatory measures for the loss of habitat environment ".

[3] When a state signs an agreement, its expresses its intention to become part of this Convention. However, this does not require from it to ratify it. Ratification means that there is a legal obligation to apply the convention.

Text	Content	Signature date, ratification[3] or entry into force in Morocco	Applicable to the project
International Convention for birds' protection – 1950	Birds' protection	Entry into force in 1956	Applicable in its aims of protecting all birds.
CMS / AEWA Guidelines Convention on the Conservation of Migratory Species of Wild Animals	Under the Bonn Convention (CMS), Morocco has signed several agreements, including the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). To this end, the Contracting Parties "... shall study the problems arising from human activities and endeavor to implement corrective measures, including habitat rehabilitation and restoration and compensatory measures for the loss of life. of habitat. "	AEWA signed in 1997	Guidelines for marking power lines, insulation system for power lines, technical choices of pylons. Applicable as the project also provides for the construction of a 3.6 km evacuation line.
Agreement on the international trade of the endangered wild species of fauna and flora – 1975	Makes sure that the international trade of the of animals and wild plants' specimens does not threaten the survival of species to which they belong	Entry into force in 1976	Applicable in what it aims at protecting numerous species of fauna and flora

Text	Content	Signature date, ratification[3] or entry into force in Morocco	Applicable to the project
The Barcelona Agreement – 1976	Protection of the Mediterranean sea	Entry into force in 1980	Applicable in what it aims at protecting some types of birds. Through ratifying this agreement, signing states have approved the Action Plan for the Mediterranean. Several specific protocols were ratified of which a protocol on the marine and littoral biodiversity. A network of areas specially protected was also constituted (SPAMI, Special Protected Areas of Mediterranean Importance). Eleonora's falcon is one of the 15 species of the Barcelona Agreement's action plan for preserving bird species. The Barcelona Agreement on the protection of marin and littoral environment was implemented by the Center of Regional Activities for Special Protection Areas whose headquarters is in Tunis. Morocco shelters one of the biggest colonies (Islands of Mogador off Essaouira) of this species of which the world population is estimated at 6 200 couples.
African Agreement for Nature and Natural Resources Conservation– 1968	Protection of fauna and flora	Ratified and entry into force in 1977	Applicable in its aim of protecting soil, water, fauna and flora
Maghrebine Charter related to environment protection and sustainable development– 1992	Environment Protection	Signed in 1992	Applicable as it aims at protecting environment
International Convention on plants' protection – 1951	Protection de la flore	Entry into force in 1972	Applicable as it aims at protecting flora
Convention on climat change – 1992	Fights against climate change	Entry into force in 1996	The project is part of this commitment to clean energy development and thus fight against climate change.
Kyoto Protocol	Fights against climate change	Membership in 2002	Aims to fight against climate change by reducing carbon dioxide emissions. The project is part of this national commitment to clean energy development.

Text	Content	Signature date, ratification[3] or entry into force in Morocco	Applicable to the project
International Conventions Ratified by Morocco on labor right	Since 1956, Morocco has ratified 51 Conventions of the International Labor Organization (OLO).	7 conventions of which 8 fundamentals were ratified [4] : - Convention n° 98 on the right of collective organization and negotiation, 1949, ratified on 20 - 05 - 57 - Convention n° 29 on forced labor, 1930, ratified on 20-05-57 - Convention n° 100 on equal pay, 1951, ratified on 11-05-79 - Convention n° 105 on the abolition of forced labor, 1957, ratified on 1-12-1966 - Convention n° 111 on discrimination (employment and occupation), 1958, ratified on 27-03-1963 - Convention n° 138 on the minimum age, 1973 ratified on 6-01-2000 - Convention n° 182 on the worst forms of child labor, 1999, ratified on 26-01-2001	The conventions are integrated to national texts And are applicable to the project as they regulate labor
The Convention Concerning the Protection of the World Cultural and Natural Heritage – 1972	Protection of cultural and natural heritage	Ratification in 1975	Applicable for the protection of cultural and natural heritage

[4] The non ratified convention is the convention n°87 related to freedom and protection of unions of 1948.

3.1.3 Presentation of international requirements

International requirements applicable to the project are :

- The World Bank Environmental Safeguard Policies
- The AfDB Environmental Safeguard Policies
- The EIB, KFW, AFD Environmental Safeguard Requirements
- EHS Guidelines of the World Bank Group and other relevant sector best practice guidance

3.1.3.1 World Bank Policy and Procedures

The World Bank has established policies and procedures to ensure that its operations are economically, financially, socially and environmentally sustainable.

These policies and procedures are included in the World Bank Operations Manual.

The World Bank supports the protection, maintenance and rehabilitation of natural habitats and their function. The World Bank does not support projects that involve significant alteration or degradation of critical natural habitats.

Documents defining the World Bank's environmental policy and governing the integration of the environment into World Bank-funded projects are often used by other international financial bodies, including the Guidelines for Environmental Impact Assessments.

Ten principles specifying the protection rules on social and environmental aspects have been introduced in the World Bank procedures to prevent or mitigate any adverse effects on the environment or on vulnerable human groups that may result from a project or any activity financed by the Bank.

These ten principles are included in the following 10 instructions:

Table 7: World Bank Guidelines specifying the principles for the protection of the social and environmental aspects

Subject and Operational policy Number
Environmental assessment including public participation (OP 4.01)
Natural habitats (PO 4.04)
Pesticide Management (OP 4.09)
Cultural Heritage (OP 4.11)
Involuntary resettlement of persons (OP 4.12)
Indigenous Population (OP 4.10)
Forestry (OP 4.36)
Dam Safety (OP 4.37)
Projects related to International Waterways (OP 7.50)
Projects in disputed areas (OP 7.60)

Source: World Bank

Application to the project:

None of these World Bank Operational Policies are applicable to the project except OP 4.03 : Performance Standards for Private Sector Activities.

OP 4.03 requires that private sector projects financed by the World Bank has to be compliant with IFC's Environmental and Social Perfomance standards.

These standards are described in Table 8 below.

Table 8: Review of IFC's Environmental and Social Performance Standards for the Project

Performance standard	Content	Applicability to the project and means of implementation
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	Identify the environmental and social risks and impacts of the project; Adopt a hierarchy in mitigation: anticipate, avoid, minimise, compensate Improve performance through an environmental and social management system; Engagement with affected communities or other stakeholders throughout the project cycle: Communication and grievance mechanisms.	The assessment of the environmental and social impacts was carried out within the framework of the FESIA and the present SESIA completed by the Consortium. The SESIA complies with recommendations and commitments of the FESIA. The Consortium has the experience in terms of environmental management to implement the results of the SESIA and ensure the management of environmental and social risks. EDF Renewables has developed an environmental and social policy. All EDF renewables subsidiaries or participation will be compliant with this policy (details §3.3 and appendix 6). In compliance with FESIA, the project company will prepare and implement an Environmental and Social Management System in compliance with PS1 and ISO 14001, one for construction and one for operation. The CESMS and its associated procedures and plans will be prepared and submitted to Masen's review and approval before the start of construction. Similar process will be conducted for the OESMS and its associated procedures and plans. The EPC will prepare and implement his own construction Environmental and Social Management Plan (CESMP) and a Health and Safety Plan in compliance with ISO 45001, The ESMP that accompanies this ESIA indicates the environmental and social management system to be put in place. The CESMP to be prepared prior to the start of construction will be associated to specific plans and procedures so as the OHS plan. Stakeholders (institutions and populations) were informed via: a public consultation meeting, a public inquiry, the modalities of which are presented in this SESIA. A second public consultation is also planned. A grievance management mechanism is set up by MASEN and another will be set up by the Consortium.

Performance standard	Content	Applicability to the project and means of implementation
NP2: Labour and working conditions	This criterion aims to establish, maintain and improve the working relationships between the workers and the management. It requires equal opportunities and fair treatment of workers and prohibits child labour and / or forced labour. Workplace conditions must provide safe and healthy working conditions that promote the health and well-being of employees. The environmental and social assessment must take into account the protection of workers and promote measuring processes that protect the health and safety of workers and local communities.	Labour Code 65-99 incorporates the requirements of NP2. Specific measures are also integrated into the environmental and social management system. The CESMP to be prepared prior to the start of construction will be associated to specific plans and procedures so as the OHS plan.
NP3: Rational use of resources and pollution prevention	Avoid, minimise or reduce project-related pollution; Sustainable use of resources, including energy and water; Reduction of greenhouse gas emissions related to the project...	The project aims at the sustainability of energy resources by exploiting solar energy. The choice of certain techniques such as dry cooling and the use of dry cleaning of photovoltaic panels also help to save resources The project sets up an industrial water treatment unit to treat pollution of potentially contaminated water. These treated effluents are mixed in the homogenization pond with the rest of the effluents produced in the plant, pH is adjusted if necessary and then, effluents are stored in an evaporation basin, thus avoiding any discharge into the natural environment Technology enables to reduce greenhouse gases, and some measures, such as the proper maintenance of machinery, help in limiting GHG emissions.
NP4: Health, safety and security of communities	Anticipate and avoid negative effects on the health and safety of the affected community; Protect people and property in accordance with the relevant principles of human rights.	The ESMP associated with the ESIA helps to specify the various measures related to the safety of people. The CESMP to be prepared prior to the start of construction will be associated to specific plans and procedures so as the OHS plan
NP5: Land acquisition and involuntary resettlement	Avoid / reduce negative social and economic impacts associated with land acquisition or use restrictions Avoid / reduce displacement; Consider alternatives to projects; Avoid forced eviction.	The acquisition procedure has been taken care of by MASEN in compliance with this performance standard. A land acquisition plan has been carried out by MASEN and has been approved by IFIs.

Performance standard	Content	Applicability to the project and means of implementation
	Restore or improve livelihoods and standards of living; Improve the living conditions of displaced persons by providing: - Adequate housing; - Securing the occupation.	
NP6: Biodiversity conservation and sustainable natural resource management	Protection and conservation of biodiversity Maintaining the benefits of ecosystem services; Promotion of sustainable management of living natural resources; Integration of conservation needs and development priorities.	Biodiversity and avifauna appraisals were commissioned and specific measures were identified.
NP7: Indigenous population	Ensuring the full respect of indigenous population Human rights, dignity, aspirations; Means of support; Culture, knowledge, practices; Avoid / reduce negative impacts; Benefits and development opportunities that are sustainable and culturally appropriate; Free, informed and prior consent in certain circumstances.	The area of influence does not contain indigenous people.
NP8: Cultural heritage	Protection and preservation of the cultural heritage Promotion of the equal sharing of the cultural heritage benefits. The purpose of this criterion is to protect the irreplaceable cultural heritage. Cultural heritage is defined as the tangible assets and sites of archaeological (prehistoric), paleontological, historical, cultural, artistic and religious value and the unique natural environmental features that incorporate	Law 22-80 supplemented by Law 19-05 governs the historical and cultural heritage in case of discovery. The ESIA incorporates this aspect into its analysis.

Performance standard	Content	Applicability to the project and means of implementation
	cultural values. This definition also includes intangible cultural forms such as knowledge, innovations and cultural practices of communities incorporating traditional lifestyles.	

3.1.3.2 Sustainability guidelines of the KfW Development bank

These guidelines disclosed in April 2016, describe the principles and procedure for assessing the environmental, social and climatic impacts of measures funded by the KfW Development bank during their preparation and implementation. In this context, the instruction pursues the following objectives in particular:

- Define a harmonised and binding framework for integrating environmental, social and climate standards into the planning, analysis, implementation and monitoring of measures funded by the KfW development bank;
- Promote transparency, predictability and accountability in the decision-making processes of the Environmental and Social Impact Assessment (ESIA) and the assessment of climate aspects;
- Improve the analysis of economic risks inherent in projects while taking into account the environmental, social and climatic aspects.

All funding from the KfW Development Bank is subject to an ESIA as well as an assessment of the climatic aspects as defined in this directive. This includes both the projects and programmes funding and the funding of non-project-specific activities, such as the joint programmes funding, projects in the financial sector, and corporate finance operations. This instruction applies to all forms of financing of the KfW Development Bank.

Financing projects are classified in three categories according to the importance of their potentially negative environmental and social impacts. These categories are described below:

Category A: Category A projects are likely to have serious negative impacts on the environment and / or the social conditions of those concerned. These projects are necessarily subject to analysis and assessment of the negative ecological and social effects in the context of an ESIA. A ESMP describing the measures needed to avoid, mitigate, compensate for and monitor the adverse effects is also required. For category A projects, KfW expects the project proponent to have an appropriate follow-up system.

Category B: Category B projects are likely to have potentially negative effects on the environment and the social conditions of the individuals concerned, although these are less serious than in the case of Category A projects. As for category B projects, the need as well as the scale, the key areas and the depth of an ESIA are determined on a case-by-case basis.

Category C: a project is classified in category C when it presents, according to all forecasts, no or minimal environmental and social costs or effects. Its implementation and operation do not require any special protection, compensation or surveillance measures. Such projects generally do not require any further analysis for this Instruction or continuation of the ESIA procedure.

The KfW Sustainability Instruction also incorporates the assessment of climate aspects within the assessment of environmental and social aspects.

KfW aligns with internationally recognised social and environmental standards (World Bank Safeguard Policies, IFC Performance Criteria, World Bank Group's Environmental, Health, and Safety Guidelines, ILO Core Standards, EU environmental legislation).

3.1.3.3 Environmental and social standards of the EIB

The Statement outlines the standards that the Bank requires of the projects that it finances, and the responsibilities of the various parties. It provides a much greater sense of urgency about the problems of climate change, gives greater recognition to the importance of biodiversity, and, expands the section on the social dimensions of sustainable development.

The EIB Environmental and Social Handbook (Version 9.0 of 02/12/2013) states that the assessment of environmental and social impacts and risk, including their significance and materiality, as well as the development of adequate management plans and programmes are key tools for achieving sound environmental and social performance. In this respect, all EIB-financed operations shall comply with national legislation and international conventions and agreements ratified by the host Country. In addition, operations outside the EU must meet best international practice with regards to the

assessment and management of environmental and social impacts and risks, promote good environmental and social governance and align with relevant EU principles and standards.

The handbook includes requirements on the assessment of pollution prevention and abatement, biodiversity and ecosystems, climate-related standards, cultural heritage, involuntary resettlement, rights and interests of vulnerable groups, labour standards, occupational and public health, safety and security and stakeholder engagement. The handbook also includes requirements on the ESIA minimum contents and on the preparation of environmental and social management plan (ESMP) based on the conclusions of the ESIA.

The EIB's Environmental and Social Principle and Standards (2009) state that In the case of co-financing, the Bank is prepared to accept a common approach based on the relevant requirements of one of its financial partners, for reasons of consistency and harmonization, and to avoid duplication. For instance, in projects outside the EU, working in cooperation with other international public and private financial institutions, a common approach based on the Equator Principles or the safeguards of the World Bank may be followed.

Environmental standards

The environmental standards established by the EIB are intended to protect and enhance the natural environment, not only for itself, but for the purpose of improving the quality of life, economic development and social well-being that result from long-term environmental conservation. They cover three aspects

- the technical aspects of the project –the expected and actual emission levels, and other environmental performance indicators;
- the aspects of the project's host environment and its immediate vicinity, including the habitat and the flora and fauna associated with it;
- the processes and management methods used for the development, implementation and operation of the project that affect the immediate impact and long-term environmental and social effects of the project.

Social standards: A human rights-based approach

Just like environmental standards, which goal is to protect and enhance the natural and built environment, social standards aim to protect the rights and improve the livelihoods of those directly and indirectly affected by Bank-financed projects. Social standards aim to promote outcomes that foster individual well-being, social inclusion and sustainable communities.

The environmental and social standards of the EIB are grouped into ten subject areas as follows:

1) ***Assessment and management of environmental and social risks and impacts***: The first standard emphasises the importance of managing environmental and social risks and impacts through the application of the precautionary principle throughout the life of an EIB-financed project. The provisions of the standard provide for the development of an effective management and reporting system on environmental and social aspects that is impartial and encourages the implementation of improvements and permanent developments. This standard includes the obligation to involve stakeholders and inform them throughout the life of the project.
2) ***Prevention and reduction of pollution***: The second standard aims to avoid or minimise the pollution caused by EIB-financed operations. It follows a project approach in terms of efficiency of resources and pollution prevention and reduction, in line with the best available and practical techniques disseminated internationally.
3) ***Biodiversity and ecosystems***: the EIB recognises the intrinsic value of biodiversity and the fact that its operations are likely to have potential impacts on biodiversity and ecosystems. This standard specifies the approach and actions that the proponent must take to protect and conserve biodiversity at all levels. It applies to all (marine and terrestrial) habitats, whether they have already been or are not disturbed or are subject to legal protection. It addresses key threats and supports the sustainable use of natural resources and equitable sharing of benefits arising from the use of natural resources by the project.
4) ***Standards related to climate***: the EIB financing as a whole is aligned with EU climate policies, which must be taken into account at all stages of the project cycle, especially when

assessing the economic cost of greenhouse gas emissions and the context of climate vulnerability. More specifically, project proponents must ensure that all projects respect the existing national obligations and, where appropriate, European legal obligations, including multilateral agreements, related to climate change policies.

5) **Cultural Heritage**: Through the projects it finances, the EIB recognises the central role of cultural heritage in individual and collective identity in supporting sustainable development and promoting cultural diversity. In accordance with the international conventions and declarations in force, this standard aims to identify, manage and protect the tangible and intangible cultural heritage that could be affected by the activities targeted by the projects. It emphasises the need for a fortuitous discovery procedure, which specifies the measures to be taken in the event of discovery of hitherto unknown cultural heritage.

6) ***Involuntary resettlement***: The implementation of EIB projects sometimes requires the acquisition of land, expropriation and / or restrictions on the use of land leading to the temporary or permanent removal of certain populations from their places of residence, their economic activities or their original livelihood practices. Standard 6 is based on the respect for and protection of property rights and decent housing, as well as the standard of living of all affected populations and communities. It is intended to mitigate any negative impact of loss of property or restrictions on land use. It also aims to help all those concerned to improve, or at least restore, their former livelihoods and standards of living and to adequately compensate them for the losses incurred.

7) ***Rights and interests of vulnerable groups***: The EIB seeks to protect all vulnerable individuals and groups affected by projects while striving to ensure that these people take full advantage of EIB operations. This standard requires full respect for the dignity, human rights, aspirations, cultures and customary livelihoods of vulnerable groups, including indigenous peoples. It requires the free, prior and informed consent of the indigenous groups concerned.

8) ***Labour Standards***: The application of good employment practices and the use of appropriate codes of conduct are important to ensure the fair treatment, non-discrimination and equal opportunities of workers. This standard aims to ensure that proponents of EIB-financed projects comply with the core labour standards set by the International Labour Office and the national labour and employment regulations. It also requires the establishment, maintenance and improvement of relations between workers and employers.

9) ***Health, safety and security of workers and populations*****:**The EIB expects proponents to preserve and guarantee the health, safety and security of people and workers, and to promote the dignity of the community concerned, all of which are aspects that are likely to be threatened by the activities related to the projects, with particular attention to vulnerable groups. This standard also requires proponents to adhere to the international standards and relevant human rights principles when using security services.

10) ***Stakeholder participation***: As a public institution, the EIB actively promotes the right of access to information, as well as public consultation and participation. Standard 10 requires proponents to maintain, in an effective and appropriate manner, an open, transparent and accountable dialogue with all communities and stakeholders involved in the projects. The value of public participation in the decision-making process is emphasised in every phase of the project's preparation, implementation and follow-up. The right of access to remedies, including the settlement of disputes, is actively required.

All these standards are detailed in the Environmental and Social Handbook of the EIB.

The application of these standards to the completion of the NOOR Midelt I project is summarised in the following table:

Table 9: Environmental and Social Performance Standards of the EIB

Standards	Applicability to the NOOR Midelt I solar power plant project	Compliance
Standard 1: Assessment and management of environmental and social risks and impacts	Need for an effective management and reporting system dedicated to the environmental and social aspects, that is impartial and that encourages the implementation of improvements and permanent changes throughout the project's life cycle. Need to involve stakeholders and inform them throughout the project's life cycle	Completion of a specific ESIA and an environmental and social management plan during Construction and operation phases. In compliance with FESIA, the project company will prepare and implement an Environmental and Social Management System in compliance with PS1 and ISO 14001, one for construction and one for operation. The CESMS and its associated procedures and plans will be prepared and submitted to Masen's review and approval before the start of construction. Similar process will be conducted for the OESMS and its associated procedures and plans. The EPC will prepare and implement his own construction Environmental and Social Management Plan (CESMP) and a Health and Safety Plan in compliance with ISO45001. Management of the environmental and social risks of ancillary infrastructures (road, power line and water supply line from the dam) is handled by MASEN. A public consultation has already been carried out on the solar project and another will be carried out in the specific Midelt I project.
Standard 2: Prevention and reduction of pollution	Implement resource efficiency and best practices available internationally. Applies to the technological and equipment choice so as to take into account resources (rare materials) and materials offering recycling opportunities.	The project's design ensures the protection of resources through the exploitation of solar energy. The uses of water resources are reduced by the implementation of a dry cooling system and by dry clean up for PV panels.
Standard 3: Biodiversity and ecosystems	Ensure that biodiversity and ecosystems are taken into account (in particular through detailed ESIA with appropriate measures).	The biodiversity expertise conducted as part of the completion of the SESIA and the measures identified ensure compliance with this performance standard. The measures adapted to the environment and identified especially for the Hubara Bustard have to be implemented.

Standards	Applicability to the NOOR Midelt I solar power plant project	Compliance
Standard 4: Standards related to climate	Standard 4 is intrinsically taken into account because the project contributes to the reduction of greenhouse gas emissions.	The project itself reduces greenhouse gas emissions. Measures relating to the proper maintenance of engines also enable to limit emissions.
Standard 5: Cultural Heritage	Ensure that a fortuitous discovery procedure specifying the measures to be taken in case of discovery of previously unknown cultural heritage elements is in place.	The fortuitous discovery procedure is supported under the ESMP during Construction phase.
Standard 6: Involuntary resettlement	Ensure that land users are identified and can return to their livelihoods should they be affected.	The acquisition procedure has been taken care of by MASEN in compliance with this performance standard. A land acquisition plan has been carried out by MASEN and has been approved by IFIs.
Standard 7: Rights and interests of vulnerable groups	Applicable to the project in the respect for human rights of the populations concerned.	Respect for the rights of stakeholders is preserved.
Standard 8: Labour Standards	Consideration of the International Labour Organisation guidelines in addition to the Moroccan regulations. Ensure good employer-employee relations in the companies involved in the project.	Compliance with labour code standards and the implementation of good practices integrated into the ESMP in the construction and operation phases ensures compliance with this performance standard.
Standard 9: Health, safety and security of workers and populations	Set up procedures to ensure the safety of people (workers and populations) in all phases of the project.	The rules of working conditions, the OHS and EHS plan to be put in place and to be followed ensure that this performance standard is respected.
Standard 10: Stakeholder Engagement	Set up a public participation in the decision-making process in every phase of the project: preparation, implementation and follow-up. Establishment of a grievance management and dispute resolution system.	A public consultation has already been carried out and another will be initiated on the basis of the detailed project. A grievance management system is set up by MASEN. And another system will also be set up by the consortium and its

Standards	Applicability to the NOOR Midelt I solar power plant project	Compliance
		subcontracting companies.

3.1.3.4 African Development Bank (AfDB operational safeguards of)

The AfDB's has an environmental safeguard system (December 2013) to manage environmental and social risks. The Integrated Safeguards System is a tool for identifying risks, reducing development costs and improving project sustainability. It promotes best practices and encourages transparency and accountability.

Operational safeguards are relevant :

- Operational Safeguard 1: Environmental and social assessment. This operational safeguard includes the requirements for the Environmental and Social Impact Assessment Process. It states that borrowers or clients are responsible for conducting the environmental and social assessment (Strategic Environmental and Social Assessment (SESA), or Environmental and Social Impact Assessment (ESIA)) and for developing, as an integral part of the project documentation, an appropriate plan for managing possible impacts. The safeguard document includes requirements for the different stages of the assessment process.
- Operational safeguard 2: Involuntary resettlement, land acquisition, population displacement and compensation. This Operational Safeguard aims to facilitate the operationalisation of the Bank's 2003 Involuntary Resettlement Policy in the context of the requirements of OS1 and thereby mainstream resettlement considerations.
- Operational Safeguard 3: Biodiversity and ecosystem services. Requires, inter alia, that as part of the environmental and social assessment, the borrower or client identifies and assesses the potential opportunities for, risks to, and impacts on biological diversity and ecosystem services, including direct, indirect, cumulative and pre-mitigation impacts. It also requires the borrower or client to apply the mitigation hierarchy.
- Operational Safeguard 4: Pollution prevention and control, hazardous materials and resource efficiency. This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.
- Operational Safeguard 5: Labour conditions, health and safety. Includes requirements regarding working conditions, such as the management of worker relationships, workers organisations, non-discrimination, retrenchment, and the grievance mechanism, and it includes safeguards for the pretention of the workforce, addressing, for example, child labour.

3.1.3.5 Environmental, Health and Safety (EHS) Guidelines

The Environmental, Health and Safety (EHS) Guidelines are technical reference documents that address IFC's expectation regarding the industrial pollution management performance of projects. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility.In the context of the proposed project, the most relevant EHS Guidelines to be considered are:

- World Bank Group General EHS Guidelines (2007); and
- World Bank Group EHS Guidelines for Electric Power Transmission and Distribution (2007).

Note that guidelines on solar plant development are currently not available.

3.1.3.6 AFD

AFD Group created its environmental, social and governance policy in 2007 to improve risk management. AFD Group has listed exclusionary criteria that it uses to deny project-funding requests on ethical, regulatory, environmental or social grounds. All Group-financed foreign aid operations must comply with the target country's national laws. However, in cases where a country's laws are incomplete or changing, the Group applies standards, rules and good practices for project financing, as set by multilateral peer institutions, including:

- The World Bank safeguard policies for public sector financing; and
- The International Finance Corporation performance standards for private sector financing.

The Group also draws on their international conventions, declarations and guidelines that it (and its aid beneficiaries) have signed. The AFD also aims at creating common practices and procedures among peer institutions – AFD currently works with the World Bank, KfW and the European Investment Bank.

3.1.3.7 Categorization of the project

In reference to the environmental and social standards of the international financial institutions, the project was put in category 1 (or A) even if the project does not generate major impacts on the environment or communities.

A category A project must be the subject of an Environmental and Social Impact Assessment and an Environmental and Social Management Plan must be drawn up and identify the various measures implemented for the removal, mitigation or compensation of the negative impacts.

For category A projects, the project leader must also demonstrate their ability to manage environmental and social risks.

3.1.3.8 Environmental and social assessment process

An environmental and social impact assessment framework was conducted in 2015 for the NOOR Midelt solar complex covering an area of 4,141 ha. This study was conducted in accordance with the impact assessment law 12-03 and took into account the standards of international lenders (World Bank, IFC, KfW, AfBD, EIB and AFD). This framework study addressed potential environmental and social impacts by examining different alternatives for solar energy production.

The FESIA was presented to the CNEIE on October 8th, 2015 and environmental acceptability was issued on December 1st, 2015 at the second CNEIE meeting.

In 2017, MASEN has prepared a land acquisition plan (LAP 1) which outlines the procedures followed for the mobilization of land necessary for the construction of the Noor Midelt solar complex, and has established it in accordance with Moroccan legislation and in accordance with International Financial Institutions Guidelines for Involuntary Resettlement and Land Acquisition.

FESIA and LAP 1 are disclosed on the MASEN website.

3.2 Gap analysis

The two following tables present gap analysis between IFC, EIB and EHS guidelines environmental and social performance standards and relevant Moroccan regulations. Measures to bridge the GAP are also listed.

Table 10 : Gap analysis between IFC performance standards and relevant Moroccan regulations

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	**Standard 1:** Assessment and management of environmental and social risks and impacts **Standard 10:** Stakeholder Engagement	N/A	Law 12-03 on environmental impact studies requires EIA for solar power project and power lines. The EIA identifies mitigation measures to assess, avoid, reduce, and compensate impacts during construction, operation and decommissioning phases. The "PSSE" (as an ESMP) is a document that identifies all the mitigation measures and how they will be implemented in each phase (construction, operation and decommissioning), the ESMP identifies also the monitoring plan. Public inquiry done under law 12-03 is a mechanism to inform population and stakeholders. Framework Law 99- 12 with Global National Charter for Environment and Sustainable Development (March 2014) : The values and principles of the Charter are: sustainable development; social development; preservation and enhancement of natural and cultural heritage; education and training; preservation and protection of the environment;	Moroccan regulations don't require any specific system to manage environmental and social issues. Moroccan regulations don't include specific mechanism to inform stakeholders all along the project development. Moroccan public inquiry isn't sufficient to comply with NP1. Grievance management mechanism isn't mandatory.	The assessment of the environmental and social impacts was carried out within the framework of the FESIA. The SESIA complies with recommendations and commitments of FESIA. MASEN has the skills and experience to manage environmental and social risks. In compliance with FESIA, the project company will prepare and implement an Environmental and Social Management System in compliance with PS1 and ISO 14001, one for construction and one for operation. The CESMS and its associated procedures and plans will be prepared and submitted to Masen's review and approval before the start of construction. Similar process will be conducted for the OESMS and its associated

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
			adaptation and mitigation for climate change, the pooling of resources; access to information; public participation; research and development; responsible production and consumption; precaution and prevention; the responsibility. These principles and values apply to any actor, project or program.		procedures and plans. The present SESIA and ESMP carried out on the specific project presents all mitigations measures. The Consortium has the experience in terms of environmental management to implement the results of the SESIA and ensure the management of environmental and social risks. EDF renewables has a environmental and social policy (§3.3) The ESMP that accompanies this ESIA indicates the environmental and social management system to be put in place. The project company will develop a specific ESMS for the project. Stakeholders (institutions and populations) were informed via: a public consultation meeting, a public inquiry, the modalities of which are presented in this SESIA. A second public consultation is also planned. A grievance management mechanism is set up by MASEN and another will be

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
					set up by the Consortium.
NP2: Labour and working conditions	**Standard 8: Labour Standards** **Standard 9**: Health, safety and security of workers and populations	Guidelines for : General Facility Design and Operation Communication and Training Physical Hazards Chemical Hazards Biological Hazards Radiological Hazards Personal Protective Equipment (PPE) Special Hazard Environments Monitoring	Labour code 65-99 : Book I - title III: General provisions Article 9 on respect for freedoms and human rights. Article 10: prohibition of forced labor Book I conventions relating to work Title I : Employment contract Book II: employment contract Article 13 to article 85. Defines the rules of employment contract ; rights and duties between employee and employer Book II : working conditions and employer remuneration : Article 135 to 263 Title IV : Workers Health and Safety: article 281 to 344. Decree No. 2-12-386 of 14 September 2012 amending and supplementing Decree No. 2-08-528 of 21 May 2009 on the protection of workers against risks from benzene and products with a higher benzene content at 1% by volume. Explosive regulations	Labour Code 65-99 incorporates most of the requirements of NP2. There is no specific regulation for carrying out and risk assessment and management plan and an emergency response plan A blast management is required	Specific measures would be integrated into the environmental and social management plan : - OHS plan - Labour management plan - Emergency response plan - Safety and security plan - Blast management plan The EPC will implement a labour grievance mechanism. In case of work accommodations on site, accommodations facilities will comply with the IFC/EBRD Worker Accommodation Guidelines.
NP3: Rational use of resources and pollution prevention	**Standard 2: Prevention and reduction of pollution**	EHS standards for noise, air quality and wastewater quality.	Law 12-03 on environmental impact studies requires EIA for solar power project and power lines. The EIA identifies mitigation measures to assess, avoid, reduce, and compensate impacts during construction, operation and decommissioning phases. Framework Law 99- 12 with Global	There is no specific regulation on noise, vibrations, soil pollution and landscape.	Application of IFI's standards for noise, vibration, air quality, wastewater quality and soil pollution if Moroccan regulations don't exist or are less stringent the Moroccan regulations. Application of Good International Industry

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
			National Charter for Environment and Sustainable Development (March 2014) : The values and principles of the Charter are: sustainable development; social development; preservation and enhancement of natural and cultural heritage; education and training; preservation and protection of the environment;, adaptation and mitigation for climate change the pooling of resources; access to information; public participation; research and development; responsible production and consumption; precaution and prevention; the responsibility. These principles and values apply to any actor, project or program. Law 42-16 approving the Paris Agreement on Climate Change. Law 36-15 for water and application decrees; Law 13-00 for air quality and application decrees. Law 28-00 for waste management and application decrees Law 47-09 on Energy efficiency.		Practices.
NP4: Health, safety and security of communities	**Standard 9: Health, safety and security of workers and populations**	Guidelines for Life and Fire Safety (L&FS) Traffic Safety Transport of Hazardous	Law 12-03 on environmental impact studies requires EIA for solar power project and power lines. The EIA identifies mitigation measures to assess, avoid, reduce, and compensate impacts during construction, operation and	There is no specific regulation for carrying out and risk assessment and management plan and an emergency response plan A blast management plan is required.	Specific measures would be included in the ESMP : - OHS plan - Labour management plan - Emergency response plan - Safety and security plan -Traffic and transport

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
		Materials Disease Prevention Emergency Preparedness and Response	decommissioning phases. Framework Law 99- 12 with Global National Charter for Environment and Sustainable Development (March 2014) : The values and principles of the Charter are: sustainable development; social development; preservation and enhancement of natural and cultural heritage; education and training; preservation and protection of the environment;, adaptation and mitigation for climate change the pooling of resources; access to information; public participation; research and development; responsible production and consumption; precaution and prevention; the responsibility. These principles and values apply to any actor, project or program. Constitution of Morocco Title II: Fundamental Rights and Freedoms (pages 19 to 40). Explosive regulations		management plan - Blast management plan
NP5: Land acquisition and involuntary resettlement	**Standard 6: Involuntary resettlement**	N/A	law 7-81 on eminent domain and the temporary occupation (6 May 1982) The law regulates the expropriation and the temporary use of land	NP 5 requirements needs to ensure that population have recovered their livelihoods. Public consultation has to be done.	The acquisition procedure has been taken care of by MASEN in compliance with this performance standard. Land acquisition plan carried out by MASEN has been approved by IFIs. A public consultation has

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
					been carried out.
NP6: Biodiversity conservation and sustainable natural resource management	**Standard 3: Biodiversity and ecosystems**	N/A	Law 29-05 on the protection of species of wild flora and fauna and control of business activities related to them.(1-11-84 Dahir of July 21, 2011) Dahir n ° 1 -10-123 of 3 chaabane 1431 carrying promulgation of the law n ° 22 -07 relating to protected areas. (BO No. 5866 of 19 August 2010).	Application texts are missing for regulation on biodiversity in Morroco. Most of time actions/assessment refers to international convention signed by Morocco.	The SESIA includes biodiversity and avifauna assessment and mitigations measures.
NP7: Indigenous population	**Standard 7: Rights and interests of vulnerable groups**	N/A	The area of influence does not contain indigenous people. Rights and interests of vulnerable people are covered by the constitution. Constitution of Morocco Title II: Fundamental Rights and Freedoms (pages 19 to 40).	N/A	N/A
NP8: Cultural heritage	**Standard 5: Cultural Heritage**	N/A	Law 22-80 supplemented by Law 19-05 governs the historical and cultural heritage in case of discovery. Law 12-03 on EIA includes cultural heritage impact assessment.	No specific regulation to promote the equitable distribution of benefits from the use of cultural heritage.	Cultural heritage assessment included in SESIA and mitigation measures are recommended
	Standard 4: Standards related to climate	N/A	Law 12-03 on EIA Framework Law 99- 12 with Global National Charter for Environment and Sustainable Development (March 2014) : The values and principles of the Charter are: sustainable development; social development;	Moroccan regulations don't require any specific assessment related to climate.	Including climate change analysis in SESIA

IFC Performance standards	EIB performance standards	EHS guidelines	Relevant Moroccan regulations	Gap analysis	Measures already realized or proposed to bridge the gaps
			preservation and enhancement of natural and cultural heritage; education and training; preservation and protection of the environment; adaptation and mitigation for climate change, the pooling of resources; access to information; public participation; research and development; responsible production and consumption; precaution and prevention; the responsibility. These principles and values apply to any actor, project or program. Law 43-09 on Energy Efficiency		

3.3 EDF Environmental policy

EDF Renewables in accordance with the social commitments of EDF Group, has developed an environmental policy that binds the company to develop sustainable renewable energy development projects and contribute to the fight against global warming.

This environmental policy, which also applies to all subsidiaries, includes five main commitments of EDF's Renewables management:

- Ensuring regulatory compliance and the environmental performance of our activities through an appropriate organization dedicated to the management of their environmental aspects;
- Identifying, assessing and reducing the impact of our activities and projects on human population and biodiversity;
- Preventing and controlling the environmental risks associated to our activities;
- Involving all actors -employees, partners, suppliers, sub-contractors- in protecting the environment;
- Informing and consulting our stakeholders about the environmental impact of our projects and respecting the commitments taken.

Each of the commitments is implemented according to the following activities:

1. Ensure regulatory compliance and the environmental performance of our activities through an appropriate organization dedicated to the management of their environmental aspects.
   - An environmental management system, adapted to the size, activities and risks of the company, is implemented and covers the following points:
   - An appropriate organization is implemented, to guarantee compliance of all our activities with applicable environmental laws, regulations, permits and other specific requirements and to anticipate coming regulatory changes
   - An EDF Renewables Group environmental multi-year roadmap is defined, approved and reviewed once a year with the management and implemented locally through an adapted action plan.
   - An efficient management and traceability of environmental incidents is implemented and significant environmental incidents[5] are reported within EDF Renewables Group and to EDF Group.
   - A program of environmental audits is planned every year and conducted on site during construction and operations phases.
   - Tools and documents are developed, shared and updated to support management of environmental risks and impacts (i.e. guidelines, procedures, registers, contractual clauses, template, etc.).
   - Appropriate resources are dedicated to environmental management.
2. Identify, assess and reduce the impact of EDF Renewables activities and projects on human population and biodiversity.

- A support is provided to the projects in order to take into account environmental issues.
- A comprehensive and proportionate environmental impact assessment, including a part dedicated to biodiversity, is systematically conducted for each new project/activity developed or an environmental due diligence for each new acquisition.
- Environmental issues are integrated from the earliest stage of the project, from project design and all along the project/assets life cycle, first aiming at avoiding the environmental impacts of our projects and assets, then if necessary by implementing mitigation measures to reduce and offset them.
- Effective mitigation measures are defined, implemented and monitored during construction and operations proportionate to the project/asset environmental risks and impacts.

3. Prevent and control the environmental risks associated to EDF Renewables activities.

[5] "Significant environmental incidents" as defined in the environmental incidents procedure.

- The environmental risks associated to EDF Renewables activities are identified at the earliest stage of the projects. Environmental requirements are effectively implemented on construction and operations sites by EDF Renewables employees and contractors.
- A local and adapted process is implemented to ensure systematic identification, analysis and traceability of environmental incidents, as well as the implementation and monitoring of appropriate corrective actions. Possible emergency situations related to the environment are identified, emergency procedures are established and tested with incident simulation.

4. Involve all actors -employees, partners, suppliers, sub-contractors- in protecting the environment.

- The Environment Policy (EDF Renewables Group Environment Policy or a local Environment Policy consistent with the EDF Renewables Group one) is available and communicated to the management and to the employees, to our suppliers and contractors, and shared with our business partners.
- Environmental specifications and requirements are presented to contractors and sub-contractors' employees on construction and operations sites.
- Environmental criteria are integrated in the selection and assessment process of our strategic suppliers.
- Awareness actions are organized and training is provided to the business teams about environmental issues and risks prevention related to our activities. Collaboration with suppliers and researchers is developed to contribute to reduce the environmental impact of our technologies along all their life cycle.

5. Inform and consult stakeholders about the environmental impact of EDF Renewables projects and respect the commitments taken.

- Information related to significant environmental impacts (notably the environmental impact assessment) associated with EDF Renewables projects is made available to local stakeholders and local communities during the development and construction phases of the projects.
- Questions related to the environmental impacts of EDF Renewables projects are addressed in the consultation process with local stakeholders.
- Local grievances related to environmental matters associated with EDF Renewables projects are answered and registered during construction and operations.
- Participation with local interest groups and bodies is organized in order to educate local stakeholders and authorities about EDF Renewables businesses and anticipate new requirements.

These 5 commitments are implemented through an ongoing improvement process, a strong internal environmental expertise and by a strengthened Environment Function.

- A Corporate environmental function develops, leads and coordinates environmental management across EDF Renewables Group.
- An Environmental Correspondent, whose role is clearly identified, is appointed by each company or significant business unit. The Environmental Correspondent has the responsibility of coordinating the local organization dedicated to environmental management, including the management of environmental risks and impacts associated to the company or business unit activities.
- An Environment Community - including all environmental correspondents and environmental experts of EDF Renewables Group - ensures the implementation of the environmental roadmap and shares experiences and best practices between business units and companies to build expertise and develop competencies.
- EDF Renewables Group is represented in key EDF Group networks dedicated to environment.

In compliance with FESIA, the project company will prepare and implement an Environmental and Social Management System in compliance with PS1 and ISO 14001, one for construction and one for operation. The CESMS and its associated procedures and plans will be prepared and submitted to Masen's review and approval before the start of construction. Similar process will be conducted for the OESMS and its associated procedures and plans.

EDF Renewables Group Environment Policy and its application note are presented in Appendix 6.

3.4 Moroccan institutional framework

3.4.1 Ministry of Energy, Mining and Sustainable Development (MEMDD)

It is in charge of formulating and implementing government policy on energy, mining and on the environment in general in the frame of currently applicable legislation and regulations. The strategic grouping together of these areas aims to achieve comprehensive, integrated environmental protection and development policy.

Secretary for Sustainable Development

More specifically, the State Secretary for Sustainable Development (SEDD) is responsible for coordinating environmental management activities. The Environmental Impact Assessment Division depending on the Direction of Control, Environmental Assessment and Legal Affairs is in charge of coordinating government action concerning environmental assessment. Its main duties are coordination, surveillance, control and the establishment of a legal framework. It also chairs the CNEI. The SEDD is in charge of :

- Develop the national strategy for sustainable development and monitor its implementation
- Propose laws and regulations in the field of environmental protection and monitor their application
- Represent the government in bilateral and multilateral negotiations in the field of environment and sustainable development
- Integrate the dimension of climate change, green economy and contribution to biodiversity conservation into government policies, strategies and programs
- Contribute to the development, implementation and monitoring of national environmental programs in collaboration with relevant departments
- Promote cooperation in the field of environment and sustainable development
- Promote partnerships (with entities, private, public, local authorities, NGOs) in the field of environment and sustainable development
- Put in place tools for observing and monitoring the state of the environment at national and regional level
- Integrate the environmental dimension in development programs, education, training and scientific research
- Monitor strategic environmental assessment of public development policies and programs
- Follow the evaluation of the impact of the investment activities projects on the environment.

The SEDD is a transversal department and all missions must be carried out in coordination with the departments concerned.

The SEDD is organized into 5 central directorates:

- The department of observation, studies and planning
- The Climate Change, Biodiversity and Green Economy Department
- The department of programs and achievements
- The department of Partnership, Communication and Cooperation
- The Control, Environmental Assessment and Legal Affairs Department.

This latter department is also in charge of monitoring the environmental audit operations of activities having an impact on the environment.

The SEDD ensures the coordination and the secretariat of CNEIE / CREIE which are the Committees in charge of the process of issuing environmental acceptability.

At the local level, the secretariat in charge of the environment is represented by a Regional Direction of the Environment set up in 2016 (decree of May 5, 2016 - Official Bulletin n ° 6526 of December 15, 2016) which includes three services:

- service of the Regional Observatory for the Environment and Sustainable Development

- environmental management service
- service of control and environmental impact studies

Ministry for Energy and Mines and Sustainable Development

This ministry develops and implements government policy in the fields of energy, mining and geology. It is organized in different directions :

- General Secretariat
- General inspection
- Direction of geology
- Direction of Mining and Hydrocarbons
- Direction of fuels
- Direction of renewable energy and energy efficiency
- Direction of electricity
- Direction for risk control and prevention management
- Direction of observation, cooperation and communication
- Resources, Corporate Affairs and Information Systems Branch

The direction for risk control and prevention management is in charge to deliver authorizations for explosive use in construction works.

3.4.2 High Commissioner's office for Water, Forest and the Prevention of Desertification (HCEFLCD)

The HCEFLD is in charge of:

- administration, by delegation of the Prime Minister and in compliance with the 10 October 1917 dahir on the conservation and use of state forest areas and other property subject to the same rules as forests, and the enforcement and control of the related legislative and regulatory instruments;
- conservation, improvement, development and promotion of forest, esparto grass, and grazing and woodland resources, on land subject to the forest regime, and also hunting and inland fishing resources, and the economic value of their numerous products, services and benefits;
- striving to promote and implement forest extension and development actions on land intended for forest purposes other than public forest property belonging to the State;
- coordinating the formulation and implementation of watershed and natural park and reserve development plans; monitoring and evaluation of such plans in conjunction with the various ministerial departments or other organizations involved;
- coordinating the formulation and implementation of integrated forest and esparto grassland development programs and projects; participating to their performance and conducting monitoring and evaluation;
- promoting cooperation and partnership actions with the various ministry departments or other organizations, local authorities, bilateral partners, regional and international organizations, professionals, non-governmental organizations and all forest users;
- in conjunction with the various ministerial departments and organizations, coordinating the implementation of international conventions on the prevention of desertification, forests, wildlife and its natural habitat at national level.

In matters concerning biodiversity management, the High Commissioner's office for Water and Forest is in charge of formulating and implementing all actions contributing to the conservation of forest and wood/grazing land resources, water and soil resources and hunting and fishing resources.

Therefore, its mandate covers conservation and regulations concerning wild fauna and flora in their biotope and the management of national parks and nature reserves.

3.4.3 Ministry of Agriculture and Maritime Fisheries (MAPM)

MAPM is in charge of coordinating government action for agricultural and rural development. For decentralization reasons, 9 "ORMVA" (Regional Agricultural Development Authorities) were set up from 1966 onwards. They are public organizations in charge of the enforcement of all agricultural policy and all its components in their respective areas (Loukkos, Moulouya Gharb, Doukkala, Haouz, Tadla, Souss-Massa, Ouarzazate and Errachidia). They are financially independent but are statutory bodies.

Each ORMVA is administered by a Board of Management chaired by the Minister of Agriculture and composed of ministry technical directorate representatives, representatives of other ministries and farmers' representatives.

Their mandate, established in their founding instruments, is the creation and operation of the water facilities necessary to irrigate and develop their regions and to manage all the water resources used for agriculture; all such water resources being placed under their general auspices in their respective areas of influence.

Outside the ORMVA schemes, for large-scale irrigation the Ministry is divided into Regional and Provincial Agriculture Directorates. These are in charge of agricultural development at the local level.

3.4.4 Ministry of Equipment and Transport

The Ministry of Equipment and Transport is in charge of formulating and implementing government policy on roads, ports, public facilities and transport (by road, rail, sea and air). The Equipment Department of this ministry is also in charge of the implementation, supervision and quality control of technical studies, the construction of technical facilities and the technical quality control of the works for other ministries, local authorities or statutory bodies

3.4.5 Ministry of the Interior

The Ministry of the Interior oversees the communal councils. The communal charter establishes the independence of the communes and the urban area communities regarding solid waste management and water and sewerage infrastructure. But their budgets and investments are subject to Ministry of the Interior supervision

3.4.6 Ministry of Health

The Ministry of Health is in charge of managing hospitals and health care facilities throughout the country. It is also in charge of checking the quality of drinking water by performing tests in decentralized laboratories. It can also be involved in checking the sanitary conditions of wells.

3.4.7 Water Agencies (Agences de Bassin Hydraulique - ABH)

Water law 10/95 created the water agencies. There is one water agency for each basin or group of basins. They are statutory bodies: legal persons with financial independence.
The project area is in the area of the Moulouya Water Agency. The water agencies assess, plan, manage and protect water resources and issue authorization or grant concessions for the use of the public water property in their area of influence.

3.4.8 Ministry of Culture

The Ministry of Culture is in charge of developing and implementing government policy for heritage and for cultural and artistic development.
The Directorate of Cultural Heritage is in charge of ensuring the protection, conservation, restoration, maintenance and promotion of architectural, archaeological, ethnographic and museum heritage and of all national artistic wealth. To do so, the Directorate may, among others, undertake studies, research or surveys as necessary to identify items of cultural heritage. It can take the adequate heritage conservation and enhancement measures and can schedule and manage archaeological research (Government order n°2-06-328 dated 10 November 2006 establishing the duties and organization of the Ministry of Culture).

3.5 MOROCCAN INSTITUTIONAL FRAMEWORK FOR ENERGY MANAGEMENT

3.5.1 Office National de l'Electricité et de l'eau potable (ONEE)

The ONEE - Electricity Sector is an industrial and commercial public undertaking placed under the administrative and technical supervision of the Ministry of the Energy, Mines, Water and Environment.

The mission of the ONEE-Sector Electricity is to "meet the electricity demand of the country at the best possible cost and quality of service and develop industrial activity or service related to electrical energy".

It is empowered to take all necessary steps to convert the electrical energy and resources to exploit public works for the production, transmission and distribution of electrical energy. He is allowed to occupy the land of the public domain required for the establishment of production facilities, transmission and distribution.

The Law 38-16 amended and supplemented the second article of the Dahir No 1-63-226 issued on 14 Rabi I 1383 (5 August 1963) establishing the National Office of Electricity (ONE) to transfer activities related to assets of the National Office of electricity and drinking water (ONEE) to the Moroccan Agency for Sustainable Energy (MASEN).

This text thus stipulates transfer to the Agency of all means of production, it is finalized, being completed or under development, using sources of renewable energy, with the exception of stations energy transfer by pumping, electricity production facilities dedicated to the peak and the stability of the national electricity system and electricity production facilities from sources of renewable energy governed by law No. 13.09 on renewable energy.

The process of agreements defining the terms and maturity in which this transfer will be carried out is under development. The text provides a period of 5 years under the coordination of the Ministry of Energy and Mines.

3.5.2 The Department of Energy and Mining, MEMDD

It is in charge of formulating and implementing government policy on energy, mining and geology and controlling the other sectors under its auspices. It is the supervisory authority for companies and statutory bodies in its area of activities (including ONEE). Its mandate includes:

- Defining options and taking the necessary measures to secure power supplies, to extend access to commercial power services for rural and urban populations and to ensure the safety of people and power and mining facilities alike;
- Maintaining a permanent strategic and prospective vision so that the country 's electricity supplies are delivered in the best possible conditions in terms of safety and quality.

3.5.3 MASEN

The Moroccan Agency for Sustainable Energy (ex Moroccan Agency for Solar Energy) which acronym is MASEN was created in 2009 as part of the "Moroccan Solar Energy Project". Benefiting from the support of the State, this company's mission was to oversee the implementation of solar electric projects. Law 57-09 creating it was amended in August 2016 by Law 37-16.

MASEN supervises the implementation of a program for the development of integrated power generation projects with an additional minimum capacity of 3,000 MW by 2020 and 6,000 MW by 2030 from renewable energies;

MASEN's mission is, among other things, to undertake all the technical, economic and financial studies necessary for the implementation of the program to later put forward the projects that will be selected by investors for their development. The main shareholders of this Agency, whose partnership agreement was signed Monday, November 2, 2009 in Ouarzazate, under the presidency of HM King Mohammed VI, are the Hassan II Fund for Economic and Social Development, the Department of Energy and Mines and the National Office of Electricity (ONEE - BE).

MASEN is authorized to carry out its missions both on the national territory, and at a continental and international level.

4. Project's design

4.1 Operating principle of the plant

The power plant captures solar energy and converts it into electricity using different processes. The proposed Power Plant is a hybridization concept that combines:

- 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 3 063 000 m² of PV panels. PV electricity is simultaneously sent to the grid, used to heat molten salt of CSP plant and stored in Battery Energy Storage System (BESS); and
- The concentration of solar radiation (CSP) using parabolic collectors in a Solar Field of around 85 ha, to produce thermal energy. Thermal energy is stored and converted into electricity using a thermodynamic cycle.

The electricity generation process is summarized in the following steps :

At the start-up in the morning, the PV system produces power and injects it to grid, and the CSP Solar Field start heating up the HTF. When the HTF has surpassed certain temperature threshold, the salt flow is slowly started and the salt is heated up by the HTF/Molten Salt heat exchanger and by the PV energy up to a temperature of more than 400°C.

In normal operation, the thermal energy storage is fed in priority. The excess PV power is sent to the grid and to the BESS of the CSP Plant.

After the sunset, the thermal energy stored in molten salts is used to produce steam that is expended in the turbine to produce electricity onto the grid during 5 hours (at 190 MW @Reference Site Conditions).

Electricity power that is required to feed the CSP plant auxiliaries (pumps, compressors, fans, etc…) and to compensate losses in the evacuation line can be taken from the available energy in the BESS of the CSP Plant.

The plan operation diagram is presented in the figure below.

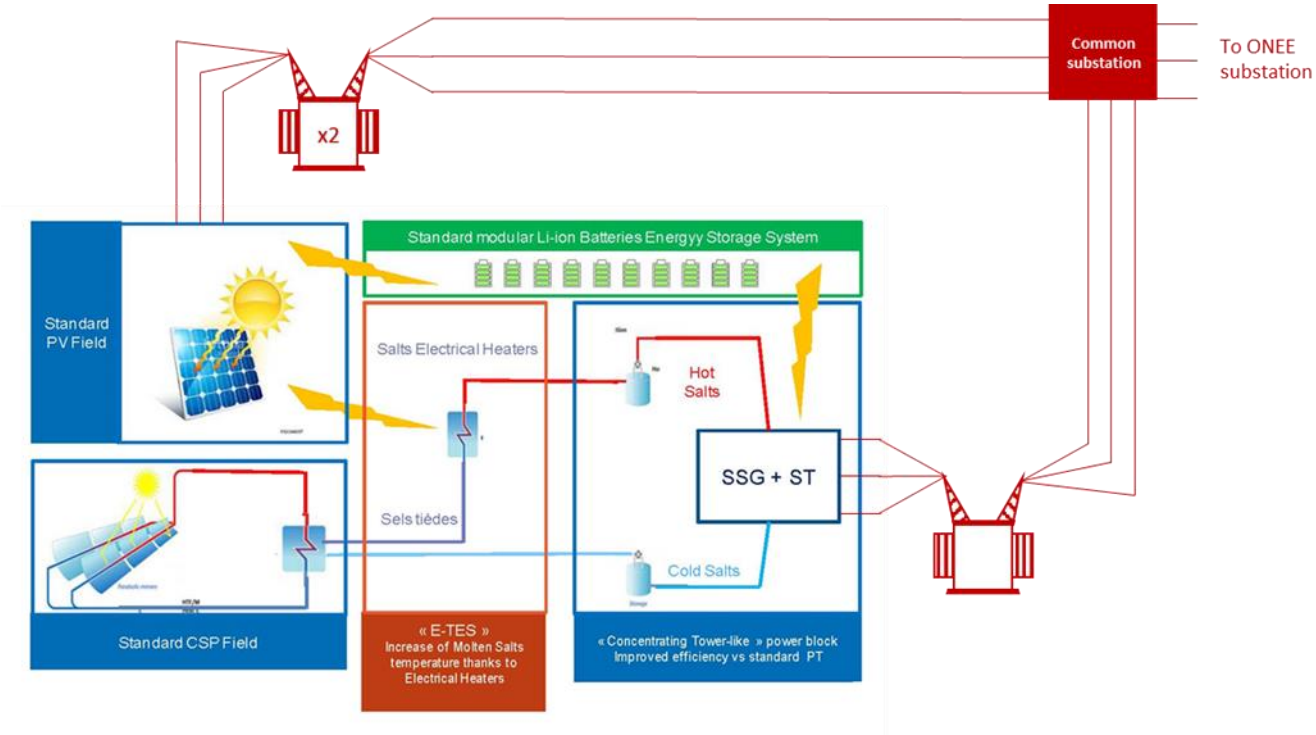


Figure 2 : Plant operating diagram

4.1.1 Operating principle of PV power plant

The solar photovoltaic power plant has no industrial risk and all the components come from very mature technology. Indeed, an installation consists of panels connected to inverters that convert DC to AC power and finally inverters to the transformer that transforms electricity from low voltage to medium voltage.

(1) The sun's radiation on the photovoltaic modules is transformed into a continuous electrical current routed to an inverter (2).

The inverter converts this electricity into alternating current (3) compatible with the electricity grid.

(4) A transformer raises the voltage before the cable electricity is injected into the public grid (5).

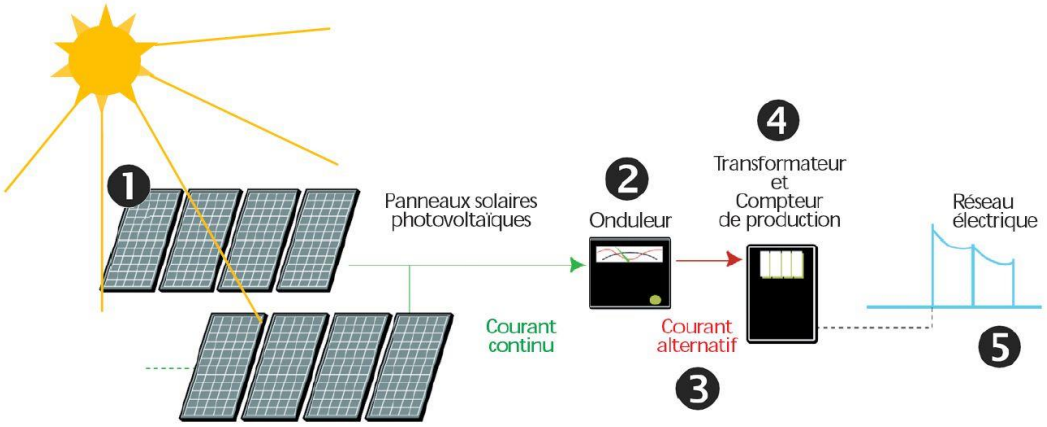


Figure 3 : PV plant operation diagram

The main characteristics of photovoltaic power plants are:

- High reliability, no moving parts (except on tracker systems, the movement is however very slow),

- Silent system,
- Reduced maintenance, low running costs,
- Electricity production only during the day,
- Storage of electricity is difficult (high costs, loss of charge over time), and possible at present for moderate power.

4.1.2 Operating principle of CSP power plant

Using the field of parabolic-trough collectors the solar radiation is concentrated on a Heat Collector Element (HCE), located at the focus of the parabola, which is filled with Heat Transfer Fluid (HTF). The HTF heated is transferred to the molten salts stored through an HTF / Molten Salt heat exchanger system. The molten salts will be pumped from the cold tank to the hot tank via the heat exchanger and the energy will be stored in the hot tank. With this energy, it is possible to produce electricity after sunset. After sunset, solar field operation is stopped and operation from thermal storage begins. Energy from hot salts is transferred directly to the water in the Steam Generator System and the steam produced is then expended in a steam turbine to generate electricity.

The steam cycle is cooled with a dry cooling system which minimizes water consumption compared to wet cooling.

Once the Molten Salt is passed through the Steam Generator System, it has cooled down and is sent to the cold tank.

Finally, in order to prevent molten salts and HTF crystallize during periods of very low temperature or non-operation, an auxiliary HTF Heater is installed to maintain the minimum temperature required and heat tracing is installed in the molten salt circuits and systems as necessary.

4.2 Accommodation, Equipment and Facilities

The figure below presents the layout of Midelt I project.

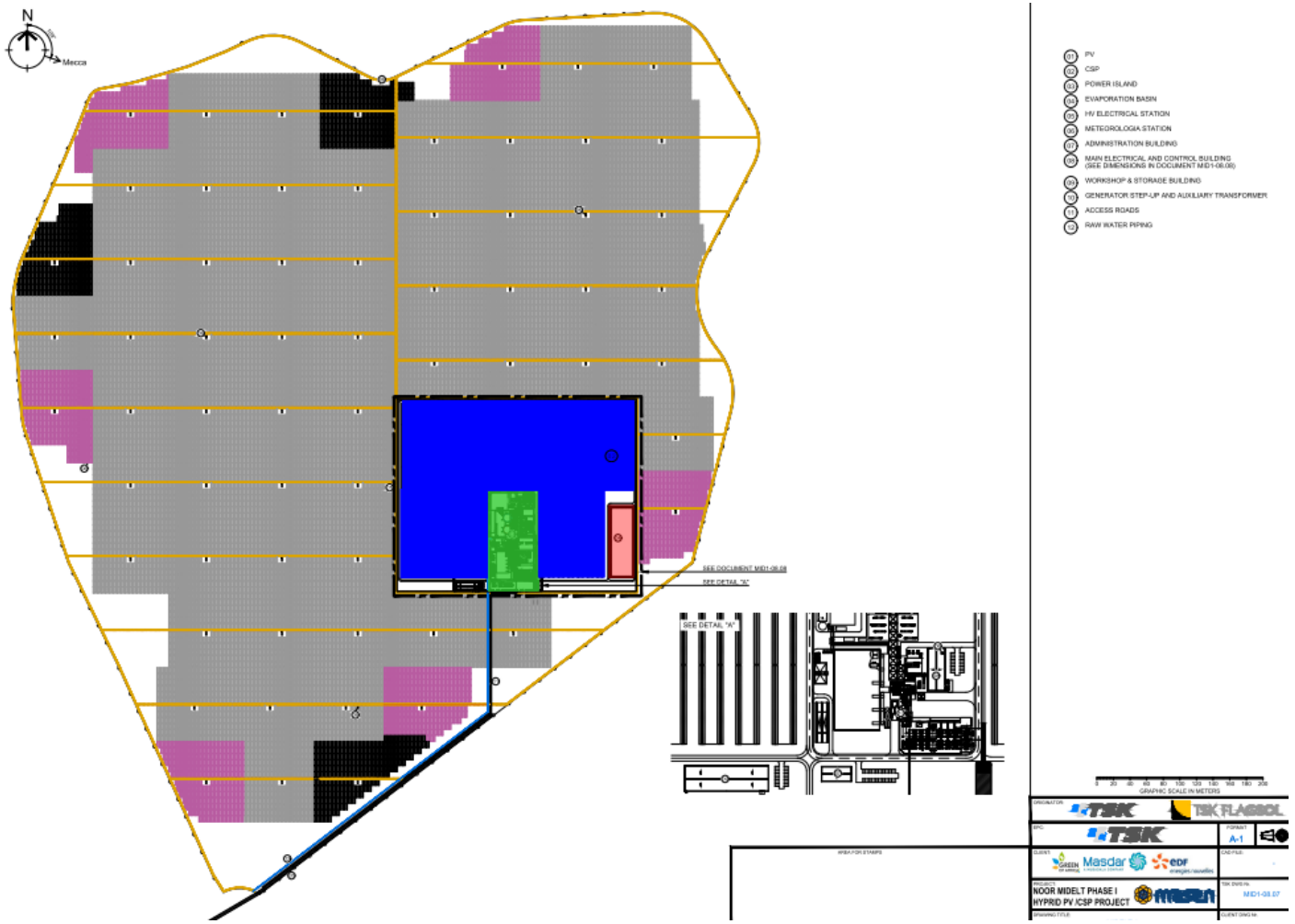


Figure 4: Development plan for the NOOR Midelt I hybrid power station.

4.2.1 PV field

The PV field comprises 604.5 MWp photovoltaic panels installed on structures following the sun's path on 1 axis (trackers). This type of structure significantly increases the production of photovoltaic panels compared to fixed structures.

Each structure supports 2 strings of 28 modules and is oriented on a north-south axis with a width of 2 horizontal modules.

The configuration of the PV field is summarised below:

Table 11 : Configuration of the PV field

Description	Value	GNU Units
Power of PV modules	390	W
DC power installed	604.5	MWp
Number of PV modules in series	28	modules
Total number of inverters	192	inverters
Number of tables (tracker structure – 2 vertical X 27)	28 704	
Total number of PV modules (390 Wp modules mono PERC POE glass)	1 550 016	modules

The structure of the modules and the orientation system of the modules are illustrated below:

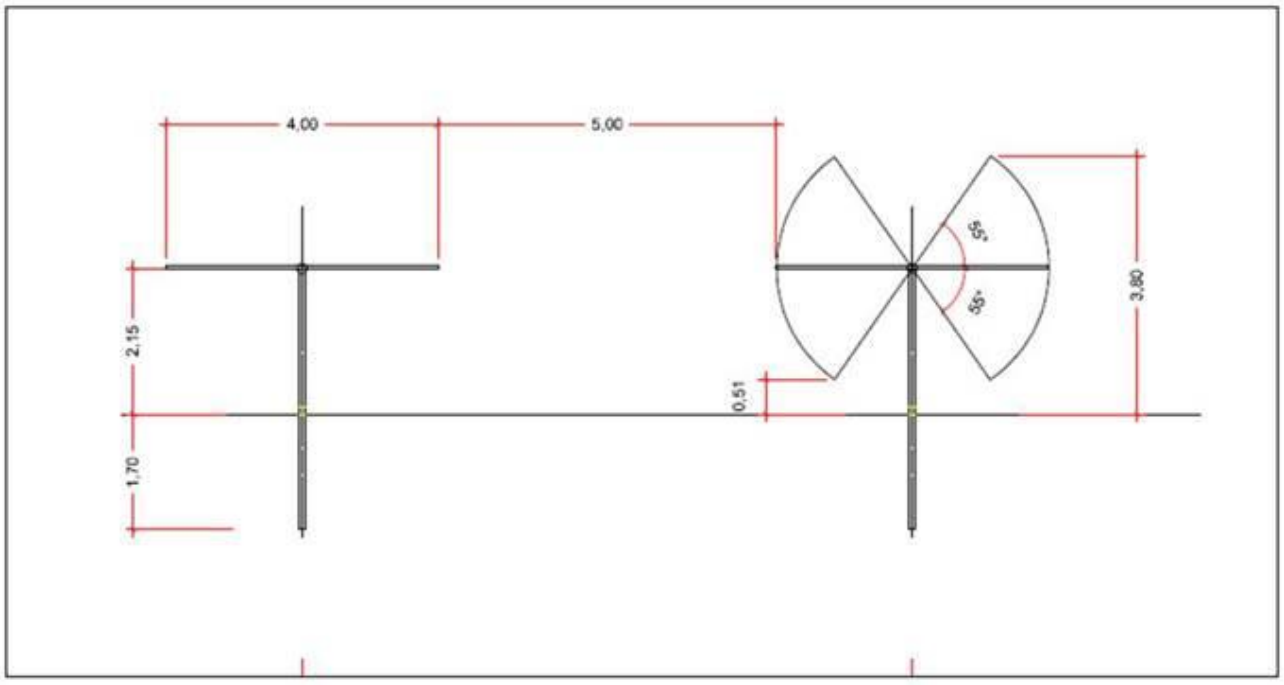


Figure 5 : Structure of the modules and the orientation system

PV panels are supported by metal piles with shallow foundations (1 to 2 m max).

The panels will be installed on parallel structures on a north-south axis. Each structure has 6 tables (size of each table is about 4 m wide and 27 m length) in portrait configuration 2x27 modules and are 5 m apart on the east-west axis. Each structure is supported by 4 pylons.

The total coverage is calculated with the number of PV modules (1 550 016) and the area of each module (1 982 m²): 3 063 000 m². The number of foundations is about 114 816.

The total area of the PV field is 866 ha.

4.2.2 CSP field

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.

Figure 6: HelioTrough ® collector loop

The CSP field loops are fed in parallel with thermal oil. Each loop consists of 4 collector assemblies connected in series. Each assembly consists of 10 collectors and an orientation/tracking system for the structure. Each collector consists of 48 mirrors and 4 vacuum tubes and is approximately 19 meters long.

The main characteristics of the CSP field are in the following table.

Table 12 : Main characteristics of the CSP field

Description	Value
Number of assemblies per loop	4
Number of collectors elements per assembly	10
Number of orientation systems per assembly	1
Number of mirrors per collector element	48
Number of vacuum tubes per collector element	4

The CSP solar field consists of parabolic trough collector assembly rows arranged along a north-south axis. Each assembly (SCA) is 6.78 m wide and 191 m long. Each assembly is carried by 11 pylons (10 middle/end

pylons and 1 drive pylon in the center of the SCA.. There is 4 SCA per loop and loops are placed about 10 m apart on the east-west axis. The CSP Solar Field area is 85 ha.

The parabolic solar field will be implemented on 5 platforms (including 1 for the power block) with different levels thus taking into account the land topography. The difference between the platforms will be 2 meters maximum. A slope about 1,5% on North-South axis following roughly the ground. A slope about 0,5% on East-West axis allows the natural stormwater flow to the drainage network.

4.2.3 Power block

The power block is located at the centre of the site and includes the components for power generation and auxiliary systems:

- A thermal storage system with molten salts. This storage system consists of one "cold" salt storage tanks and one "hot" salt storage tanks. Each of the tanks has a height of 14 m height and a diameter of 37 m. These tanks store 26 920 tons of molten salts consisting of 60% Sodium Nitrate and 40% Potassium Nitrate. . The volume of molten salts remains the same along operation, no renewal or top up is necessary.
- BESS. The power of BESS is about 60 MWh. Batteries will be arranged in containers or in outdoor cabinets. Containers or cabinets will be placed on a concrete slab. The arrangement includes fire protection. Batteries are based on Lithium-ion (Li-ion) technology.
- A thermal oil management system (HTF) (See details in §4.2.4);
- A steam turbine generator of 190 gross MW ;
- An air-cooled steam condenser that operates in a closed loop operation;
- A filtered water and firefighting tank providing water to the water demineralization unit and the fire water reserve : 2 050 m3 capacity in total
- A Water Treatment Plant (WTP) which is a 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). A module is to be replaced every 5 years (resin and membranes). Demineralized water is stored in a 700 m3 tank.
- Industrial effluent treatment units: neutralisation 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.

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.

4.2.4 Thermal oil management system

The system uses a heat transfer fluid (HTF) which is a mineral oil composed of an eutectic mixture of biphenil and diphenyl oxide. 570 tons are required to fill the system.

During operation, the HTF is subjected to both thermal expansion and contraction. The expansion and overflow system serves as a buffer for changes in HTF volume due to heating or cooling. The expansion vessel is also used to fill and store the HTF during circuit maintenance. The system includes:

- Expansion vessel and over flow vessel (equipped with HTF filters).
- Nitrogen system for inerting and pressurizing the expansion vessel, overflow vessels and HTF circuit to ensure the HTF circuit is always kept above the HTF boiling pressure and that the HTF remains in the liquid state.
- A ventilation system is used to clear the expansion vessel and overflow vessels, the nitrogen and HTF vapors and send them to a controlled pressure condensation and purification system.
- A controlled pressure purification / condensation system to ensure the elimination of compounds from the degradation of HTF oil (this system includes activated carbon filters downstream of the vent)

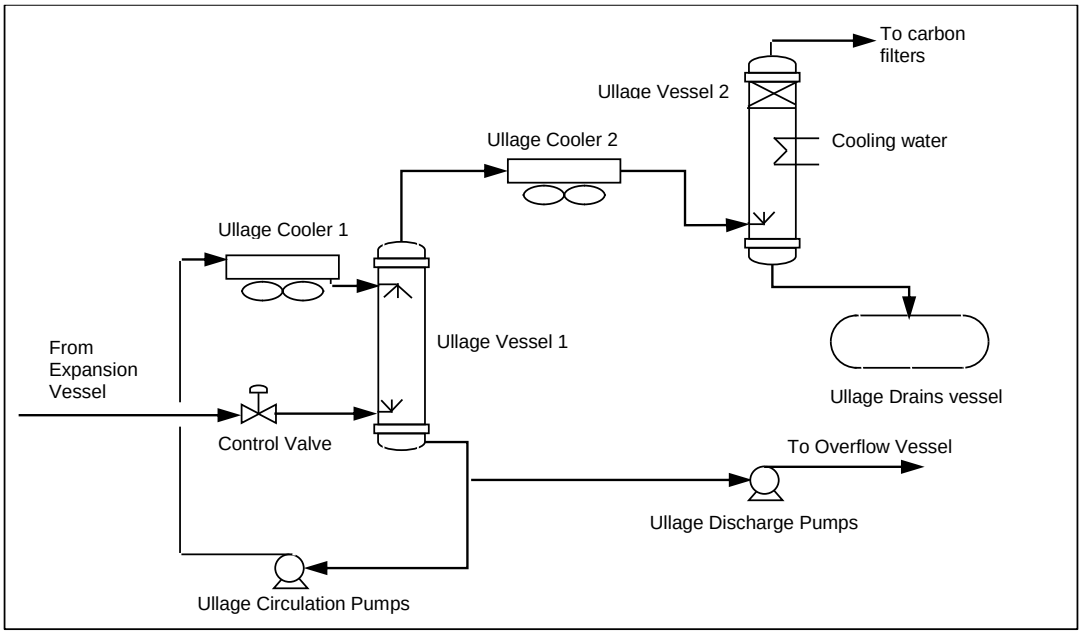


Figure 7 : Thermal oil management system (Ullage system)

In operation, to maintain a constant volume of fluid in the system a top-up is less than 1% of the total amount needed.

4.2.5 Evaporation pond

Evaporation ponds with a volume of 2x15000m^3 will be set up in the southern part of the power block. It receives the different treated water at the power block. This pond prevents any discharge of water into the natural environment. The dimensions of each of the ponds are : 1 m deep, 100 m wide and 150 m long. The evaporation ponds will be watertight (environmental protection double liners) and equipped with a leak detection system. The presence of two ponds allows for cleaning work to be executed without affecting the operation of the solar power station. The cleaning would be done whenever necessary. The sewage sludge generated will be collected and processed according to the appropriate channels. Indeed, depending on the nature of the cured product, the disposal options will vary. These ponds will be cleaned by authorized companies. The responsibility is taken by the O&M Contractor. It will be contracted few months before beginning of the O&M Phase, the cleaning will be done by company.

Estimated composition of the sludge is below (100% dry):

- Calcium carbonates 50%
- Magnesium salts (carbonates and sulphates) 24%
- Sodium chloride 19%
- Others inorganic salts 7%

4.2.6 Temporary construction areas

During the construction, approximately 150,000 m² of temporary areas will be covered.

CSP/PV temporary area

A temporary area –at the south east of the site is provided for storage, prefabrication, assembly and subcontractor offices. This area of approximately 15 ha will be dismantled at the end of the construction phase.

Assembly of collectors

The collectors' assembly is carried out in an assembly hall in the south of the power block area in order to minimise the equipment's movements. This area will be reused for maintenance purposes in operation.

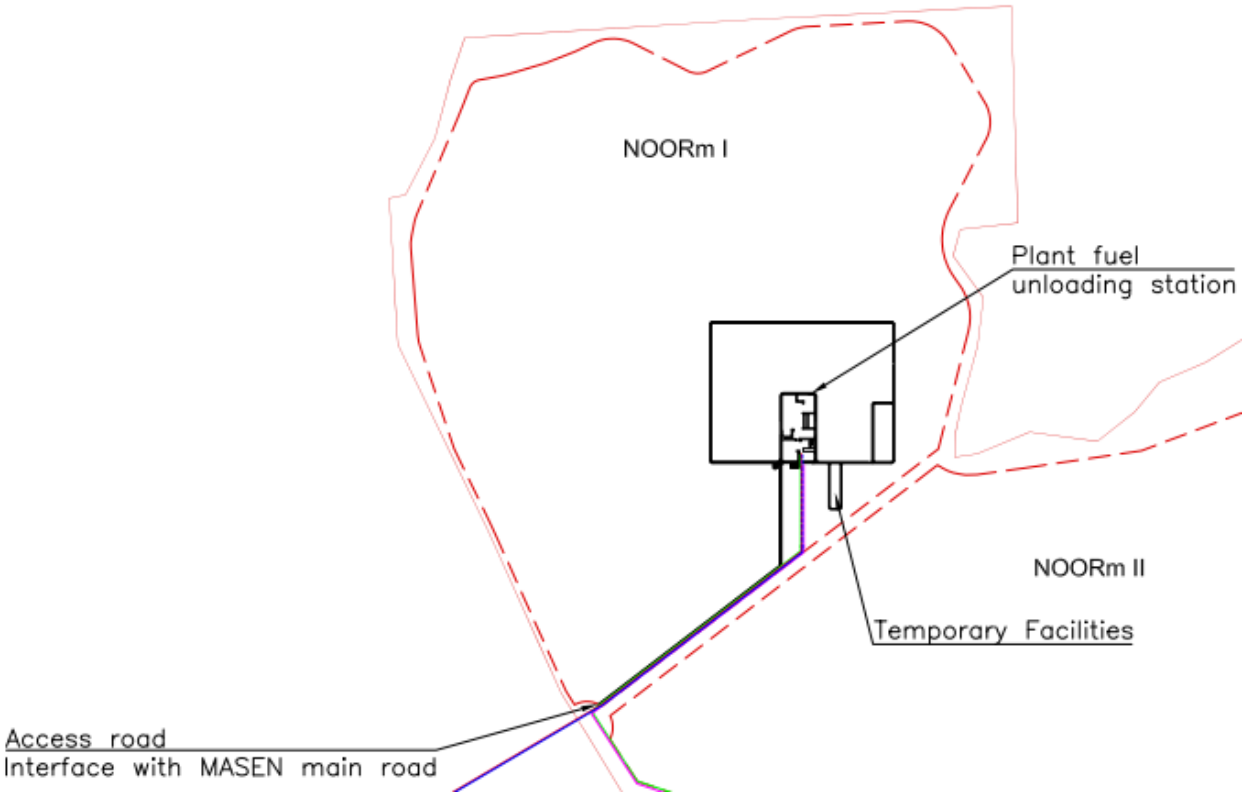


Figure 8 :Layout of the Plant showing the temporary facilities areas

4.2.7 Access and traffic lanes

Access to the site is through the south-western end of the site. To move around the site, road and service lanes are arranged for the accessibility of maintenance vehicles on every part of the site.

Main access road

The access road runs along the south limit of the site and provides access to the power block where the driving centre and all the administrative buildings of the site are located. This route will have a junction with the main access road arranged and managed by MASEN. This access road will be asphalted.

Power block peripheral and internal roads

These roads will be paved (granular soil + asphalt concrete or hydraulic concrete)

Site Peripheral road

Two peripheral roads run along the PV and CSP fields (site boundary) and will help monitor the site's periphery. This lane will be compacted uncoated

PV field and CSP field Internal roads

Internal roads are set up in north-south and east-west axes in the PV field and provide access to the PV field's inverter blocks for construction and maintenance activities. In the CSP field internal roads are also provided in the north-south and east-west axes to serve all ends of the CSP field's loops. This lane will be compacted uncoated.

Internal paths:

In the CSP field, the paths along the collectors are provided for the maintenance and mirror cleaning activities. This lane will be compacted uncoated

4.2.8 Power line

In the operation phase, a single electrical line THT (225 kV) is used to export power and for the power station's consumption (common PV / CSP). It is mostly aerial and follows the access road from the interconnection point southeast of the site to the power block. It will have a total length of: 3,6 km. The design of power line will be compliant with AEWA-CMS guidelines.

During the construction phase, a temporary line will be provided and dismantled at the end of the construction phase.

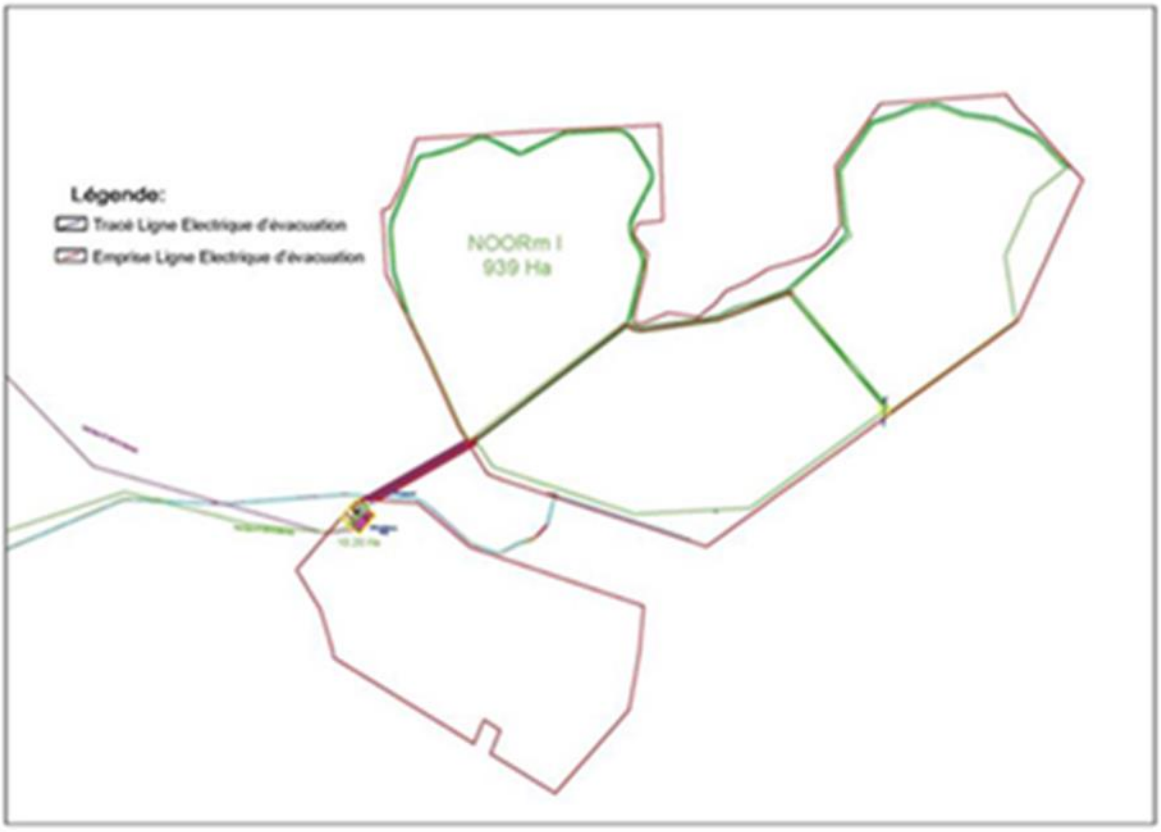


Figure 9 : Power line location

4.2.9 Fencing

The entire perimeter of the site will be surrounded by a single fence materialised by rigid panels of welded steel wire mesh fence with the following characteristics:

Rigid, grid-panel fence, with a +/- 200x55 mm mesh, a welded steel wire diameter adapted to safety and security standards and with a minimum height of 2,50 m.

- The entire fencing shall be hot-dip galvanised.

A main entrance gate will be installed to ensure control of the access to the site.

4.3 Earthworks and levelling of the site

Given that the topology of the site is relatively favourable, the levelling works are limited to the areas requiring earthworks for the operation of the equipment. Consequently, the areas of the CSP field and the power block will be levelled horizontally at several levels to reduce the impact on the displaced volume.

Part of earthworks will require explosives. The blast areas are located in the north and in the middle of the plot for Midelt I (Figure hereafter). The total area is estimated at 131 527 m² and represents a volume about 133 753 m^3.

As far as the PV field is concerned, the earthworks will be limited to areas where the land does not meet the maximum slope criteria allowed by the structure.

For the entire plant, the volume of land moved is estimated at round about 1 Mm^3. The Excavation/ Filling works ratio will be balanced.

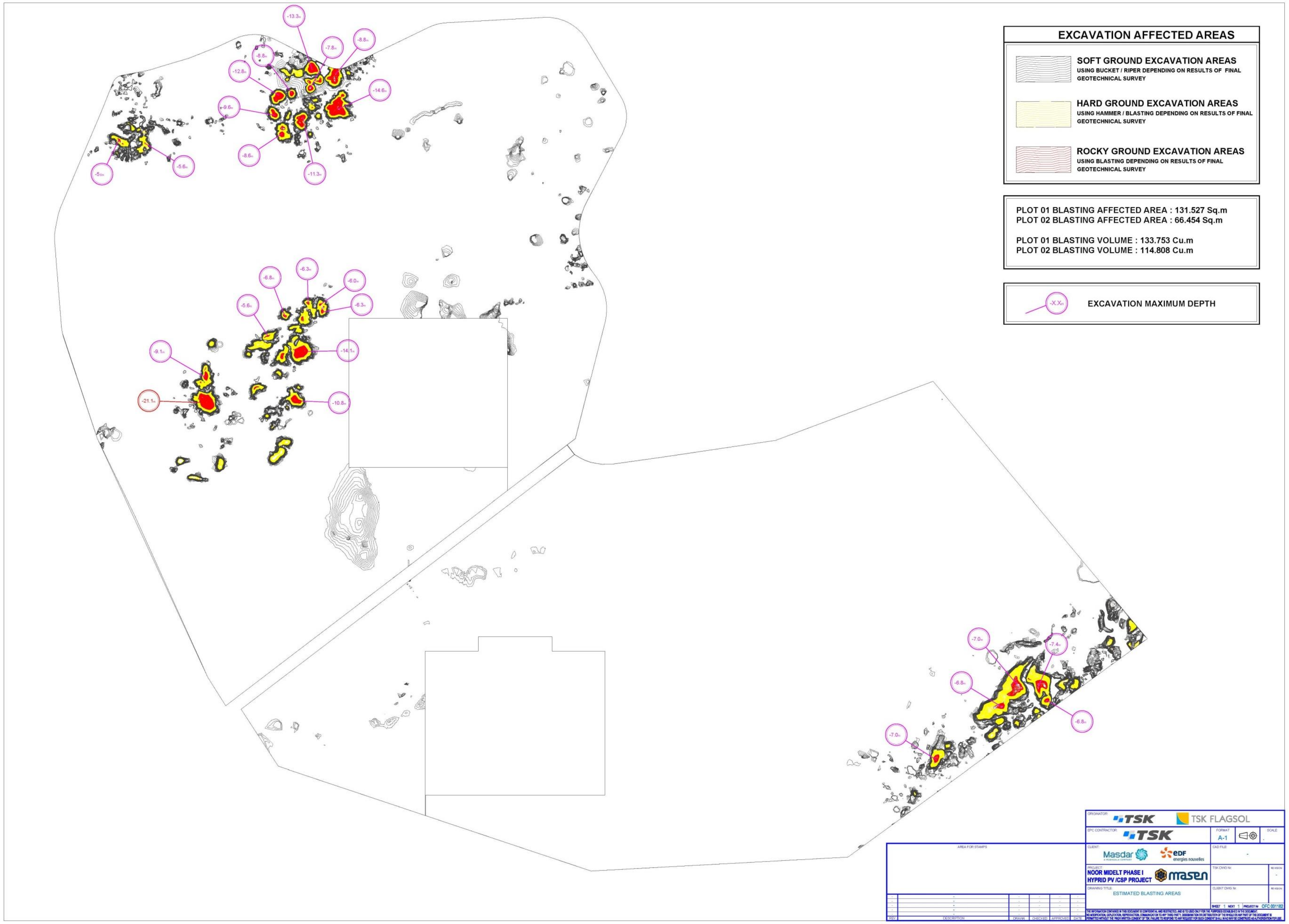

EXCAVATION AFFECTED AREAS
SOFT GROUND EXCAVATION AREAS
USING BUCKET / RIPER DEPENDING ON RESULTS OF FINAL GEOTECHNICAL SURVEY
HARD GROUND EXCAVATION AREAS
USING HAMMER / BLASTING DEPENDING ON RESULTS OF FINAL GEOTECHNICAL SURVEY
ROCKY GROUND EXCAVATION AREAS
USING BLASTING DEPENDING ON RESULTS OF FINAL GEOTECHNICAL SURVEY
PLOT 01 BLASTING AFFECTED AREA : 131.527 Sq.m
PLOT 02 BLASTING AFFECTED AREA : 66.454 Sq.m
PLOT 01 BLASTING VOLUME : 133.753 Cu.m
PLOT 02 BLASTING VOLUME : 114.808 Cu.m
-X.Xm
EXCAVATION MAXIMUM DEPTH
ORIGINATOR:
EPC CONTRACTOR:
FORMAT
A-1
SCALE
CLIENT:
PROJECT:
NOOR MIDELT PHASE I
HYPRID PV /CSP PROJECT
DRAWING TITLE:
ESTIMATED BLASTING AREAS
SHEET 1 NEXT 1 PROJECT Nr OFC 001182

Figure 10 : Estimated blasting areas for Midelt I and Midelt II

4.4 Use of resources and waste streams during construction phase

4.4.1 Electricity needs

During the construction and reception phase of the plant, electricity requirements are estimated at 7,500 MWh. They will be provided by the temporarily installed medium voltage power line.

4.4.2 Hydrocarbon needs

During the construction phase the hydrocarbon requirements are:

- Molten salts liquefaction process
- The fuels necessary for the operation of the different vehicles as well as the operating needs of generating sets as needed.
- The operating needs of the generators used in addition to the MV line to supply the site and / or the temporary electricity network, if needed.

Hydrocarbon storage tanks will be provided onsite for the different needs. Supplying will be provided by tanker trucks.

4.4.3 Water needs

Drinking water in the construction phase would be made available to employees. It will be bought and stored in fountains and mobilised via trucks. The raw water will come from the dam without any treatment planned and will be provided during construction as per subcontractor's needs.

During the construction phase, water consumption is estimated at 300 000 m3 for the total duration of the work.

These needs are divided into:

- Concrete: 6%
- Earthworks / compaction: 16%
- Temporary facilities (toilets, showers, canteens, machinery washing facilities, etc.) 19%
- Dust control 40%
- Commissioning 18%

Groundwater will be not used during construction phase (in Site and Off site).

4.4.4 Wastewater during construction phase

During the construction phase, only 30% of the raw water used will be an effluent to manage. The rest will be evaporated or infiltrated into the soil.

The various waste water sources and treatments must be :

- **Sanitary waters :**

During construction phase the following will be implemented, chemical toilets will be distributed around the BOP 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 (normally the same company that rent those toilets).

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.

Oily waters from machinery maintenance work and refuelling

A waterproof concrete area shall be provided with a tank to collect any liquid waste.

Refuelling will only be carried out in designated areas following specified procedures, not at machinery work locations, to reduce potential spillages. This area will be equipped with oiler separator. Treated water will be sent to a storage tank. According the quality and subject to MASEN authorization, this water could be reused for dust control and/or compaction soil. The water will be pumped to a truck tank in order to reduce dust or for cleaning. If the treated water can't be reused, it will be evacuated by an authorized operator.

Concrete cleaning

Wastewater from the cleaning of concrete discharging chutes that could include concrete waste shall be directed to a settling basin to retain water. Water free of sediments may be used to dust control and compaction soil according their quality and subject to MASEN authorization. Not reused water will be stored in waterproof tanks on waterproof areas and will be evacuated by and authorized operator

4.4.5 Solid waste in the construction phase and hazardous materials

Construction phase will produce various solid wastes described hereafter :

Non-hazardous wastes

Non-hazardous waste generated during the construction phase comprises:

- Solid waste assimilated as urban
  - Office equipment (paper / cardboard, etc.).
  - Food or drink containers and packaging.
  - Food scraps.
- Inert industrial waste
  - Falling metal
  - Glass
  - Plastic or polymeric materials.
  - Empty plastic containers.
  - Fiberglass.
  - Rubber and elastomers
  - Tyres.
  - Empty metal containers.
- Inert construction waste
  - The soil and the excavation rocks, the soil movements, etc.
  - Dried
  - Rubbles
  - Remains of concrete, lime and gypsum
  - Asphalt, tarmac and other tarred products at room temperature.

Hazardous waste

- Used oils and mineral oily substances.
- Grease.
- Oil/water or hydrocarbon/water, emulsions.
- Diesel oil / fuel oil
- Remains of the use of paint and varnish.

- painting residuals.
- Resin, latex, plasticiser products, glue.
- Absorbent, cleaning cloths and protective clothing.
- Liquids or sludge containing metal
- Soil, clay or sand (including sludge), which may be contaminated.
- Residuals of decontamination treatments.
- Sludge from wastewater filtration systems.
- Batteries and accumulators
- Remains of cleaning and / or storage transport tanks.
- Containers and packaging containing dangerous products (cleaning products, oil, grease, glue and paint, etc.)
- The remains of the selective collection of solid urban residues (ink cartridges, toner, unusable fluorescent tubes, batteries, etc.).
- Waste from infectious risk care activities (DASRI): Expired drugs, syringes, bloody bandages, plasters, gloves, surgical dressing, cutting and sharp remains, body fluids.

The different types of waste will be sorted, stored in containers or on adapted platforms (sealed, covered and equipped with retention bottoms). This waste will be disposed of by authorized operators and under environmentally friendly conditions.

Hazardous materials

- Explosive used for earthworks.

4.5 Use of resources and waste streams during operation

4.5.1 Electricity needs

In operation, the plant's power consumption is less than 5500 MWh in a typical year. The maximum power needs to provide electricity will be less than 10 MW.

4.5.2 Hydrocarbon needs

In the operation phase the hydrocarbons are needed for:

- The operation of the auxiliary HTF Heater which is necessary to maintain the temperature of the thermal oil in case of low temperatures (intermittent) In case of heater operation when the power plant doesn't operate), the needs are around 25.4 m^3 per week.
- The operation of emergency generators/firefighting pumps (intermittent), around 2m^3/year.
- The needs for vehicles used for operating (except cleaning) is 37m^3/year.
- The needs for vehicles used for cleaning is : 97 m^3/year for PV cleaning and 15m^3/year for CSP cleaning.

A hydrocarbon storage tank will be set up on site, the supply will be provided by a tanker truck. Considering the reduced operating time of the auxiliary HTF Heater and generators, the quantities stored will be small.

4.5.3 Heat transfer fluid needs

It is eutectic mixture of biphenyl and diphenyloxide.

In total, the plant will need about 570 tons of HTF for the filling of the circuit, with extra <1% / year.

4.5.4 Needs in molten salts

The molten salts will be composed of 60% Sodium Nitrate and 40% Potassium Nitrate.

A total of 26 920 tons of molten salts will be stored at the NOOR Midelt I plant. This initial volume of molten salts will be the same, and will remain so throughout the operating phase of the plant. No renewal or supplement is planned.

The planned storage allows to produce electricity during 5 hours.

4.5.5 Li-ion batteries – PV panels

The life of the storage system is 25 years. During this period the batteries may be replaced or added to meet the storage needs of the plant. End-of-life or defective batteries will be returned to the supplier for recycling.

4.5.6 The life of PV panels is 25 years. End-of-life or defective panels will be returned to the supplier for recycling. More details about dismantling are provided in the chapter 18.Water needs

The water for operation phase will be provided by the common tank on site constructed and managed by MASEN. Drinking water will be provided by dedicated tanks from Midelt city. Groundwater will not be used during operation phase.

Water balance and uses

The water requirements of the plant during the operation phase will be less than 70 000 m3 m^3 /year. The figure below shows the diagram of the different uses of water. 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.

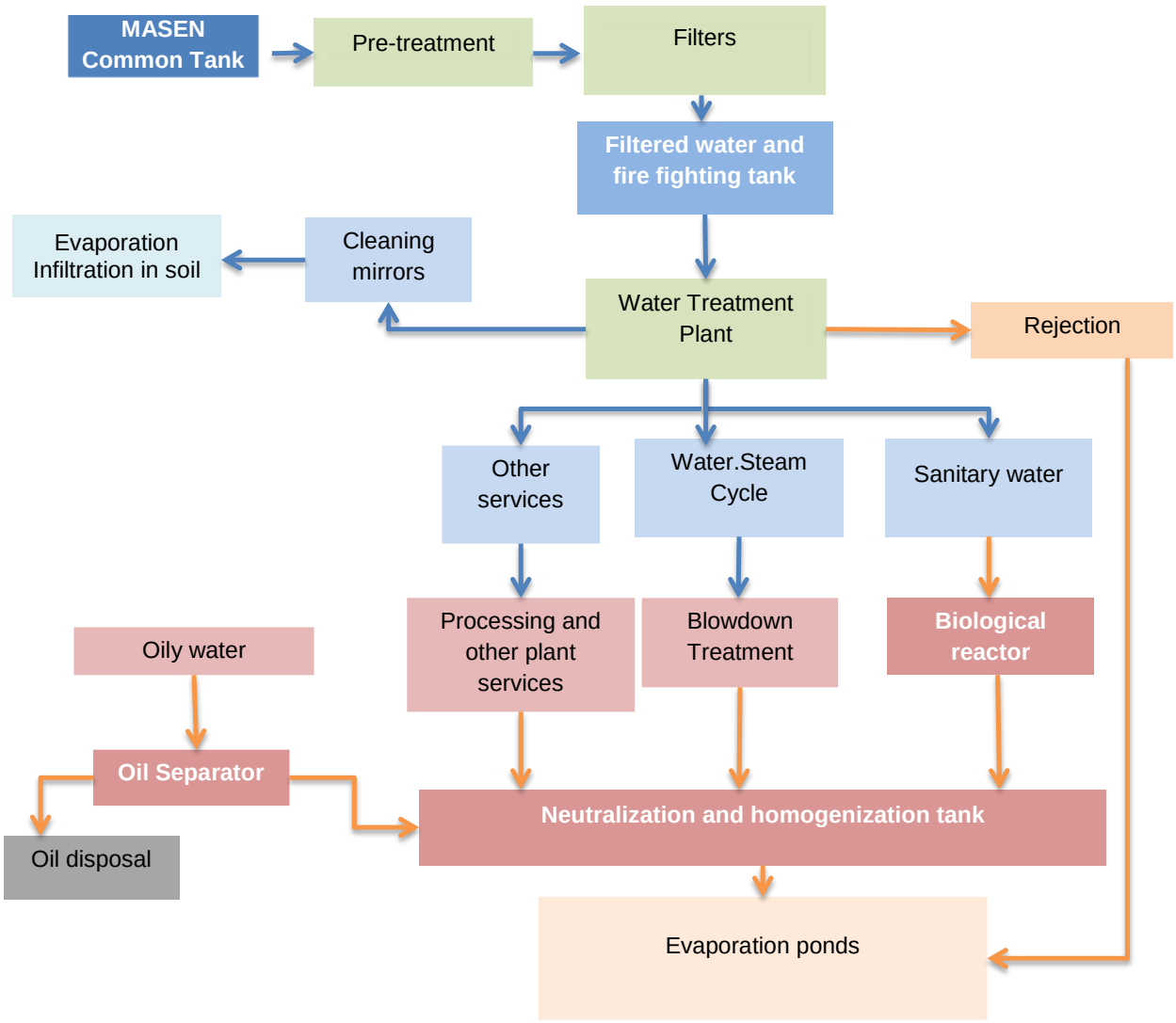


Figure 11 : Water use diagram

This water is mainly used to top up the steam cycle and wash the CSP. Photovoltaic panels are cleaned by a dry system that does not use water. (Dry brushes system).

The raw water from the MASEN storage tank is sent to a pre-treatment system including a filtration system and the use of chemicals. At the pre-treatment outlet, the water is stored in a filtered water tank for the operating uses of the plant and for the fire water (2050 m^3). The input flow rate of the raw water is about 52.9 m3 / hour.

Part of the pretreated water is sent to the demineralization unit. The demineralised water is used to feed the steam-water cycle and to produce the washing water of the CSP mirrors. Demineralized water is produced by an Reverse Osmosis system followed by deionization (EDI). Demineralized water is stored in the demineralized water tank (700 m^3).

The water balance is presented below :

- Raw water input dimension: 181.8 m3/d
- Output:
  - Mirrors cleaning: 9.6 m3/d (5,3%)

- Supplement for the water-steam cycle : 48.3 m3/d (27%)
- Service water : 61.0 m3/d
- Sanitary water : 3.7 m3/d
- Others intermittent consumers (washing the air condenser, RO flushing and miscellaneous): 19.8 m3/d
- RO1 reject: 30.7 m3/d
- Backwashing overflow (water not recovered): 8.2 m3/d
- Sludge: 0.3 m3/d

Cooling system

There are two cooling systems :

- Air Cooled Condenser system
- Auxiliary cooling (Fin fan) system

Air Cooled Condenser, consists of several modules of A-shape (or V-shape) steel frames supporting the fin tube bundles sitting on a raised steel leg system to allow proper forced draft air intake. The turbine exhaust steam flows through a main steam duct to the inlet of the fin tube bundles and is condensed by air moved by axial fans which are installed on support structures beneath the fin tube bundles. Fans are driven by electric motors coupled with speed reducing gearboxes. The fans are located within fan rings and move the cooling air through the fin tube bundles.

The auxiliary cooling source is of the "Fin Fan" type, i.e. cooled with air and does not consume any water. It is a closed water circuit used for the cooling of plant auxiliaries (i.e. pumps, compressors, etc.). The Fin Fan type exchanger is a non-contact heat exchanger that cools the water cooling circuit. The cooling water cools down while circulating in fin tubes, thanks to a forced air flow driven by fans.

These two systems allow to save water.

As a comparison, a steam cycle equipped with a wet cooling tower (instead of the air cooled condenser installed on this project) would consume about 385 t / h of raw water at full load for cooling under the reference conditions of the site (RSC), which equates, considering the 5 hours at 190 MW @Reference Site Conditions of operation at full load in a day, to an average daily consumption of 80 t / h continuously. The preservation of the water resource therefore imposes the dropping of this solution despite the potential gain in yield.

The choice of dry cleaning for photovoltaic panels also helps to reduce water consumption.

4.5.7 Wastewater

The sewage system will be designed to allow every effluent stream so that everyone can be treated appropriately according to its quality. The effluents that may occur at the plant are classified as follows:

- Sanitation of treatment equipment
- Sanitary wastewater
- Effluents that may contain oily / greasy residues from lubricated equipment
- Steam-water cycle purge water

The sanitation system will consist of:

- Collection network (separate collectors for every effluent stream)
- Buffer basin
- Oil separators
- Neutralization and homogenization Basin
- Evacuation network to the evaporation ponds
- Insights and other components related to the sanitation network
- Evaporation ponds

Sanitary water treatment

Sanitary water produced by the employees on the site will be treated in a dedicated water treatment system. The system will be designed according to a number of 30 people working on site, with a consumption of 125/p/day during operational phase.

The main stages of the sanitary wastewater plant design will be :

- A coarse screening system
- A biological rector :
  - Primary sedimentation chamber
  - Aeration chamber
  - Secondary sedimentation and sludge recirculation chamber.

Treated water will be sent to the neutralization/homogenization basin and then to the evaporation ponds.

Industrial water management in operation

Industrial effluents will be collected within the power block to an industrial water treatment plant. These waters will be neutralised, cleaned from oil and will then be sent to the evaporation ponds.

The industrial water treatment system includes:

- System for separating oils from water by coalescing plates;
- Chemical effluent treatment system to obtain a neutral effluent (pH> 7) before discharge;
- Quenching of hot effluents to limit the water temperature before discharge.

A volume of about 156 m3 will be sent to the evaporation ponds daily.

The evaporation ponds will have a volume of 2 x 15000 m^3. It will be connected to underground water networks. It will be sealed by a tarpaulin system and a leak detection system will be provided.

The quality parameters of the water sent to the evaporation ponds will comply with the recommended limits required in the MFS as follow :

Parameter	Recommended Limits
BOD5	25 mg/l
COD	125 mg/l
TSS	35 mg/l
Total Nitrogen Compounds (as N)	15 mg/l

Storm water management in operation

Drainage works are planned in all CSP and PV fields to evacuate surface water without risk of flooding for structures. Natural flows will be preserved as much as possible and ditches will be built around the roads.

- At the power block level, rainwater that may be in contact with oil will be cleaned from oil before being discharged into the evaporation ponds. This system will collect, among other things, rainwater that may be contaminated ;

4.5.8 Solid waste in operation phase

The solid waste generated in operation phase are:

Non-hazardous wastes

The different types of non-hazardous waste that will be produced are:

- Household and similar waste resulting from administrative activities and the presence of staff on the site. This waste will be produced in small quantities, only about 60 people will work on the site (around 30 workers simultaneously on site).

- Non-hazardous waste from industrial maintenance: plastics, metal, etc.

Hazardous waste

The hazardous wastes that will be produced are:

- Waste from the water treatment activity: activated carbon, sand, anthracite, filtration cartridge, reverse osmosis unit's membrane
- Waste from the industrial water treatment unit: sludge
- Waste from oil separators: sludge
- Waste from the HTF oil filtration unit: sludge
- Used Li-ion batteries
- Empty packaging of various products (oils, lubricants, etc...)
- DASRI – Infectious clinical waste

4.5.9 Hazardous materials

In operation phase the following products will be stored and used:

- Hydrochloric acid, sodium hydroxide, sodium hypochlorite, ammoniac, oxygen absorbent and phosphate, thermal oil.

4.6 Occupational health and safety risks

Activities carried out during the construction and operation phases present risks to the health and safety of employees.

Among risks during construction phase, we identify :

- the operation of heavy equipment and trucks,
- working at height,
- working in confined spaces,
- construction traffic,
- use of electrical devices,
- handling of hazardous materials
- and other hazardous activities.

Due to the nature of the activities being undertaken during construction phase, worker H&S is a key risk with the potential for accidents that may result in injuries and fatalities as well as lost man-hours.

In case of a base camp on the site, workers accommodations it will be compliant with IFC / ERDB guidelines for worker accommodation. It will meet health and safety requirements.

Among risks during operation phase, we identify :

- the operation of heavy equipment and trucks,
- working on electrical devices including high voltage,
- working at height,
- maintenance of high pressure pipework and vessels
- handling of hazardous materials.
- Noise
- Vibration
- Illumination
- Working Environment Temperature

- Fire and Explosions

A health and safety program will be established, put in place and maintained to cover the construction and operation stages of the plant. This program will include accident prevention at the workplace, training. More details are provided in chapter 17.

This program will be compliant with Moroccan regulations and IFC EHS guidelines.

4.7 Security measures

A security plan management will be implemented for any attacks on personnel, property and equipment. This plan will be compliant with applicable laws and standards will be ensured.

4.8 Construction schedule and employment

- In the construction phase: more than 1000 people for around 30 months for labour jobs but also, welders, assemblers, machine operators etc.
- In operation phase; around 60 people will operate and maintain the power plant.

4.9 Investment amount

The investment of the project is of the order of 800 MUSD.

4.10 Roles and responsibilities

The project company will set up an organisation and adapted means to ensure the environmental, social, health and safety management during the construction and operation phases.

The project company will designate an environmental health and safety officer who will oversee all environmental and social aspects of the project.

The company in charge of the design and construction as well as the company in charge of the operation will set up a health and safety environment department in charge of the following aspects:

- Health and security at work
- Environmental and social management

This department will be equipped with the human and technical resources necessary for the accomplishment of its activities.

5. Methodology

5.1 Introduction

The working methodology was applied by considering the Midelt I solar power station as a single plant with two components:

- A central component PV and
- A central solar concentrating component with cylindro-parabolic mirrors.

The impact assessment is carried out for both components, and any impacts between the two components are indicated whenever necessary.

5.2 Investigations for the baseline conditions

Document Review

The following project information has been reviewed within the course of this assessment:

Framework study of the environmental and social impacts of the NOOR Midelt project carried out by MASEN for the complex in 2016 Original document in French. All measures identified in the SESIA will be compliant with the recommendations and commitments in the FESIA.

Investigations for the baseline conditions

Forming an integral part of the SESIA, the baseline surveys provide a benchmark of the existing conditions by which the potential impacts of the NOOR Midelt I project can be assessed during the construction and operational phases.

The environmental baseline surveys carried out as part of the SESIA contain the following:

- Field survey on foot - July 2018;
- Baseline survey on biodiversity – March – April 2017;
- Baseline Air Quality Survey – July 2018;
- Surrounding noise control – July 2018;
- Soil sampling study July 2018

These surveys are described further in the relevant chapters.

5.3 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 project's site is the perimeter within property boundaries where the power plant will be implemented. The area is about 950 ha.

The close perimeter corresponds to a buffer of 500 m wide around the property boundaries of the project site. Within this perimeter, a detailed analysis of the environment will be conducted. This analysis includes the study of fauna / flora / habitats and the analysis of cadastral documents. 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). In this close perimeter, the elements mentioned below will be taken into consideration: the water resource, including streams and Oued Sidi Ayad, soil, fauna and flora, noise, etc.

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, particularly socio-economic impacts. Indeed, all or part of the inhabitants of the neighbouring douars (Agoudi is 10 km north-east project's site, Ahouli is 15 km south-east project's site) will be affected directly or indirectly by the project and the influence that it will constitute at the local level.

The remote study area is delimited by:

- Route RP 7320 eastwards from Midelt to the village of Ahouli included in the remote perimeter
- The city of Midelt
- RN13 from Midelt to about 2 kilometres before the junction with the RR 503
- The natural relief to the north and northeast, including the village of Agoudi

In this remote area as defined, the elements listed below will be taken into consideration:

- The water resource, including the watercourses and the Hassan II dam's impoundment;
- Traffic and transport;
- The main socio-economic elements.

The figure below shows the delimitation of the study area.

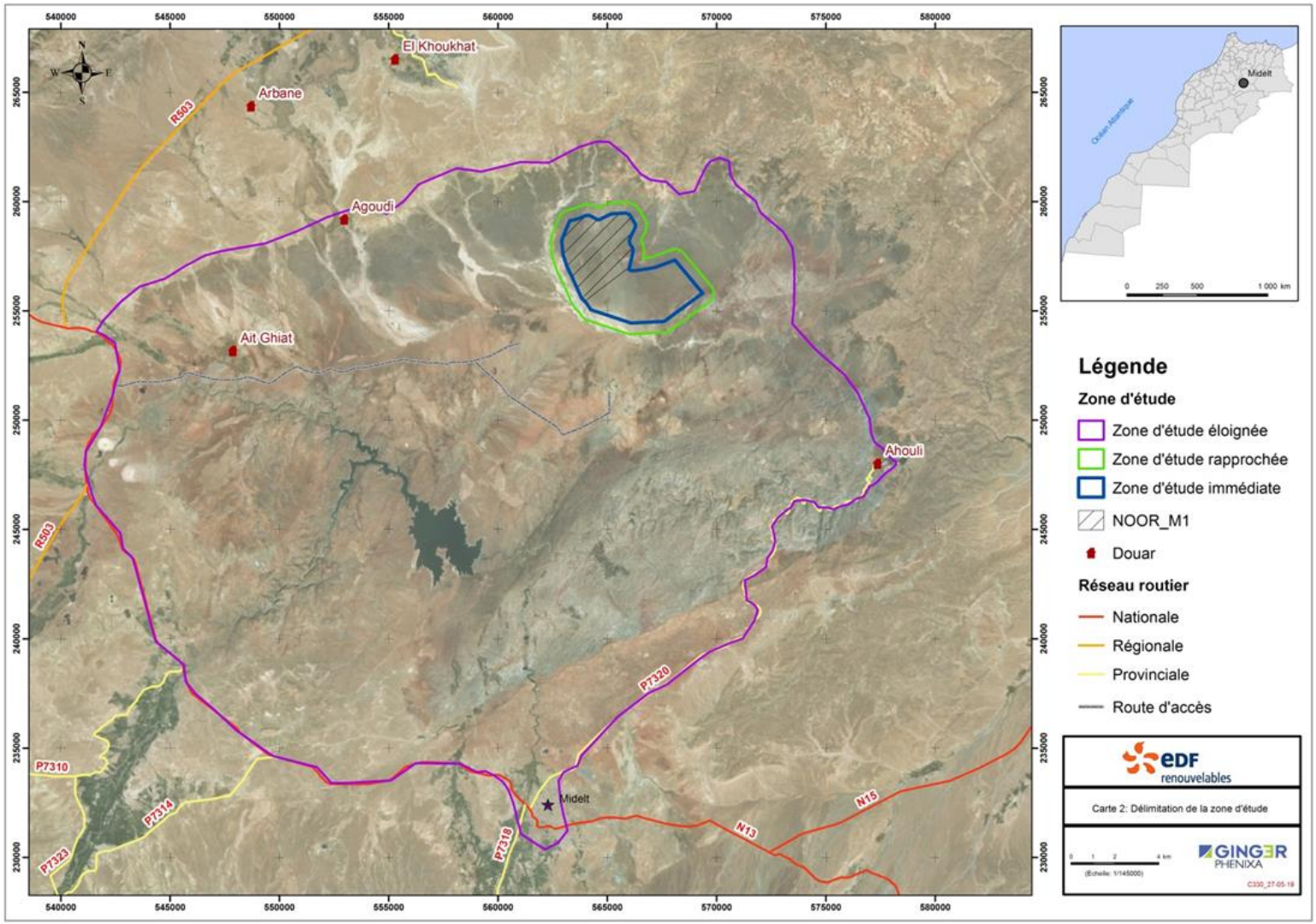


Figure 12 : Map of study area for the SESIA of Midelt I project

5.4 Impact Assessment Significance Criteria

In order to obtain a credible assessment of the environmental impacts, the valuation of an 'impact significance' for each identified impact needs to be a transparent, rigorous and objective process. The methodology used to assess the 'impact significance' is outlined below and follows the International Best Practices based on the assumption that the significance of an impact on resources or receptors is considered to be resulting from an interaction between three factors:

- The nature and magnitude of the impact or change;
- The characteristics of resources or receptors affected;
- The environmental sensitivity of these resources or receptors to change.

A three-step approach has been used to determine the significance of the environmental effects, and proceeds as follows:

- Step 1 – Identification and valuation of the sensitivity of the resource or receptor;
- Step 2 – Assessment of the impact's magnitude on the resource or receptor; and
- Step 3 - Determination of the impacts' significance.

The environmental value (or sensitivity) of the resource or receptor has been defined by using the criteria in the table below.

Table 13 : Environmental value of the receptor or resource

Value (sensitivity)	Description of value
Very high	High significance and rarity on an international scale and limited or no potential for substitution. The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports. Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).
High	High significance and rarity on a national scale, and limited potential for substitution. The receptor is closed to reaching its carrying capacity, so a further impact may lead to significant damage to the system that it supports. Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalised groups).
Average	High or medium significance and rarity on a regional scale, limited potential for substitution. The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point. Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas).
Low (or Lower)	Low or medium significance and rarity on a local scale. The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system. Locations or groups that show low vulnerability to the environmental impact under consideration (e.g. industrial areas).
Very low	Very low significance and rarity on a local scale. The receptor is not impacted and shows a very large spare carrying capacity. Impacts

Value (sensitivity)	Description of value
	are very unlikely to generate any noticeable stress in the underlying system. Locations or groups that show very low vulnerability to the environmental impact under consideration (e.g. industrial areas).

The existence of receptors that are legally protected (e.g. designated areas, protected habitats or species) will be taken into consideration for the assessment of the receptors' sensitivity.

The intensity of the impact is defined where possible in quantitative terms. The magnitude of an impact has a number of different components, for example: the extent of physical change, the level of change in an environmental condition, its spatial footprint, its duration, its frequency and its likelihood of occurrence where the impact is not predictable.

The criterion that has been used for assessing the magnitude of impacts includes the geographical scale of the impact, the permanence of the impact and the reversibility of the impacted condition. A brief description of the impacts' magnitude is provided in the table below.

Table 14: Impact intensity criteria

Impact intensity	Description of intensity
High	Negative: Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements. A major impact is usually large scale, permanent and irreversible. Positive: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of the attribute's quality.
Average	Negative: Significant impact on the resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. Moderate impacts usually extend beyond the site's boundary, and are usually permanent, irreversible or cumulative. Positive: Benefit to, or addition of, key characteristics, features or elements; improvement of the attribute's quality.
Weak	Negative: Some measurable changes in attributes' quality or vulnerability; minor loss of, or alteration to, one (maybe more) key feature(s), function(s) or element(s). Minor impacts are usually only noticeable onsite and are temporary and reversible. Positive: Minor benefit to, or addition of, one (maybe more) key feature(s), function (s) or element (s); a beneficial impact on the attribute or a reduced risk of negative impact.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

In addition to the factors outlined in the table above, the possibility of any standards being breached will be taken into consideration in the determination of the impact's magnitude.

The significance of effects is a combination of the environmental value (or sensitivity) of a receptor or resource and the magnitude of the project's impact value (change).

5.5 Different phases assessment

According to best environmental assessment practice, the environmental assessment must cover the entire life cycle of the project including the design, construction, operation and decommissioning phase.

The decommissioning phase of the project has only been discussed in general terms since the property will change once the power purchase agreement (PPA) will have ended after 25 years. As a result, ownership of the plant will be returned to MASEN at the end of 25 years and the activities related to the decommissioning of the plant will be under the responsibility of the future owner.

The identification of decommissioning activities can be specified at the end of the plant's life cycle, taking into account any technological advances in this type of equipment.

Measures in the phase of decommissioning are presented in chapter 18.

5.6 Cumulative impact assessment

At this stage, no large-scale project development likely to have a cumulative effect with the NOOR Midelt I project has been reported by municipalities and local authorities. It should also be noted that site 2 of the Noor Midelt tender was not awarded by Masen.

6. Consultation process

In order to comply with the guidelines of the lenders, public information meetings must be conducted. The process started with the completion of the public inquiry according to the law 12-03 and a first meeting of public consultation of presentation of the FESIA.

6.1 Public Inquiry under Law 12-03

The public inquiry carried out under Law 12-03 was conducted from June 30 to July 20, 2015.

The FESIA was presented to the CNEIE on 8 October 2015 and environmental acceptability was pronounced on 1st December 2015 at the second CNEIE meeting.

6.2 First public consultation

A first public consultation meeting was held on March 10, 2016 in Midelt, bringing together the various stakeholders identified on the project:

- Representatives of ethnic communities involved in the project (Ait Oueflla, Ait Rahou Ouali and Ait Massoud Ouali Ennajil) and Ait Ben Yacoub concerned by the proximity of the project
- Representatives of the rural municipalities of Zaïda, Ait BenYacoub and Mibladen and the neighbouring douars of the site (Agoudim, Ait Ghiat, Ahouli, Ait Ben Yacoub, Mibladen, Zaida and Midelt);
- Representatives of civil society: development associations, environmental and women's associations, cooperatives, etc.;
- Academics
- Representatives of the external services of the province of Midelt (Equipment and transport, water and forests, water basin agency, ONEE etc.)

During this meeting, the various stakeholders were informed about the project and its possible socio-economic impacts were assessed within the framework of the SESIA. A complaint management mechanism was also presented.

6.3 Second public consultation

A second public consultation will be held to present the results of the SESIA to the various stakeholders. This meeting will be held once the developer has been designed preferred bidder by MASEN at the end of the bidding process. This meeting will need to be expanded to ensure that all stakeholders are informed. Newspaper publications will be made to inform the meeting. During the meeting, a presentation of the project as well as the main impacts and measures will be carried out. An exchange of questions and answers will be held with the different participants.

The results of this public consultation will be incorporated into the final document.

7. Air Quality

7.1 Introduction

This chapter identifies the existing air quality conditions on the project's site and the potential impacts that may occur as a result of the construction and operation of the proposed NOOR Midelt I Project.

Impacts of poor air quality affect human health, ecosystems and vegetation.

7.2 Methodology

This study has been undertaken based on the following:

Initial identification of the relevant national and international standards and requirements relating to air quality during the construction and operation phases (included in the legal and institutional section of this SESIA);

An assessment of the potential construction and operational impacts on the possibility to generate air pollution;

Mitigation measures in light of the results of the impact assessment and the residual impacts predicted on receptors outside the site and workers onsite.

Basic information on the existing air quality on-site has been and / or is being compiled with the data collected through field visits. A campaign to measure the air and dust quality was realized in July 2018. The purpose is to establish a benchmark for the parameters associated to the construction phase of the proposed plant, and will therefore be used for evaluation purposes..

7.3 Baseline conditions

7.3.1 Air quality - reference situation

The average wind speed at the Midelt site is around 14km / hour with a dominant western direction (Source: MASEN data, hourly measurements in 2014 and 2015). This average speed corresponds to a light breeze. During 55% (year 2014) to 80% (Year 2015) of the time the winds are lower than 14km / h.

The project will be built in a solar complex where solar power plants are planned, but not yet built. As a result, dust and other parameters related to air emissions will only be present in the air at the start of construction works. Air emissions will come from all vehicles and machines included excavators, graders, trucks, generators but also all vehicles involved in the supply of inputs and removal of wastes..

Otherwise, no point source of industrial emissions is located in the project area. The closest non-point source is that of vehicles travelling on the N13, located less than 10 km west of the NOOR Midelt I power station and the road for access to the site.

Given the potential atmospheric emissions during construction and operation (presence of auxiliary HTF Heater), the air quality characterization parameters adopted for the reference state are:

- PM10 dust. The measurement campaign was carried out on 4 points for the site of Midelt I with for each point a continuous measurement over 48 hours. The campaign ran from July 2 to July 18, 2018 realized by the laboratory GEOTECHMED.
- SO2, NOX and BTEX. Measurements were made from passive tubes (from the laboratory PASSAM) that allow average values equivalent to an average annual value. The exposure of passive tubes was carried out from July 18 to July 31, 2018.

The location of the measurement points is shown in the figure below:

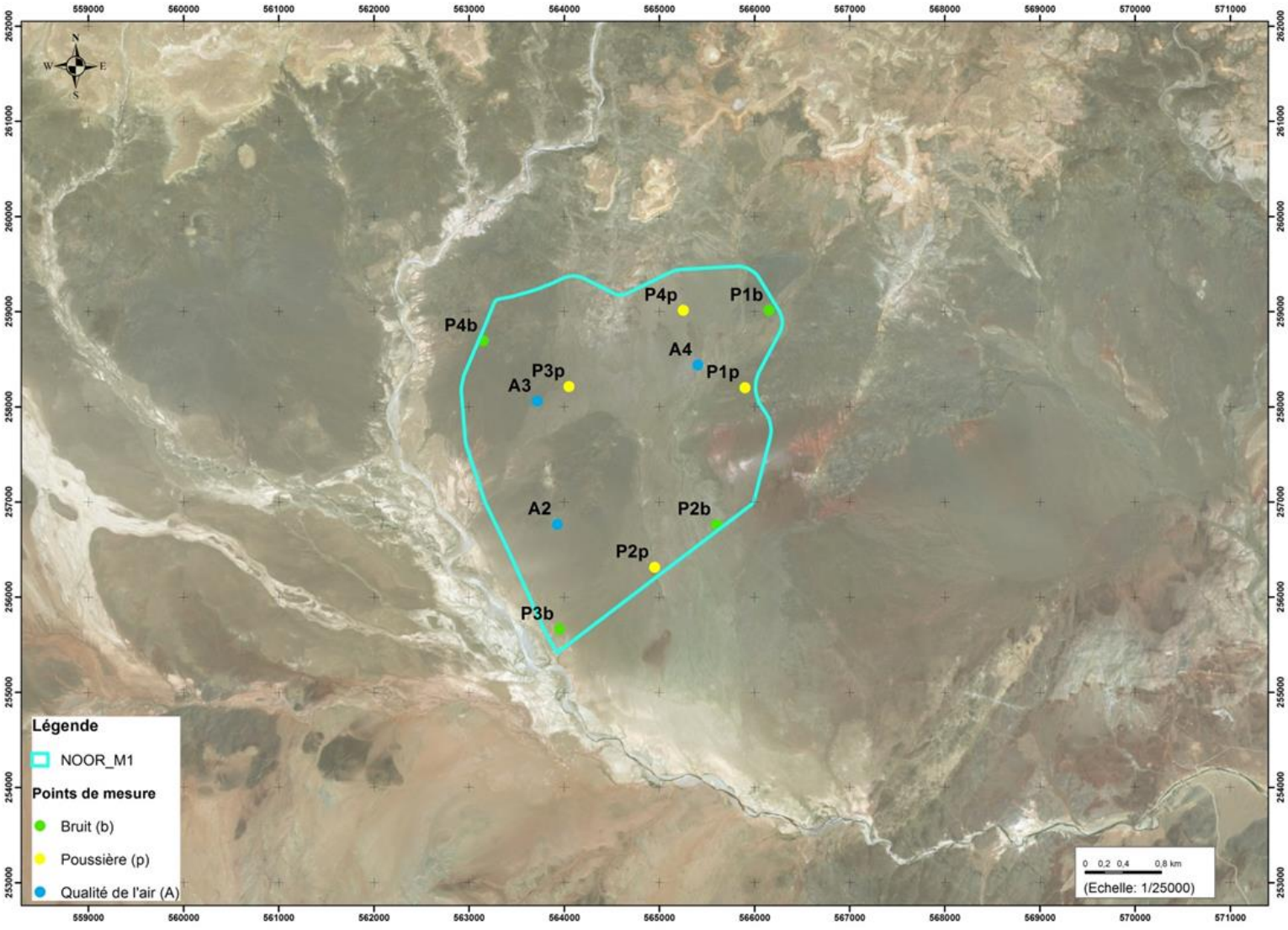


Figure 13 : Localisation of points measured for dust, air quality and noise on Midelt I site

7.3.2 Analytical results

Table 15: Results of the air quality analysis (dust in µg/m3)

Parameter	General SFI ESS Guidelines / WHO Guidelines (guide line value for 24 hours)	Morocco threshold (value for 24 hours)	Results	
PM_{10}	150 (Provisional target 1)	50 µg/m3	P1p	31,07
	100 (Provisional Target 2)		P2p	19,7
	75 (Provisional Target 3)		P3p	15,7
	50 (Guideline)		P4p	17,5

All the results obtained at the points of measurement P1p, P2p, P3p and P4p are lower than the general limit values (50µg / m3). The air quality is considered good.

On the other hand, measurements of air quality through the following parameters were made on 4 points spread over the territory of the NOOR Midelt I plant (see Appendix 1, and figure below).

Table 16 : Air quality analysis results – NOOR Midelt I - –July 2018

Parameter	Nature of the value	Guideline value (moroccan regulation in µg/m³	Results en µg/m³
Sulfur dioxide (SO2) µg / m3	Limit value for ecosystems protection	20 annual average.	P1 : 3.5 P2 : 0,7 P3 : 1.3 P4 : 1.3
Nitrogen dioxide (NO2) µg / m3	Limit value for Health protection	50 annual average	P1 : 3.5 P2: 2.4 P3: 1.7 P4: 1.3
	Limit value for Flora protection	30 annual average	
Benzene (C6H6) µg / m3	Limit value for Health protection	10 annual average	P1: < 0.4 / 1.6 P2: 0.4 P3: 0.4 P4: 0.4

For the other BTX parameters measured in the context of the present SESIA (Toluene, Ethylbenzol, p-Xylene, m-Xylene and o-Xylene) and whose Moroccan law has not yet set regulatory thresholds, the values recorded are < 10 µg / m3, except for Toluene in sample P1 where the two values recorded are: 24.4 and 2 µg / m3

7.4 Sensitive receptors

In accordance with good international practice, the assessment of sensitive receptors should extend up to 500 m from the site boundary for both human and ecological receptors (Holman et al, 2014), due to the typical distance of dust dispersion. The assessment of other pollutants (e.g. gaseous exhaust fumes) will require a smaller area of assessment (~ 200 m) as suggested by Bignal, K. et al, 2004, before emissions are indistinguishable from background concentrations.

For the Midelt I site, the sensitive receptors are first and foremost the employees located at the construction and operating sites, the ambient air quality in general and the potential users of the access road to the site. Sensitive receptors are located in the immediate and close area.

7.5 Impacts and measures during construction phase

7.5.1 Impacts

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.

The main sources of dust and anthropogenic emissions on the project site during construction will be:

- Excavation and earthworks, e.g. ground movements, levelling (excavation and back-fill), trench preparation for the water line;
- Vehicle movements over unpaved surfaces;
- Movement of vehicles to and from the site (deliveries..)
- Dust from uncovered stockpiled powdery materials or trucks;
- Emissions (e.g. NOx, SOx and CO) and particles from vehicles, diesel generators, heavy and other mechanical equipment; and
- Stored VOCs and other volatile hazardous materials.

Dust due to site preparation

Dust resulting from construction activities typically comprises large diameter particles, which settle rapidly and close to the generation source, e.g. within 500 m under low/calm conditions. Impacts can also be caused by dust emissions when trucks are not properly covered, or when vehicles move on unpaved surfaces. Explosion used for some earthworks will also produce dust.

The significance of dust impacts from construction works is largely based on the direction of the wind and the proximity of sensitive receptors. The prevailing wind direction on the project area may vary between seasons and could therefore disperse dust in almost any direction.

Gaseous and particulate emissions from equipment and vehicles

Vehicles and equipment will cause the emission of gases and particles into the air due to the burning of fossil fuels. Such vehicles and equipment include, but are not limited to: Excavators, Graders, Trucks, Generators and also vehicles involved in the supply of inputs and removal of wastes. It should be recalled that MASEN will provide a 22kV power line which will join the common area of the Midelt complex. The EPC will have to connect to this line once available and the connection made. It is likely that the line will be available quickly during the construction phase, therefore the use of diesel generators for construction purposes will be limited only to the construction phase until the availability of the 22kV power line. No fossil fuel can be used for electricity production once the 22kV line is available.

Air quality impacts relating to the use of the above are generally small. Indeed the peak number of trucks which will supply the equipment to the site and cross some towns according the itineraries, during construction phase is 75/day. If there is no base camp on site, the peak number for cars and buses is 150/day for workforce transportation. These vehicles will mainly move to Midelt. Compared to the existing traffic which is 4 917 vehicles/day on RN13, the impact is minor. Equally, the equipment used on site is relatively new and well maintained, and as a consequence these impacts are unlikely to occur. Where there are multiple vehicles or equipment in operation, the potential for cumulative impacts resulting from the combination of these emissions increases.

Volatile organic compound (VOC)

A small amount of fuels, paints, solvents and other volatile substances is necessary during the construction phase. If not properly contained, these substances can potentially cause the dispersion of volatile emissions into the atmosphere. However, only small volumes of these substances will be needed, and these will be stored in the lay down area. As a result, the potential impacts are limited to the immediate area.

The following table summarises the predicted impact levels from the various sources on the nearest sensitive receptors.

Table 17 : Air Quality - Significance of impacts during construction phase

Impact	Receptor	Sensitivity	Significance of the impact
Dust from earthworks and site activities Medium intensity	Air Quality (Gaseous and Particulate)	Weak	Negligible to Minor
	Construction employees	High	Minor to Moderate
Dust from Vehicles (power plant including CSP and PV fields and power line corridor) Low intensity	Air Quality (Gaseous and Particulate)	Weak	Negligible to Minor
	Construction employees	High	Minor to Moderate
Atmospheric emissions from vehicles (including (power plant including CSP and PV fields and power line corridor) Low intensity	Air Quality (Gaseous and Particulate)	Weak	Negligible to Minor
	Residents - Road Transportation	Weak	Minor
	Construction employees	High	Minor to Moderate
VOCs and other hazardous volatile compounds (power plant including CSP and PV fields and power line corridor) Low intensity	Construction employees	High	Minor to Moderate

7.5.2 Mitigation measures

An air quality monitoring programme will be implemented as described in the ESMP.

Table 18 : Air Quality – Mitigations measures in construction phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Dust production due to earthworks and site activities and vehicle dust (NOOR Midelt I power plant and power line corridor)	Site preparation and, levelling will be undertaken during periods of low winds when possible (<15 km/h) (most of the time	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Powdery materials will be covered as much as possible.	EPC and Subcontractors	As soon as the works start and throughout construction period.	Included in the contract No specific additional cost
	Dusty material stockpiles will only be located onsite and away from the site boundaries to reduce dust outside the site.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered to avoid any loss while moving forward. Water spraying on roads is also recommended to minimise the dust generated from the vehicles and trucks	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Powdery materials (e.g. cements) will be stored and transported in sealed containers.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	No burning of waste or other materials will be allowed on site	EPC and	As soon as the works	Included in the

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
	during the construction phase.	Subcontractors	start and throughout construction period	contract No specific additional cost
	Undertake daily visual assessment of dust levels and take actions (dust suppression) to reduce emissions, when they are identified as excessive.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Transport of uncovered powdered loads (materials and waste) is strictly forbidden.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
Gaseous and particulate emissions from vehicles (NOOR Midelt I Power plant or power line corridor)	On-site / off-site speed limits are included in the Road safety and traffic section of this SESIA. In addition to road safety, these limits will help reduce exhaust emissions resulting from traffic movements.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Efficiently manage deliveries of equipment/installation to the site, to reduce the number of trips.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
	Minimise exhaust fumes and particles emitted from trucks and vehicles by ensuring the use of vehicles in good condition. Vehicles entering the site for the first time will be inspected for their integrity and where necessary will not be permitted to enter the site. Vehicles will be turned off while waiting on site to minimise gas emissions	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
VOCs and other fugitive emissions	Hazardous materials stored and used on site with potential gas emissions (e.g. Volatile organic compounds) will be located in well-ventilated, secured and low-risk areas	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
				additional cost
	Fires and material burning is prohibited on the project's site.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost
General	Personal Protection Equipment will be provided to all employees when necessary. Special attention will be given during site preparation and other activities likely to cause significant levels of dust.	EPC and Subcontractors	As soon as the works start and throughout construction period	Included in the contract No specific additional cost

7.5.3 Residual Impacts

Following the implementation of an appropriate CESMP with the mitigation measures (which will at least include the mitigation measures outlined above), the residual impacts are expected to be a temporary/short-term duration and of minor negative significance.

7.6 Impacts and measures during Operation phase

7.6.1 Impacts

No significant impact is expected on the quality of the air for the power line.

Exhaust gas impact (Except VOC)

Generally, solar power plants by their very nature are zero emission facilities since they use renewable and clean sources to generate power. The power plant will have a positive impact on the regional air quality, as it will prevent CO2 from being emitted unlike a conventional fossil fuel power plant.

The main air emissions would be :

- HTF Heater
- Diesel Generators

Others air emissions would be :

- 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 (PM10 & PM2.5), nitrogen oxides, sulphur dioxide and BTEX. Adequate protection measures must be presented.

Auxiliary HTF Heaters would operate only during winter outage periods (few hours from time to time) and at least once time per year for maintenance before winter time.

Emergency Diesel generator would operate only in case of grid blackout (very limited hours).

Therefore, impact on air quality during the operation phase will result from the intermittent use of fossil fuels for the operation of the auxiliary HTF Heater for the CSP parabolic plant component in case of very low temperatures or emergency electricity. The air emissions will be very low.

The following table identifies potential sources of air emissions, which are intermittent and limited to a few hours per year. An appropriate control of these emissions will be carried out according to the regulations in force.

Table 19 : Air emissions of the CSP parabolic trough component

Sources of production	Operation system	Potential polluants
Auxiliary HTF Heater	Few hours per year	NOx, SOx, CO,PM
Fire system diesel pump	Only in case of power failure	NOx, SOx, CO,PM
Fire system diesel pump	1 hour per month (test)	NOx, SOx, CO,PM

Emissions levels will be very low given the very small number of hours of operation.

Table 20 : HTF Heater Exhaust Gas

Pollutant	Emission Rate (g/s)	Chimney Height (m)	Chimney Diameter (m)	T (°C)	Exit Velocity (m/s)	Nb hours per year	Total/year (estimated maximum value)
CO	**CO:** 0.1096 g/s	21 m	0,63 m	220 ºC	16 m/s	maximum expected possible value (several outage days) 38 hours	15 kilos/year
NOx	**NOx:** 0.493 g/s						67,4 kilos/year
SO2	**SOx:** 0.548 g/s						75 kilos/year
PM10	**PM:** 0.1096 g/s						15 kilos/year

VOC (Volatile Organic Compound)

VOC emissions will come from HTF system. Main emissions would be from activated carbon filter (Ullage system vent) and also non-point source emissions will occur at the piping network (pipes joins) of the HTF, with benzene as the primary pollutant.

Daily venting will be required over the duration of the start-up operation and during HTF heating operation, being the duration of these venting vents quite limited in time. The VOC emissions would be more important for start-up case. Daily venting over the duration of the start-up operation, being the duration of these venting vents quite limited in time, can be preliminarily estimated in 30 min/day. The start-up operation is the worst case for level of VOCs emissions.

The heat transfer fluid (HTF) used by the CSP plant, although stable, undergoes a certain rate of degradation over time due to exposure to heat, resulting in the production of chemical compounds resulting from this degradation, considered as residues. When the concentration of these residues in the oil exceeds a certain threshold set by the supplier of the product, these residues must be separated from the oil to maintain its properties.

These residues are thus separated and eliminated by a process of condensation and purification of the system called Ullage. This system includes vent to the atmosphere. The system reduces upstream the quantities sent to the vent. Downstream, the VOCs are filtered on carbon filters before being sent to a safe zone. Benzene and phenol are the main VOCs emitted by the HTF.

Then , except start-up operation, Ullage system venting will operate only in case of the HTF degradation. It is very difficult to estimate the duration and frequency these vents will take place, as they depend on how the plant is operated throughout plant's lifetime and how the HTF is degrading or not, therefore a daily occurrence and duration of these episodes is difficult to provide, if there is no degradation there will not be any need for venting and no daily occurrence. COVs emissions during these vents are lower than during start-up operation. An estimation of 10 minutes a day once the HTF is starting to degrade can be considered.

VOC Flow

Table 21 : VOC Flow Inlet and Outlet (preliminary estimations – start-up operation)

CASE START-UP	
VOC Inlet Flow (kg/h)	VOC Outlet Flow (kg/h)
63,44	6,34

Table 22 : VOC Flow Inlet and Outlet (preliminary estimations – In case of HTF degradation)

CASE of HTF Degradation	
VOC Inlet Flow (kg/h)	VOC Outlet Flow (kg/h)
3,84	0,38

VOC Mass balance

Table 23 : VOC mass balance (preliminary estimations – start-up operation)

CASE START-UP						
Stream to filter						
	Intlet			Outlet		
	Flow (kg/h)	T (ºC)	P (bara)	Flow (kg/h)	T (ºC)	P (bara)
Nitrogen	3622,06	40	1,15	3622,06	40	ATM

CASE START-UP						
Stream to filter						
	Intlet			Outlet		
	Flow (kg/h)	T (ºC)	P (bara)	Flow (kg/h)	T (ºC)	P (bara)
Benzene	50,11			5,01		
Phenol	9,21			0,92		
Biphenyl	0,51			0,051		
Diphenyl Oxide	3,61			0,36		
DibenzoFuran	1,1E-03			1,1E-04		
O-Terphenil	1,2E-05			1,2E-06		
P-Terphenil	2,0E-05			2,0E-06		
Total Flow	3685,50			3628,40		

Table 24 : VOC mass balance (preliminary estimations – in case of HTF degradation)

CASE HTF degradation						
Stream to filter						
	Inlet			Outlet		
	Flow (kg/h)	T (ºC)	P (bara)	Flow (kg/h)	T (ºC)	P (bara)
Nitrogen	213,19			213,19		
Benzene	3,39			0,34		
Phenol	0,34			0,03		
Biphenyl	0,01			0,001		
Diphenyl Oxide	0,11	40	1,15	0,01	40	ATM
DibenzoFuran	2,2E-05			2,2E-06		
O-Terphenil	1,1E-07			1,1E-08		
P-Terphenil	1,9E-07			1,9E-08		
Total Flow	217,03			213,58		

- **Venting frequency and conditions:**

During the day and under normal operating conditions, venting of nitrogen in the HTF Expansion Vessel will not happen.

During daily starts up, and also as a consequence of HTF heating operation (when there is no sun) during salts thermal storage system unloading, some venting of the gaseous phase from the HTF Expansion Vessel will be necessary. Daily venting will therefore be required over the duration of the start-up operation and during HTF heating operation, being the duration of these venting vents quite limited in time. The estimated duration is about 30 minutes/day.

Table 25 : Ullage system exhaust gas

Pollutant	Emission Rate (g/s) Average value	Chimney Height (m)	Chimney Diameter (m)	T (°C)	Exit Velocity (m/s)	Hours/day	T/year
Benzene	< 0,00067	3	0.206	40	1.58	30 minutes/day	0,44 Kilos/year

The treatment system will respect the VOC emission values listed below:

- Benzene: 5 mg / m3;
- Phenols, cresols and xylols (in the form of phenols): 10 mg / m3;
- Total Class A VOC (VOC less hazardous than benzene and phenols included in the Montreal Protocol): 20 mg / m3 if the total mass flow exceeds 100g / h (expressed as individual VOCs);
- Total VOC Class B (VOC less hazardous than Class A), such as 75 mg / m3 if the total discharge rate exceeds 5 tons / year or 2 kg / h, the lowest (expressed as carbon).

The activated carbon filter efficiency is 90%.

Modelling results

Burgeap (Phenixa parent company) carried out a modelling of atmospheric dispersion of pollutants was carried out in June 2019. Air quality modelling study is Appendix 7.

The modelling of atmospheric dispersion of pollutants was carried out with ADMS 5, software developed by the CERC (Cambridge Environmental Research Consultant Ltd).

ADMS 5 is considered by INERIS and US-EPA as part of the new generation of atmospheric dispersion models of the Gaussian type (2nd generation). ADMS has also been validated nationally and internationally: model / measurement comparison, publications in international scientific journals. Its main technical features are described in Annexe 7.

The concentration of pollutants have been calculated at the site boundaries but also at some sensitive receptors located in the study area, as shown in the figure hereafter.

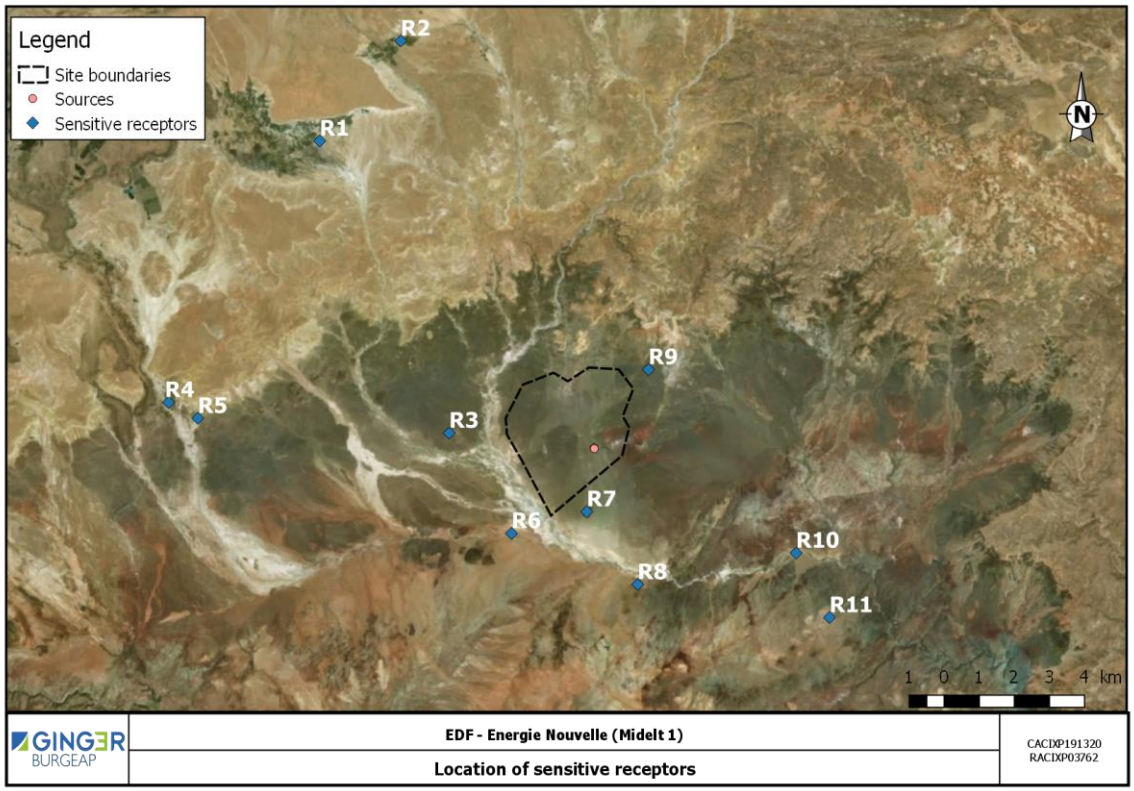


Figure 14 : Location of sensitive receptors for air quality

In order to identify if the expected air quality is compliant with Moroccan regulations, the modelling calculated annual average concentration as percentile concentration depending on the pollutants.

Results for annual average

Annual average concentrations were calculated in the study area for two pollutants (NO2 and benzene) (Figure 15 and Figure 18). The results are :

- pollution levels are generally very low over the whole area. The higher at the site boundaries is lower than 0,001 µg/m3 for NO2 and 0,002 µg/m3 for Benzene
- the largest impacts are located in the direct environment of the two pollution sources, within a radius of 280 m;
- The maximum concentration calculated at the site boundary remains below 0,02% of the regulatory values of NO2 and benzene.

The impact of the project's emissions on pollution levels in the study area is negligible. This is confirmed by the concentrations calculated at the level of the receptors R1 to R11 (following Table). The latter being <0,001 µg/m3, whatever the receptor.

Table 26 : Modelled annual average concentrations

Receptors	NO_2	Benzene
	Average annual concentration (µg /m^3)	
R1	< 0.001	< 0.001
R2	< 0.001	< 0.001
R3	< 0.001	< 0.001
R4	< 0.001	< 0.001
R5	< 0.001	< 0.001
R6	< 0.001	< 0.001
R7	< 0.001	0.001
R8	< 0.001	< 0.001
R9	< 0.001	< 0.001
R10	< 0.001	< 0.001
R11	< 0.001	< 0.001
Maximum value at the site boundaries	< 0,001	< 0,002
Regulatory value (Moroccan regulation)	**50**	**10**
IFC guideline	**40**	**-**

In conclusion, the average annual concentrations for NO_2 and benzene at the receptors' level and within the project boundaries are well below the limit values. The project's emissions will have a negligible impact, the concentrations are less than 0,02% of the regulatory value for $NO_2$and benzene at the site's boundaries.

Results for percentile analysis :

Percentile concentration were calculated in the study area for the following pollutants (Figure 16, Figure 17, Figure 19, Figure 20) :

- NO_2 - hourly percentile 98;
- SO_2 - daily percentile 99.2;
- PM10- daily percentile 90.4;
- CO - daily maximum of the moving average over 8 hours.

Table 27: Modelled percentiles

Receptors	P99.2 daily SO_2 ($\mu g/m^3$)	P98 hourly NO_2 ($\mu g/m^3$)	Daily maximum of moving averages over 8-hrs CO (mg/m^3)	P90.4 daily PM_{10} ($\mu g/m^3$)
R1	0.013	0.056	< 0.001	0.003
R2	0.007	0.034	< 0.001	0.002
R3	0.049	0.164	< 0.001	0.009
R4	0.015	0.057	< 0.001	0.003
R5	0.016	0.056	< 0.001	0.003
R6	0.054	0.201	< 0.001	0.010
R7	0.084	0.419	< 0.001	0.019
R8	0.023	0.024	< 0.001	0.004
R9	0.047	0.196	< 0.001	0.008
R10	0.023	0.075	< 0.001	0.004
R11	0.015	0.042	< 0.001	0.003
Maximum value at the site boundaries	<0,5	<2	<0,001	<0,2
Regulatory value (Moroccan regulation)	**125**	**200**	**10 mg/m^3**	**50**
IFC guideline	**125**	**200**	**-**	**50**

In conclusion, the percentiles calculated for all compounds at the receptors' level and within the project's boundaries are well below the limit values. The impact is located in a restricted area and contained within the boundaries of the site. Concentrations, pollutant by pollutant, reach in the site's boundaries:

- CO, <0.1% of the regulatory value;
- PM_{10}<0,2% of the regulatory value;
- NO_2, 1% of the regulatory value;
- SO_2, 0.25% of the regulatory value.

The figures below present all the results.

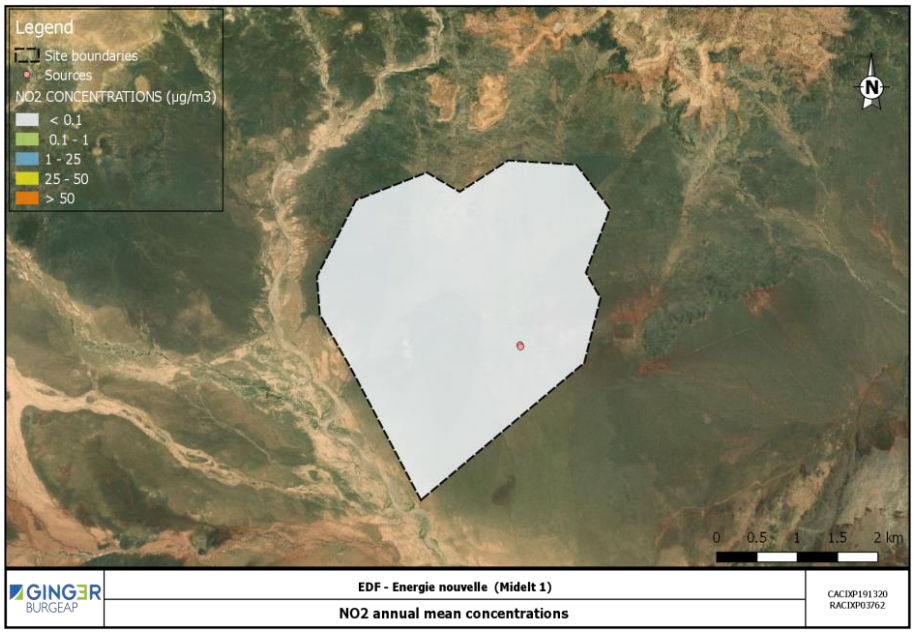


Figure 15 : NO2 annual average concentrations

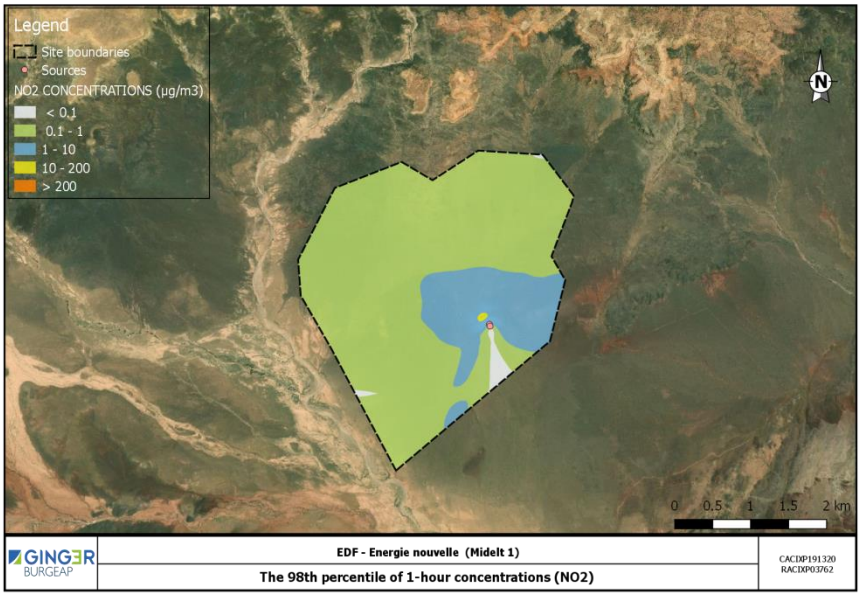


Figure 16 : the 98th percentile of 1 hour concentrations (NO2)

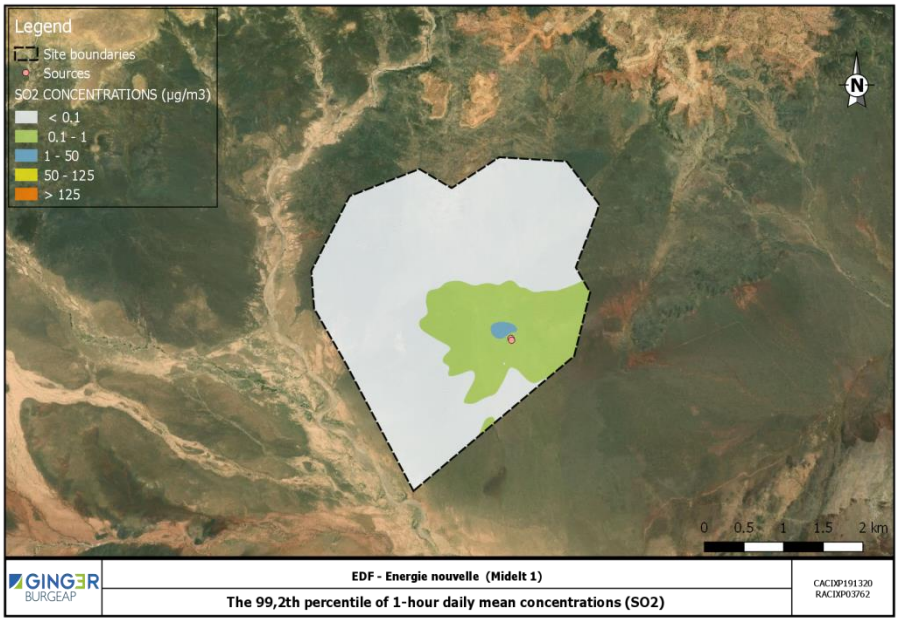


Figure 17 : the 99,2th percentile of 1 hour daily average concentrations (SO2)

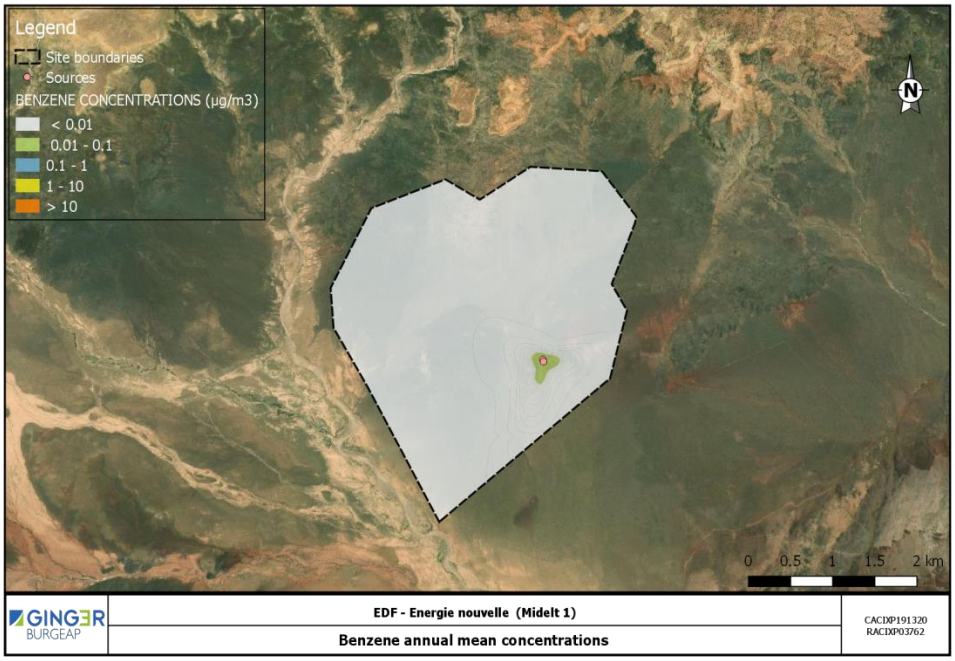


Figure 18 : Benzene annual average concentration

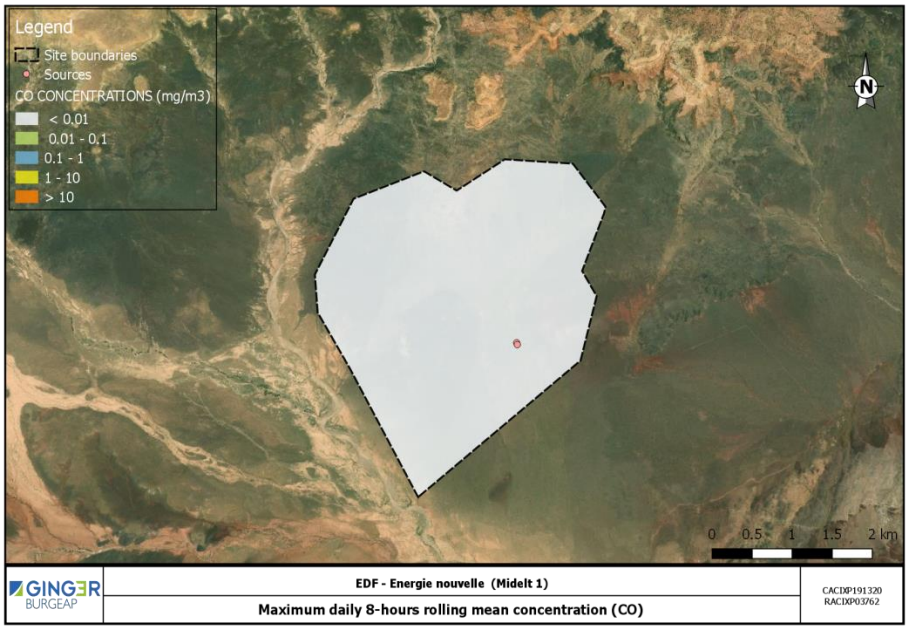


Figure 19 : Maximum daily 8 hours rolling average concentration (CO)

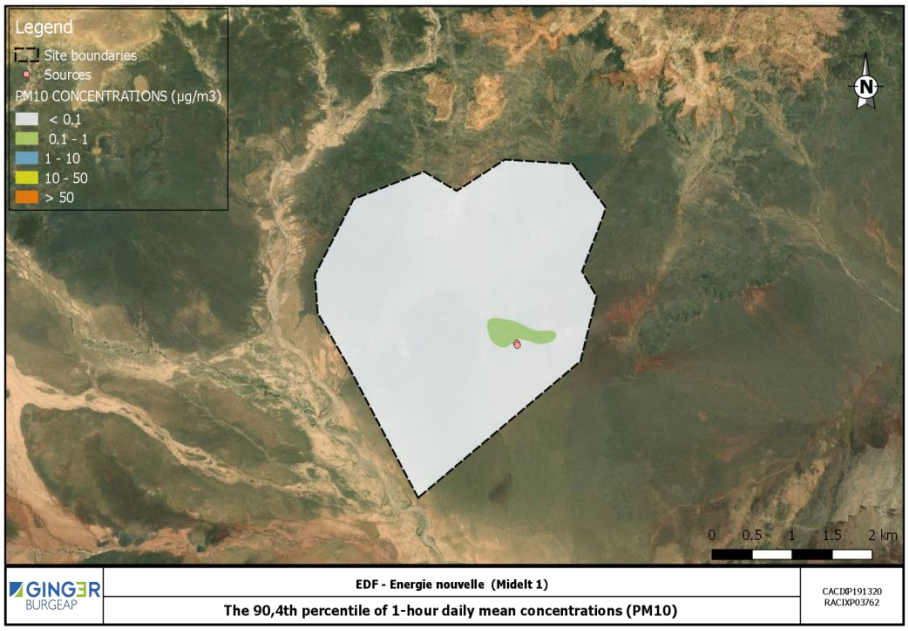


Figure 20 : The 90,4th percentile of 1 hour daily average concentration (PM10)

Conclusion

This study focused on the assessment of the air quality impacts of channelled emissions from the Noor Midelt solar project located about 20 km north of the city of Midelt in Morocco. The approach adopted here is a "screening" of the pollution levels calculated in the project area, the purpose of which is to provide a first diagnosis of the potential impacts at the site boundary with respect to Moroccan regulations and IFC guidelines.

The results obtained in this study can be summarised as follows:

- the average annual concentrations calculated for NO_2 and benzene at the receptors' level and within the project limits are well below the applicable regulatory values. Project emissions will have a negligible impact to reach a maximum of 0.02% of the regulatory value for these two pollutants at the site boundaries;

- In conclusion, the percentiles calculated for all compounds at the receptors' level and within the project's boundaries are well below the limit values. The impact is located in a restricted area and contained within the boundaries of the site. Concentrations, pollutant by pollutant, reach in the site's boundaries:
  - CO, <0.01% of the regulatory value;
  - PM10<0,4% of the regulatory value;
  - NO 2, 1% of the regulatory value;
  - SO2, 0.4% of the regulatory value.

In conclusion, the pollutant emissions generated by the Noor Midelt project will have a negligible impact at the site boundary with regard to Moroccan regulatory and IFC values. The analysis of pollution maps shows that the most important pollutant is nitrogen dioxide. Its impact at the site boundary reaches a maximum of 1% of the applicable regulatory value.

Humidity from evaporation ponds

Evaporation from evaporation ponds will cool the air nearby ponds. Evaporation is the physical phenomenon of transformation of liquid water into water vapor. Evaporation consumes energy and therefore takes heat from the environment and induces cooling effect.

Evaporation will increase local humidity in the area around ponds. Some evaporation fog (steam fog) could rise above the pond, especially during the cold season and specifically after sunset, when the air temperature falls down quicker than the water body. It could lead to slightly lower visibility just at the periphery of the pond (but it would be a local phenomenon and would not affect the rest of the site area).

The humidity rate can't be assess without complex modeling. The impact of increasing humidity will refresh the air, and will create favorable conditions for vegetation around the ponds.

Based on experience in other plants, there is no specific environmental issue associated to the humidity impact of evaporation pond.

Greenhouse Gas Assessment

This GHG assessment has been prepared to estimate the greenhouse emissions displacement associated with the generation of electricity from NOOR Midelt I power plant is about 1000 GWh.

The project emissions are calculated based on the following equation:

Project Emissions=Upstream Emissions + Operational Emissions + Downstream Emissions + Leakage

Based on the IFC Greenhouse Gas Reduction Accounting Guidance for Climate-Related Projects (2013), upstream, downstream emissions and leakage issues are considered negligible for renewable projects since the total contribution is not significant once annualized over the project's life cycle.

Electricity generated by solar power projects does not result in GHG emission and is supposed to reduce the generation of more intense sources of GHG-emission – i.e. replace the grid generation. The following calculation has been applied:

According the developer, the expected annual energy production will be at least 1 072 000MWh per year. Therefore, the environmental benefit of the project will be the reduction of GHG emissions in a volume of about 675 360 tons of CO2 per year - calculated on the basis of the representative emission factor of projects supplying additional electricity to the Moroccan grid, from 0.630 tCO2 / MWh.

Table 28 : Air quality - Significance of impacts during operation

Impact	Receptor	Sensitivity	Significance of the impact
Air emissions from vehicles Low intensity	Air Quality (Gaseous and Particulate)	Weak	Negligible to Minor
	Residents - Road	Average	Negligible or

Impact	Receptor	Sensitivity	Significance of the impact
	Transportation		Minor
	Plant O&M employees	Average	Negligible or Minor
GHG emissions avoided	Moroccan GHG emissions	High	Positive
VOC from HTF Low intensity	Air quality	Low	Negligible or Minor
	Plant O&M employees	Average	Negligible or Minor
Emissions for auxiliary HTF Heater and generators Low intensity	Air quality	Low	Negligible or Minor
	Plant O&M employees	Average	Negligible or Minor

7.6.2 Mitigation measures

Table 29 : Air Quality - Mitigation measure - Operation Phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Air emissions from vehicles	Regular maintenance of vehicles in dedicated maintenance areas Adequate indications for traffic Vehicle speed control Road maintenance to limit dust rises Public transit service for employees	O&M	As soon as the operation start and throughout operation period.	Cost included in O&M Budget No specific additional cost
	Third parties employed to provide services during the project's operation that involve regular transportation to the site (e.g., waste collectors or chemical toilet collectors) will be required to use vehicles that are regularly maintained and in good condition and will be inspected prior to entry into the site	O&M	As soon as the operation start and throughout operation	Cost included in O&M Budget No specific additional cost
COV from HTF	The treatment of VOCs with carbon filters minimizing emissions and treating makes it possible to limit Benzene emissions to less than 5mg / m^3. Adsorption carbon filter is classified as a Best Available Technology.	Design and O&M	Included in Design	Cost included in O&M Budget No specific additional cost
	Information will be provided to employees about the emissions of VOC from HTF system. VOC Concentration will be lower than Threshold Limit Values –ACGIH Guidelines).	O&M	As soon as the operation start and throughout operation	Cost included in O&M Budget No specific additional cost
	Health, Safety and Environmental management plan will be carried out and including actions addressed VOCs risks.	O&M	As soon as the operation start	Cost included in O&M Budget No specific

				additional cost
Emissions for auxiliary HTF Heater and generators.	Emissions from heaters and generators will be compliant with Moroccan limit values and MASEN requirements (CO : 100 mg/m" (1 hour average), NOx 200 mg/m3 (1 hour average), SOx 100 mg/m3 (1 hour average), Particular Matter : 50 mg/m3 (1 hour average)	Design and O&M	ESMP during Operation phase – Operation	Cost included in O&M Budget No specific additional cost
	Monitoring air emissions from the auxiliary HTF Heater and generators to ensure compliance with permissible emissions levels. Monitoring quarterly for VOC and monthly for the heater (rate of flow, T ° C, SOx, NOx, CO, CO2 et MP)	O&M	ESMP during Operation phase – Operation	Cost included in O&M Budget No specific additional cost

7.6.3 Residual Impacts

Residual impacts during the operation phase on air quality are low. They are positive for reducing GHG emissions

8. Noise and vibrations

8.1 Introduction

Noise and vibrations are environmental impacts that will be generated, mainly through the construction phase of the project. During the operation phase, the main noise emitting equipment is the equipment of the water-steam cycle of the CSP plant, located in the heart of the site and surrounded by solar fields CSP and PV.

The potential impacts are assessed, mitigation measures considered and the residual impacts reported.

8.2 Methodology

8.2.1 Noise

This study has been undertaken based on the following:

Initial identification of the national and international standards and requirements relating to noise during the construction and operation phases (included in the legal and administrative section of this SESIA);

An assessment of the noise generated by the possible phases of construction activities and a qualitative assessment of the impacts.

Determination of the required mitigation measures, including noise abatement technologies that might be needed to comply with national and international noise limits.

In order to establish the baseline conditions of the noise onsite, a noise measurement campaign has been realized in July 2018.

During this campaign, noise monitoring measures are taken in eight (4) locations for Midelt I to account for the ambient noise levels onsite and the influence of existing and surrounding noise sources.

Measurements are made using a pre-calibrated sound metre, connected to a laptop for direct data download. Specific software is used to process the data and provides tables and graphs of noise levels. The measurements were made over a period of 15 minutes, during the night and during the day, at two different locations in a measurement range of 20 to 100 dB.

The results of the noise measurement campaign will be used as a reference for the planned noise monitoring activities, which will be implemented for the construction and operation phases of the ESMP.

8.2.2 Vibration

The impacts due to vibration have been determined by considering the likely construction and operational processes involved in the NOOR Midelt I project.

8.3 Baseline conditions

In general, the site is located in an isolated area with no significant development or commercial activities within a radius of 10 km. Once construction activities are complete, noise levels are expected to decline to previous levels, with only a few road noises resulting from the movement of light commercial vehicles and private vehicles along the road connecting the plant to the RN13. The only other source of noise observed is the wind.

In the context of this SESIA, noise measurements at the site of the NOOR Midelt I solar power station were made using a sound level meter between 2 and 5 July 2018, for 15 minutes during the day and

15 minutes at night at 4 points at the site of the plant. The wind measurements were performed in parallel. The detailed report of the noise measurements is presented in Appendix 2. The location of the points is shown in the figure hereafter.

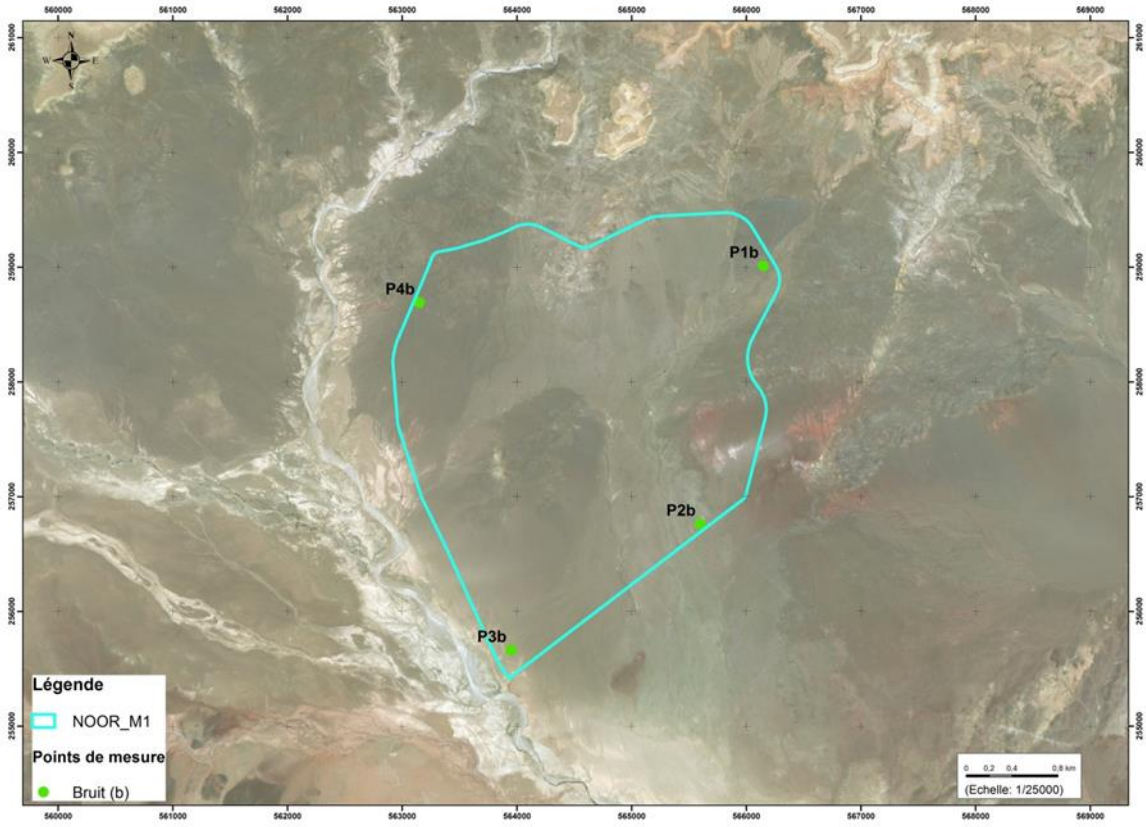


Figure 21 : Spatial distribution of noise measurement points at NOOR Midelt I

The results are presented in the table below.

Table 30 : Results of the average noise measurements at NOOR Midelt I - July 2018

Measure Point	Lambert Coordinates		Average Level noise in dBA			
	X	Y	Day	Guideline IFC	Night	Guideline IFC
P1b	566000	259300	31.7	55	34.9	45
P2b	565450	257050	32.2	55	35.4	45
P3b	563800	255950	35.2	55	36.5	45
P4b	563000	258980	34.3	55	52.0	45

The measured average values are below the threshold values recommended by the IFC in residential areas, with the exception of the evening measurement of point P4b. 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.

8.4 Sensitive receptors

In accordance with Good International Industry Practice (GIIP), the identification of sensitive noise receptors must be considered on a 1 km buffer around the solar power plant, thus ensuring that all sensitive receptors are identified considering the standard noise abatement factors due to geometric divergence (i.e. 20 dB reduction for each tenfold increase of distance according to Murphy, E. et al, 2014).

Given that the anticipated construction activities will not generate significant levels of vibration, the sensitive receptors that are closely located to the source are the only ones considered.

The table below describes the identified receptors with respect to noise and vibration as well as the identification of their sensitivity.

Table 31 : Noise/Vibration – Receptors sensitivity

Receptor	Sensitivity	Justification
Employees for construction and operation	High	Employees in the construction phase are noise sensitive receptors because they are directly exposed to noise impacts. Employees during construction phase are sensitive receptors in relation to explosive use for earthworks.
Neighboring facilities	High	Neighboring facilities are vibration sensitive receptors because of their potential vicinity with explosive impact areas.

8.5 Impacts and measures during Construction phase

Construction activities normally result in temporary and short duration increases in the noise and vibration levels of a site.

8.5.1 Noise impact

Construction activities in relation to noise and vibration are likely to include earthworks, piling, site levelling, installation of structures and services, use of diesel generators, etc.

The increase in traffic during construction may also lead to an increase in noise levels, particularly in the city of Midelt and other non-bypass roadside habitat centres. .75 trucks/day are expected at the peak of construction phase compared to 4 917 vehicles/day on this road (RN13 which crossed Midelt). The impact is low. The measures are treated in chapter 14: traffic and transportation.

During construction, the works related activities are likely to include the following:

- Site preparation - back-filling, levelling and excavation of soil in areas where the foundations are to be installed. The initial clearing and grading of the area will require the use of a common excavator. Noise from dumper trucks, compressors, excavators and generators, as well as occasional dump rumblings related noise;
- Installation of structures, panels and other services.

Prior to the implementation of mitigation measures, this impact can be assessed as being of minor negative significance. However, measures will be introduced to reduce noise levels when working in close proximity to the site boundary, as they could exceed the required standards without mitigation. It is likely that in certain locations of the site, noise levels will be in excess of 85 dB (A), and that ear protection is required for the personnel on site. Such areas will include those in the immediate vicinity of the plant or machinery. Prior to the mitigation measures, the impact on workers can be deemed to be of a minor to moderate negative impact.

8.5.2 Vibration impact

Certain constructions processes, particularly those involved with site preparation and civil works, e.g. breaking, piling and planning, have the potential to create vibration within the vicinity of the works. Using explosive for earthworks will create vibration in the impact area of the explosion. Vibration will also occur sporadically around the construction site due to the moving of materials and equipment. However, it should be noted that vibrations dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source.

Within the project, the small size temporary structures, offices, canteens, and storage areas, are likely to be sensitive to vibration resulting from the construction activities. Construction activities located on

site Midelt I project and on site Midelt II project are sensitive to vibration resulting from explosive used for earthworks.

The response of a building or other constructions to earth vibrations depends on various characteristics, such as the construction of foundations, the underlying conditions of the ground, the state of operation, etc. The answer may also depend on whether the vibration is continuous or constant / intermittent.

BS5228-2 standard recommends that a conservative threshold for minor or cosmetic damage should be considered as a peak particle velocity (ppv) as of 10mms-1 for intermittent vibration and 5mms-1 for continuous vibration to determine whether there is any risk of building damage, particularly as a result of construction works involving piling.

Surface facilities such as transformers or inverters are not recognised as sources of high levels of environmental vibration according to 'Control of Vibration and Noise during Piling' (British Steel. 1998) which confirms that even at a very close distance of 10 m, the ppv generated by the facility is significantly inferior to 5mms-1. For example, the indication is that a bulldozer would generate a ppv of approximately 0.6mms-1 and a heavy truck on poor road surface a ppv of less than 0.1mms-1 at 10 m.

Table 32 : Noise and Vibration - Significance of impacts during Construction phase

Impact	Receptor	Sensitivity	Impact significance
Construction noise	Construction workers	High	Moderate to major
Explosive use for earthworks	Construction workers and facilities on site (Midelt I)	High	Moderate to major
Vehicle noise	Construction workers	High	Moderate to major
Construction vibration (including vehicle vibration)	Construction Workers / Operators	High	Minor or moderate

8.5.3 Mitigation measures

A monitoring programme will be implemented and this will be described in more detail in Chapter 20. The following measures will be implemented.

Table 33 : Noise - Mitigation measure during Construction phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Construction noise and vibration (For power plant and power line corridor)	Diesel compression equipment or generators will be equipped with effective silencers when necessary	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Electrically powered equipment will be preferred, where possible, to mechanically powered alternatives. The motorised mechanical equipment will be equipped with appropriate silencers when necessary	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	On site's facility units operating intermittently will be shut down during the intervening periods between uses.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Construction employees will, at all times, carry out all works in such a manner as to keep any disturbance from noise and vibration to a minimum within the industrial best practices limits. Operators of vibrating hand held machinery will be provided with appropriate PPE (Protective gloves) and be given suitable breaks form using such equipment to reduce the impacts of vibration.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	No employee will be exposed to a noise level greater than 85 dB (A) for duration of more than 8 hours per day without hearing protection. No unprotected ear will be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C)	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Activities with highest noise emissions will be undertaken during daytime hours avoiding as much as possible weekends.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Explosives will only be used by qualified and licensed professionals..	EPC and	As soon as the works	Included in the

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
		subcontractors	start and throughout site preparation	contract no specific additional cost
	An approved handler shall develop the blast management plan and be responsible for all aspects of the use of explosives. The blast management plan content will be compliant with the requirements of the Joint Circular of the Ministry of Energy and Mines and the Ministry of the Interior No. 4546 of 21/7/2006. This document will content the instructions for the use of explosives that have to be approved by the regional representative of Ministry for energy and mines after the opinion of the provincial commission for explosives. a procedure for immediate consumption is available. The application for authorization to use explosives and accessories is addressed to the Director of Control and Risk Prevention of the Ministry of Energy and Mines.	EPC and subcontractors	As soon as the works start and throughout site preparation	Included in the contract no specific additional cost
Vehicle noise	Heavy vehicle traffic during the night will be limited	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Deliveries of fuel, materials and equipment as well as removals of waste must be carried out during daylight hours when possible	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	All vehicles will be adequately maintained in order to minimise sound emissions	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost
	Onsite/offsite speed limits are included in the Traffic and road safety section of this SESIA. In addition to road safety, these limits will help reduce noise levels resulting from traffic movements, particularly in the city of Midelt. These limits will be included in the traffic management plan that will be prepared by the EPC before starting construction works	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract no specific additional cost

8.5.4 Residual Impacts

Following the implementation of the mitigation measures (CESMP), the residual impacts are considered to be minor negative significance.

8.6 Impacts and measures during Operation phase

8.6.1 Noise and vibration impacts

Powerline operation doesn't have significant impact on noise.

The highest noise levels will be produced in the area of the CSP power island, due to the presence of rotating machinery related to power generation. In PV and CSP solar fields, no sound insulation is considered necessary due to the low noise level. Indeed there will be very few point sources of punctual noise coming from the solar fields, besides the maintenance vehicles and the low amplitude potential buzz coming from the electric transformers, or the tracker engines that will not be visible from a distance.

The solar plant design, especially the CSP power island already includes reduction noise measures :

- 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 the partitions and enclosures to ensure that noise limits are not exceeded.
- In addition, buildings used to store equipment in the absence of workers will be designed with a coating providing the necessary soundproofing to meet the limits set on the entire perimeter of the building within the limits of application of the corresponding standards.
- The safety valves will be equipped with silencers to reduce noise emissions during unloading. All machines will be adequately maintained to minimize noise emissions.
- Any equipment used at all times will be designed to ensure that vibration, cavitation, etc. do not produce excessive noise under any circumstances within the limits of application of the corresponding standards.
- The equipment of power block of the plant will be designed acoustically and if necessary adequately protected so as not to exceed the maximum permitted noise levels

Noise levels taken into account during pre-operation and operation and in relation to the maximum values defined in international standards. Prior to the operation of the plant, noise baseline studies will be conducted to determine the existing reference level and sensitivity of the surrounding areas.

The noise generated during the operation phase would occur mainly in the center of the site and dissipate before reaching the perimeter of the site. Cumulative noise emissions generated within the plant would be rapidly reduced and lower ambient background noise levels at the site boundary. All equipment specifications will limit near field noise to a maximum of 85 dB (A) at 1 m.

The following table identifies the noise emission sources of the solar thermal power island (during power block operation).

Table 34 : Noise emission sources

Description on Noise Emission Compounds	Lw (dBA)
ACC Air Inlet	105
ACC Air Outlet	102 (*)
Fin Fan Coolers	103 (*)
Steam Turbine Generator	104
Steam Turbine Casing	102
Feed Water Pumps	98
Main Transformer	100
Auxiliary Transformer	93

(*) The effect of sound directivity was incorporated into the noise propagation from this unit.

A preliminary noise modelling study was undertaken, using SoundPLAN software (SoundPLAN LLC, Braunstein + Berndt GmbH) which is an industry-standard noise prediction software used to calculate sound pressure levels and to generate noise maps. The latest version of the programme (V. 8) was used for this assessment. SoundPLAN uses the calculation methods given by standard ISO 9613 for noise propagation.

The simulation was based on the sound pressure levels at 1 m from the main noise sources in the power block at normal operating conditions.

The results of the model are presented on noise contour maps, which were generated from a colour-coded noise level distribution grid. The colour scale was chosen to depict low SPLs as cool colours (green) and high SPLs as warm colours (red).

The operation of the power plant is intended to be continuous (24 hours/day, 7 days/week); noise predictions and contours will apply for night operation, since it will be the most restreictive period.

Far-Field Results at the Project Boundaries

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 (See figure below).

Near-Field Results at Control Central Room

Sound Pressure Levels inside the Control Central Room were calculated indirectly by modelling the SPLs at the exterior façade of the building and estimating the minimum transmission loss requirement by the construction materials to comply with the indoor target level.

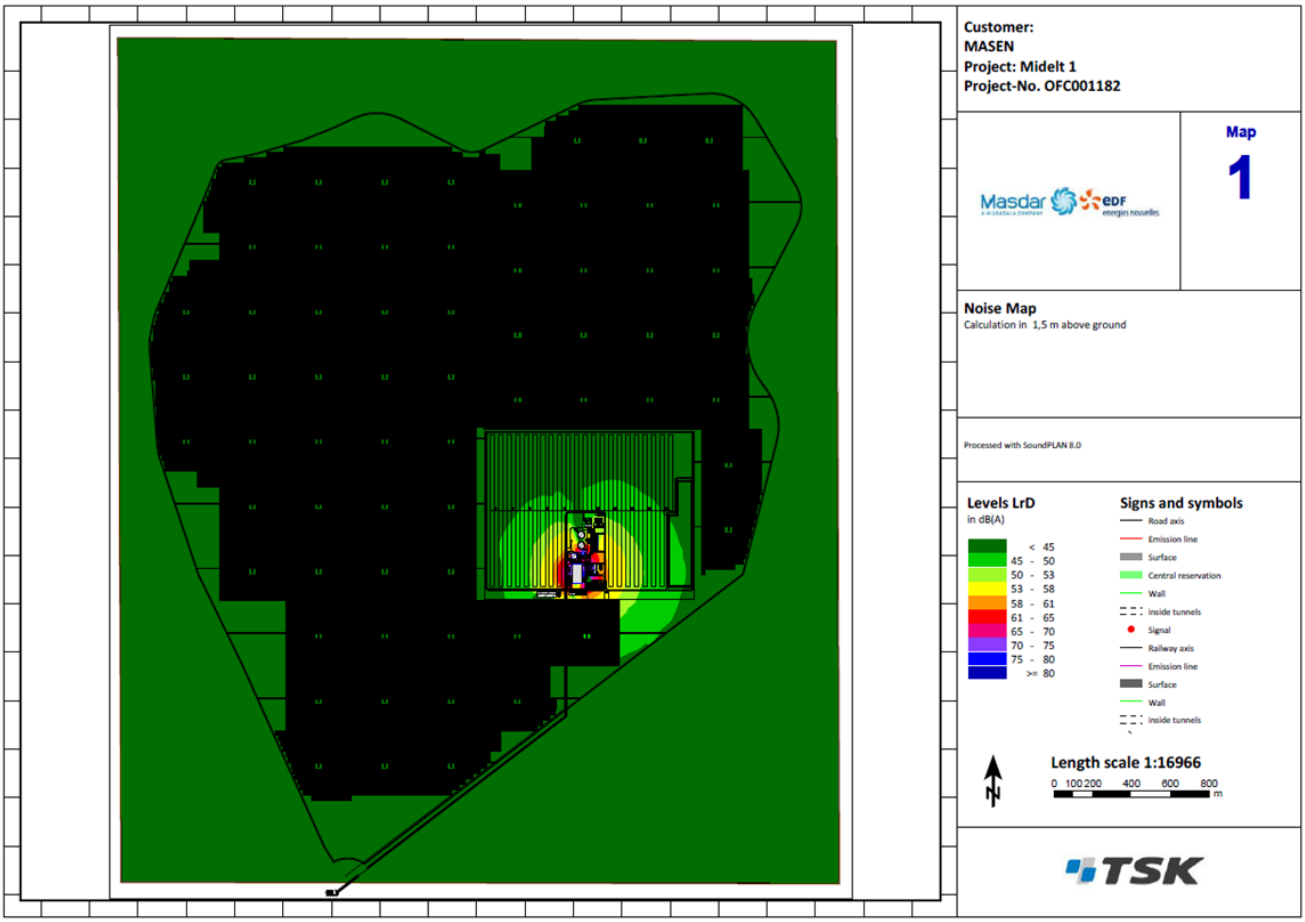


Figure 22 : Noise modelling results for NOOR Midelt 1 project

During operation phase, monitoring noise will be conducted to assess compliance with predicted level and requirements value. The following table identifies the most critical areas of the solar thermal

power island in terms of noise emissions where steps will be taken to ensure that allowable noise levels are met.

Table 35 : Critical areas for noise monitoring

Potential source emission	Monitoring point
Steam turbine	1m away from the equipment
Main pumps (feedwater, HTF, etc…)	1m away from the equipment
ACC (Air condenser)	1m away from the equipment
Auxiliary Cooling Fans	1m away from the equipment
Discharges to safety valves	1 m away
Air compressors	1 m away

This monitoring will be included in ESMP – Operation phase.

Table 36 : Noise and vibration - Significance of operation impacts

Impact	Receptor	Sensitivity	Impact significance
Vehicle noise	Workers / Operators	High	Minor to Moderate
	Residents - Road Transportation	Moderate	Minor
Operation noise	Workers / Operators	High	Minor

8.6.2 Mitigation measures

Table 37 : Noise - Mitigation during Operation phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Vehicle noise	Deliveries of fuel and materials and removals of waste must be carried out during daytime when possible.	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
	All vehicles will be adequately maintained in order to minimise sound emissions	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
Noise during operation phase	All machinery will be adequately maintained in order to minimise sound emissions	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
	The noise generated during the operation phase would occur mainly in the power block area and dissipate before reaching the perimeter of the site. Cumulative noise emissions generated within the plant would be rapidly reduced and lower ambient background noise levels at the site boundary. All equipment specifications will limit near field noise to a maximum of 85 dB (A) at 1 m. When equipment and installations exceed 85 dB (A) at 1 m under normal operating conditions, noise suppression techniques shall be developed, which may include: - Acoustic isolation enclosures for certain installations - Sound-absorbing materials - Safety valves with silencer	EPC	Design	Included in O&M budget No specific additional cost

8.6.3 Residual Impacts

The residual impacts following the implementation of the mitigation measures are low to zero.

9. Soil and groundwater

9.1 Introduction

The relatively undisturbed and undeveloped nature of the site means that the potential for existing contamination to the soil is unlikely. However, the construction phase may potentially increase the risk of contamination because of poor site management practices and inadequate waste disposal management. During the operation phase of the project, the risk of contamination identified relates to the leakage of heat transfer fluid (HTF) handled at the solar field CSP and is considered minor. General contamination risks are associated with the handling and processing of products. Liquid hazardous materials can escape into the soil; these are associated with the transport, handling and storage of such materials and the potential threat of discharges and spills onto the ground. The only hazardous materials onsite will be diesel and oil/lubricants and HTF. Other risks to soil quality are associated to soil compaction due to heavy vehicles. Groundwater will be not used during all phases of the project.

9.2 Methodology

The assessment of the potential impact of the project is based on desk research as well as baseline soil test results.

We examined the following studies:

- Review of environmental studies for the complex;
- Review of relevant guidelines identified in the IFC Performance Standards;
- As there is no specific reference in Morocco concerning soil quality, we took into consideration Dutch guidelines for assessing soil,

As part of the establishment of the baseline soil conditions at the proposed site, Phenixa undertakes a limited soil sampling and analysis campaign in July 2018. The sampling includes a collection of the top soil layer (at 0,3m depth) collected from the proposed project site, which is then analysed for heavy metals, in accordance with Dutch standards. Chosen parameters focused on the most important heavy metals and hydrocarbons. Detailed report is in Appendix 3.

The purpose of the soil sampling activity is to establish a benchmark of the soil conditions on-site, which will be used for the long-term monitoring and environmental management of the site. In particular, if a spill or leak were to occur, the successful clean up procedure would include soil testing in order to detect any residual contaminants and the benchmark index would be used in the assessment.

9.3 Baseline conditions

9.3.1 Geology and topography

As a whole, the NOOR Midelt solar complex site is located on the doorstep of Upper Moulouya, a geological structure known for its very long-term geodynamic stability. More specifically, the site is associated with a flat area surrounded by mountains and hills where the materials consist mainly of basalt, rhyolite, shale, dolerite, granite, barite, marl and marly limestone at the hills level and sandy-loam, alluvial and conglomeratic deposits on the plain level.

Depending on the lithological nature of the geological formations encountered on the solar complex site as a whole, four lithologically distinct zones are to be mentioned:

Zone 1 - The plain: The litho-stratigraphic section is formed successively from the base upwards of red clay, pudding stone and alluvium conglomerates, then sandy loams surmounted by a crust of gypsum and sandy loams (rock salt) and alluvial sandy loams on the top;

Zone 2 - Basalt and dolerite: the geological formations encountered in this zone made of basalt generally doleritic and Permian Triassic basaltic tuffs;Zone 3 - Magmatic and metamorphic rocks: the formations encountered made of granite, rhyolite, shale and micro granite with intrusions of barite and galena. As well as sandstone facies (fine sandstone, quartzite and grauwackes);

Zone 4 - Marno-limestone: the litho-stratigraphic section consists of alternating marl and marl-limestone.

The site of NOOR Midelt I is predominantly argillaceous (Zone 1) and basaltic (Zone 2).

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.

9.3.2 Groundwater

The study area is sterile from a hydro-geological point of view, only a few small superficial aquifers are to be noted around the study area, which are already exploited for the supply of drinking water and food agriculture. This aquifer is located in the karst of Khoukhat outside remote perimeter area (11 km north of the site - Figure 12).

9.3.3 Ground

Numerous outcrops in the surrounding magmatic and sedimentary rock hills and in the center of the plain enable to distinguish volcanic, plutonic and vein rock, as well as sedimentary series formed of alternation of marl and marl-limestone at the borders of the project's site.

No visual indications of soil contamination have been identified on-site during the site visit.

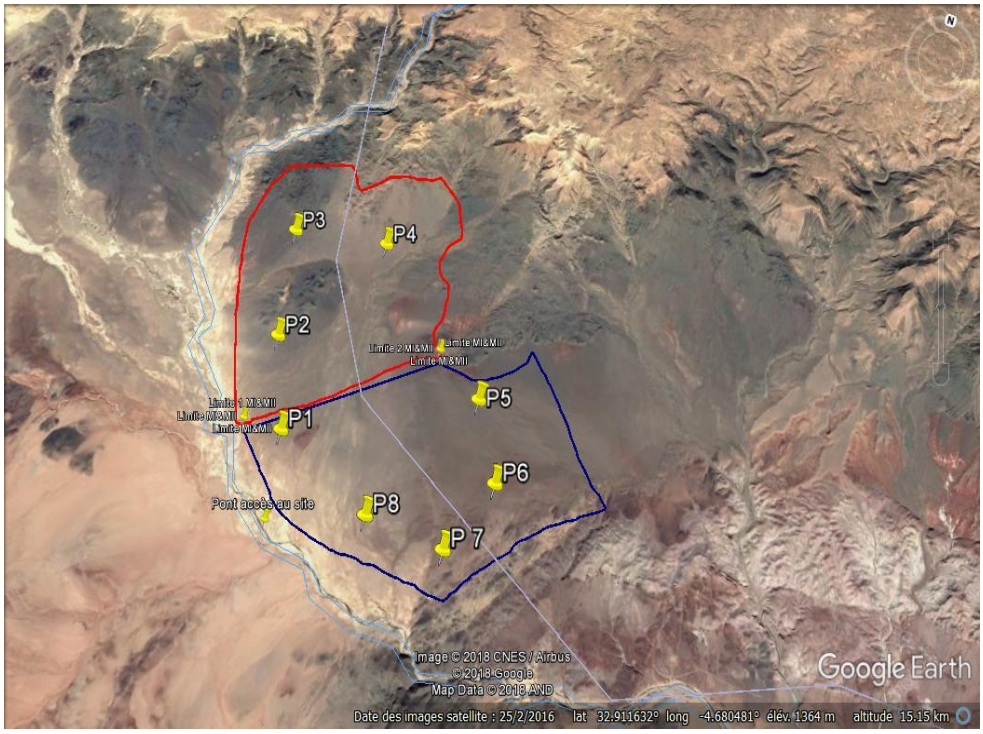


Figure 23 : Location of soil sampling points (NOOR Midelt I - red outline)

Analytical results

The results of the analysis of the points on the site of NOOR Midelt I are recorded in the table below

Table 38 : Soil analysis results for NOOR Midelt I site

N° sample	Unit	P1	P2	P3	P4	Guideline value (target value)
Physico-chemical preparation						
Dry matter		97.6	98.2	97.5	97.6	
Weight refusal at 2 mm		14.7	13.8	17.5	8.65	
Metals						
Arsenic (As)	mg/kg Ms	5.44	2.03	2.68	1.30	
Cadmium (Cd)	mg/kg Ms	0.44	<0.40	<0.40	<0.40	0,8
Chrome (Cr)	mg/kg Ms	41.8	63.1	64.2	147	100
Cobalt (Co)	mg/kg Ms	14.0	19.0	16.8	29.3	20
Copper (Cu)	mg/kg Ms	34.3	61.3	51.6	76.8	36
Iron (Fe)	mg/kg Ms	33400	41800	43400	63200	
Manganese (Mn)	mg/kg Ms	619	307	334	536	
Nickel (Ni)	mg/kg Ms	28.2	40.8	38.0	66.5	35
Lead (Pb)	mg/kg Ms	22.5	7.30	7.12	13.6	85
Zinc (Zn)	mg/kg Ms	55.4	51.0	63.8	99.7	140
Mercury (Hg)	mg/kg Ms	<0.10	<0.10	<0.10	<0.10	0,3
Total hydrocarbons						
Hydrocarbons Index	mg/kg Ms	16	<15	<15	<15	1

Comparing these values with the target values of the Netherlands regulation, it is noted that for certain points and certain parameters, the content is higher than the target but without reaching values which would require a depollution intervention. These high values correspond to the nature of the soil without it being a sign of existing pollution. Point 1 with a high hydrocarbon content remains unexplained.

Therefore, based on field observations, in the absence of prior activities that may be polluting, it can be concluded that the soils of the site are not contaminated with heavy metals.

9.3.4 Seismic activity

The study area is in a seismic zone 3 (RPS 2000). This zone is characterised by a maximum horizontal acceleration, at the bedrock level of 0.10 g and a maximum seismic ground velocity of 0.10 m / s, for a probability of occurrence of 10% in 50 years.

The NOOR Midelt solar complex site region has a seismic intensity between V to VI on the MSK scale.

The seism tectonic map shows two networks accidents NE-SW (Midelt) and ENE-WSW to EW (High Atlas) which were taken into consideration during the calculations for the determination of the Seismic Hazard of the site's region of Midelt solar power plant.

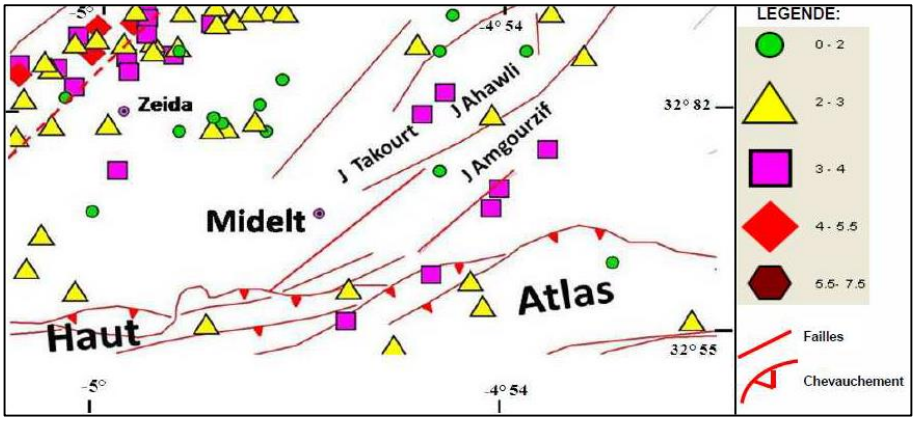


Figure 24 : Seism tectonic distribution of the site area of Midelt solar power station (Source : sismic study – synthesis report – MASEN)

According to the seismic studies carried out in the NOOR Midelt site, we have noted the following facts:

- The maximum magnitude of earthquakes occurring in the Midelt site area is 4.9;
- The Operating Basis Earthquake (OBE) is a magnitude 5 earthquake;
- The Maximum Design Earthquake (MDE) is a 5.5 magnitude earthquake;
- The acceleration at the site level is 0.15 g;
- The seismic velocities vary in depth at all sections of 700 m / s for superficial layers, around 4000 m / s at depth. Thus, the resonance phenomenon seems very unlikely;
- The dominant periods on the site of Midelt solar power station gradually vary between 1.4 and 3.5 seconds.

Therefore, the seismic conditions of the site have been taken into account for the project's design and the ESMP contains an Emergency response plan comprising the procedures to be followed in the event of an earthquake.

9.4 Sensitive receptors

The table below describes the receptors and their sensitivity identified with respect to soil and groundwater.

Table 39 : Soil and Groundwater - Sensitivity Receptor

Receptor	Sensitivity	Description
Ground	Average	The site is a greenfield, and no contamination was observed. Natural resources are not used for grazing or agriculture.
Groundwater	Average	Groundwater recharge is low and no aquifer is present on the site. However, neighbouring villages in the valleys rely on groundwater wells for their drinking water supply and irrigation.

9.5 Impacts and measures during Construction phase

9.5.1 Impacts

A series of activities scheduled during the construction phase of the plant may pose a threat and cause changes in the chemical properties of the soil and lead to contamination.

Impacts can occur as a result of spills of liquid materials used during construction, poor solid waste management.

Spillage: During the construction phase, there is an actual risk of accidental spillage and leakage of various chemicals (e.g. fuels), and employee sanitary wastewater. Impacts can occur in the storage areas of the site as well as during the transportation of these materials to the site. In the absence of preventive measures, temporary pollution may occur. Similarly during the installation phase of the thermal fluid in the conductive network of HTF leaks, accidental spills can occur and contaminated soil. Given the characteristics of the fluid that solidifies at room temperature these spills will remain very localized in area.

The recommended temperature for the filling of the system is circa 65 °C. Spills or leaks during the truck discharge and filling of the system occur mainly in the following situations:

- Dripping in flanges and connections when opening the tank truck connections or during hose connection and disconnection.
- Rupture of hoses for inadequate or poor maintenance.
- Bad storage once the hose has been used.

To avoid these situations it must be taken into account the following considerations:

- The HTF should be at low pressure and temperature, between 35ºC and 60° C.
- Hoses must be metal and flexible homologated for high temperatures, as well as the flanges and connections. They should be removed when they are not used to avoid risks.
- The tank and the hose connection must be within a concrete area to avoid spillage of the product and its extension.
- Hoses should be checked periodically, removing those in poor condition.
- Line endings will remain closed through valves and plugs.
- It must be taken into consideration that the HTF will remain inside of the hose so it must be collected in concrete areas and in containment systems.

Waste management: the construction of the solar power plant includes activities that generate solids and waste on site. Waste generated during these activities is a threat to the soil. During Construction phase, hazardous waste such as oils, machine lubricants, paints and sludges account for a relatively small proportion of the total amount of construction waste, however this requires special attention. If temporary storage and handling of such waste on the construction site is insufficient, before being removed for disposal, the risk of soil contamination increases. In the absence of preventive measures, temporary pollution may occur.

Quarries: the construction will require materials from quarrying. The environmental impacts of quarries are assessed in the context of specific authorisations given to quarry operators. The EPC company and their subcontractors will ensure that the quarries used comply with local regulations.

Table 40 : Soil, Geology and Hydrology - Significance of impacts during Construction phase

Impact	Receptor	Sensitivity	Significance of the impact
Spillage Average intensity (related to the extent of works)	Ground	Average	Average
Inadequate waste management Average intensity (related to the extent of works)	Ground	Average	Average
Quarrying	Ground	Low	Low

9.5.2 Mitigation measures

Table 41 : Soil contamination - Mitigation measures - during Construction phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Spillage and leakage (of any pollutants except HTF) (CSP and PV Power Plant and power line corridor)	Chemicals, fuels, lubricants and paints will be stored in dedicated locations on impermeable surfaces to prevent leakage into the ground and will be contained inside a secondary containment (110% of the largest container). Additional mitigation measures are presented in the non-hazardous waste and hazardous materials section.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	The design and location of permanent/temporary storage areas will consider the potential ground contamination risks. Storm water runoff will not be able to enter areas where hazardous materials are stored, handled or transferred. If storm water runoff can enter potentially contaminated areas there will be an oil separator and then storage tank.. Depending on the quality (the limits value will refer to Moroccan regulations (Arrêté conjoint n° 1276-01 du 17 octobre 2002 portant fixation des normes de qualité des eaux destinées à l'irrigation see table 2), treated water could be used for dust control or soil compaction. When reuse is not possible, water will be stored on site until the waste water system will operate. The tanks will be waterproof and potential leaks would be monitored..	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Hazardous materials' storage areas will be positioned away from major transport corridors and construction activities, in order to avoid potential collisions of vehicles or other machinery. No hazardous material will be stockpiled without respecting Good Industrial Practices.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	MSDS will be provided for all chemicals	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	All chemicals will be handled in accordance with the relevant instructions (MSDS)	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Reduce quantity of chemicals and fuels on site to minimum practicable levels	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Regularly inspect drip collectors and containers for spills and leaks.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Ensure the availability of spill response equipment in all areas where hazardous liquids are stored.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Develop and implement an Emergency preparedness and Response Plan, to take immediate action in the affected area in the event of a spill or leakage of chemicals, fuels, paints, and any hazardous material.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Metal structures (including painting and protections) will be designed/selected to resist corrosion due to local environment conditions. All outdoor structural steel shall be hot-dipped galvanized in accordance with MFSrequirements	EPC and subcontractors	Design phase	Cost included in the contract No additional cost
	Prepare a vehicle/machinery maintenance plan	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Washing of equipment, machinery, and vehicles will be performed on sealed platforms with a sanitation system to send the washing water to an oiler separator and solid decantation. Treated water will be stored in a tank. Depending on the quality (the limits value will refer	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	to Moroccan regulations (Arrêté conjoint n° 1276-01 du 17 octobre 2002 portant fixation des normes de qualité des eaux destinées à l'irrigation – see table 2), treated water could be used for dust control or soil compaction. When reuse is not possible, water will be stored on site until the evaporation ponds will operate. The tanks will be waterproof and potential leaks would be monitored. Refuelling will only be carried out in designated areas following specified procedures, not at machinery work locations, to reduce potential spillages			
	Vehicle maintenance areas will be equipped in such a way that there is no spill to the outside: protective measures, sealed areas with runoff water recovery system	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	In case of soil contamination by spillage or leakage (Oils, chemicals, etc..) during construction activity, soil will be excavated separately, and stored onsite in accordance with environmentally adequate measures for waste management to reduce contamination. A licensed operator will collect the contaminated soil for disposal and will evacuate it from the site within a very short time.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	Construction workers will attend training programmes, and safety induction sessions with regards to the transportation and handling of hazardous materials. Toolbox talks will also be held.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
Leakage of evaporation ponds	Evaporation ponds will be watertight (with double liner) and equipped with a leak detection system	EPC and subcontractors	Design and construction phase	Cost included in the contract No additional cost
Spillage and leakage of HTF.	The following considerations will be taken into account during filling operation : • The HTF should be at low pressure and temperature, between 35ºC and 60° C. • Hoses must be metal and flexible homologated for high	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost of bioremediation system

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	temperatures, as well as the flanges and connections. They should be removed when they are not used to avoid risks. • The tank and the hose connection must be within a concrete area to avoid spillage of the product and its extension. • Hoses should be checked periodically, removing those in poor condition. • Line endings will remain closed through valves and plugs. • It must be taken into consideration that the HTF will remain inside of the hose so it must be collected in concrete areas and in containment systems.			
	A bioremediation system will be constructed as a corrective measure to prevent contamination of soil and groundwater sources by accidental losses of HTF, which may occur in exceptional circumstances resulting from leaks and spills from materials and defective joints. The biological remediation plant will consist of impervious reinforced concrete tanks of approximately 470 m2 by 1 m of depth containing hydrocarbon degradation bacteria and CO2 and containing about 200 m3 of contaminated soil. The process is capable of reducing the initial contamination concentration from 20 g / kg to 0.5 g / kg over a period of about 2 to 4 months. For the treatment to be effective, nutritional elements are added such as monopotassium phosphate (0.3 kg / tonne of contaminated soil) and urea (0.4 kg / tonne of contaminated soil). In addition, a 50 to 70% moisture system is maintained by a sprinkler system and the soil is aerated by surface raking to facilitate bacterial activity.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost of bioremediation system
Storage and waste management (CSP and PV Power plant and power line	All hazardous construction waste and chemicals, such as fuel, will be stored in well-equipped, leak-tight enclosures where drums have drip trays to avoid spillage to the ground. The storage tanks of fuels or chemicals and chemical toilets will be properly maintained and stored in contained areas amounting to 110% of the storage capacity.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
corridor)	Wherever possible, reduce the quantity of chemicals and fuel stored on site to minimum practical levels. Infrequently used chemicals will be ordered just before they are needed.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
	All servicing, refuelling, stockpiles, waste disposal and storage areas will be located as far as possible from the run-off drainage system to reduce the pollution risks via spillage or windblown debris.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
Soil compaction (CSP and PV Power plant and power line corridor)	Areas or parks where vehicles are allowed to circulate will be minimised and located only inside the project boundaries	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost
Quarrying	Only quarries approved according Moroccan regulations will be used.	EPC and subcontractors	As soon as the works start and throughout construction period.	Cost included in the contract No additional cost

9.5.3 Residual Impacts

Following the implementation of the mitigation measures and further measures which will be established in the CESMP, the potential impacts of soil and groundwater on site is expected to be significantly reduced to minor negative impact.

9.6 Impacts and measures during Operation phase

No impact is considered significant for power line operation

The main impact identified during the operation phase concerns the accidental leakage of HTF (mineral oil used as thermal transfer fluid) at the solar CSP field.

While HTF impacts are expected to be low in magnitude and number of occurrences, accidental leakage can sometimes occur due to unforeseen defects in materials and joints.

The following table identifies in general terms the type and location of areas where HTF leakage to the ground or the atmosphere could occur accidentally.

Table 42 : Location of potential HTF leaks

Leaks sources	Description
HTF exchangers / Molten salts	Possibility of HTF leakage in metal coil flanges
Expansion and overflow vessels	Possibility of HTF leakage in metal coil flanges, Discharge to safety valves: Possible discharge of light impurities.
HTF system pumps	Possible leakage points to the outside by rupture of the pump seals
HTF Line Instrument Connections	Possible leaks in flanged fittings
Purification Flash Tank	Possibility of HTF leakage in metal coil flanges, Discharge to safety valves: Possible discharge of light impurities
Purification drainage tank	Possibility of HTF leakage in metal coil flanges, Discharge to safety valves: Possible discharge of light impurities. Opening the event to the atmosphere. Discharge point in the common manifold.
Condensation tank -1	Possibility of HTF leakage in metal coil flanges Discharge to safety valves: Possible discharge of light impurities. Opening the event to the atmosphere Discharge point in the common manifold. Discharge the safety valves to the chamber. Possible presence of HTF light impurities
Condensation tank -2	Possibility of HTF leakage in metal coil flanges Opening the event to the atmosphere Discharge point in the common manifold. Discharge the safety valves to the chamber - Possible presence of HTF light impurities -Possibility of HTF leakage at manhole flanges and flanges connection of the instrument
Condensing air coolers	Possibility of HTF leakage in metal coil flanges, Possible presence of light impurities HTF, - Opening of the vent to the atmosphere. Point of discharge in

Leaks sources	Description
	the collector common to the chamber and point of discharge in the atmosphere
Control valves	Valves certified by an organization that guarantees the absence of leaks
Events and drains	Occasional use

Wastewater from the site that has the potential to contaminate soils and is addressed in Part 13 of this document.

Only small quantities of fuel can be stored for construction vehicles (in the construction phase or maintenance periods) and vehicles used in operation (mirror washing trucks in particular), diesel emergency generators / fire pumps and the auxiliary HTF Heater .

Table 43 : Soil Contamination - Significance of impacts during Operation phase

Impact	Receptor	Sensitivity	Impact significance
Spills and accidental releases Low intensity	Soil quality	Average	Minor
Inadequate waste management Low intensity	Soil quality	Average	Minor

9.6.1 Mitigation measures

Mitigation measures during the operation phase are identical to those during the construction phase.

O & M supervisors will implement the mitigation measures listed below.

Table 44 : Soil Contamination - Mitigation measures during Operation phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Spillage and leakage (power plants out of HTF system)	Develop and implement a spill emergency and contingency plan	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
	Develop and implement the training programme for employees to increase their awareness of chemical management protocols including proper handling and storage of chemicals, emergency response, contingency plans and appropriate PPE, if needed.	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
Storage and waste management (Power plants)	Storage areas for domestic waste will be sealed, covered, water-resistant, with shelving / cabinets in order to prevent spillage and leakage into the ground.	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
	The storage tanks of fuels/chemicals/sewage will be properly maintained and stored within a confined space of 110% of their storage capacity.	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost
Spillage and leakage of HTF (CSP Solar field)	The design of the HTF system will include the following features: HTF pipes: - Aerial (not buried, to facilitate the detection of leaks) - equipped with isolation valves, - Welded joints Paved areas of reinforced concrete slabs reinforced at the main HTF system Adequate drainage system	EPC (design)	Design & Construction phase.	Included in O&M budget No specific additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	Bio-sanitation system for the treatment of soil polluted on site. Contaminated soil may be recognized by its characteristic color and odor or by the use of a portable hydrocarbon detector, and will be immediately removed for bio-sanitation treatment. Leak detection system at the thermal storage Sampling system to detect the presence of HTF in the process water Bioremediation system (see mitigation measures in the construction phase concerning bioremediation)			
Wastewater collectors	The design of wastewater collectors, sewers and pumping needs will take into account topography and geotechnical constraints as the case may be.	EPC	Design & Construction phase.	Included in O&M budget No specific additional cost
Spillage, leaks	MSDS will provided for all chemicals	O&M	As soon as the operation start and throughout operation	Included in O&M budget No specific additional cost

9.6.2 Residual Impacts

Residual impacts are close to zero following the implementation of mitigation measures.

10. Storm water management

10.1 Introduction

The development of the project will change the site's topography. Infrequent heavy rain events will lead to increased erosion and the discharge of sediment laden run-off.

One of the main environmental issues with storm water relates to its potential contamination from wastewater or hazardous fluid spills or contaminated soils. This impact has been addressed in the Waste water management chapter. And the mitigation measures included in such section ensures that storm water only contains soil particles excluding contaminants.

10.2 Methodology

The assessment has been conducted by identifying the relevant local and international standards and best practice applicable to the environmental conditions at the NOOR Midelt site and relating to storm water management and erosion prevention during the construction and operation phases of the proposed plant.

10.3 Reference

10.3.1 Erosion risk

According to the FESIA, the NOOR Midelt solar complex as a whole is subject on the one hand to rill erosion stripping the unconsolidated sediment of the Quaternary soil and on the other hand to deep incisions caused by the watercourses which develop a very dense hydrographical network characterizing this basin.

The field diagnosis revealed the occurrence of several forms of erosion, the most marked of which is water-like at the main watercourses level bordering the plateau of the project’s site and the network of chaâbas that cross it.

The various manifestations of erosion, recognised in the site and its close perimeter, are illustrated and described below:

Sheet erosion:

This form of erosion is the most widespread in terms of surface area on the project site's plateau. It is characterized by runoff water without visible claws or rills.

Given the weak slope on the site plateaus (less than 2%), and the impact of the raindrops, the particles are torn off and transported.

Linear erosion:

Linear water erosion is the predominant form of erosion in the study area. When the sheet runoff is organised, it digs deeper and deeper forms. This form of erosion generates runoff that concentrates on lines with greater slope carrying fine particles of soil (clays, silts) and or coarse elements.

Wind erosion

Wind erosion also exists in the project area. The wind erodes by deflation and corrosion. The suspension, transport, and deposition of soil particles depend on the wind speed, the size and density of these particles, soil moisture, and vegetation cover. This phenomenon seems very limited in the study area given the low wind speed (average speed < 14 km/h).

Measures must be put in place to take into account the risk of erosion on the site.

10.3.2 Surface drainage

The existing natural drainage system consists of chaâbas crossing the site from north to south. As shown in the figure below, the NOOR Midelt I site is bordered within less than 200 m of its western boundary, the wadi Bou Arich and wadi Sidi Ayad to the south. The drainage runoff from the site will not be connected to this ephemeral river and therefore the possibility to cause any environmental impact is negligible.

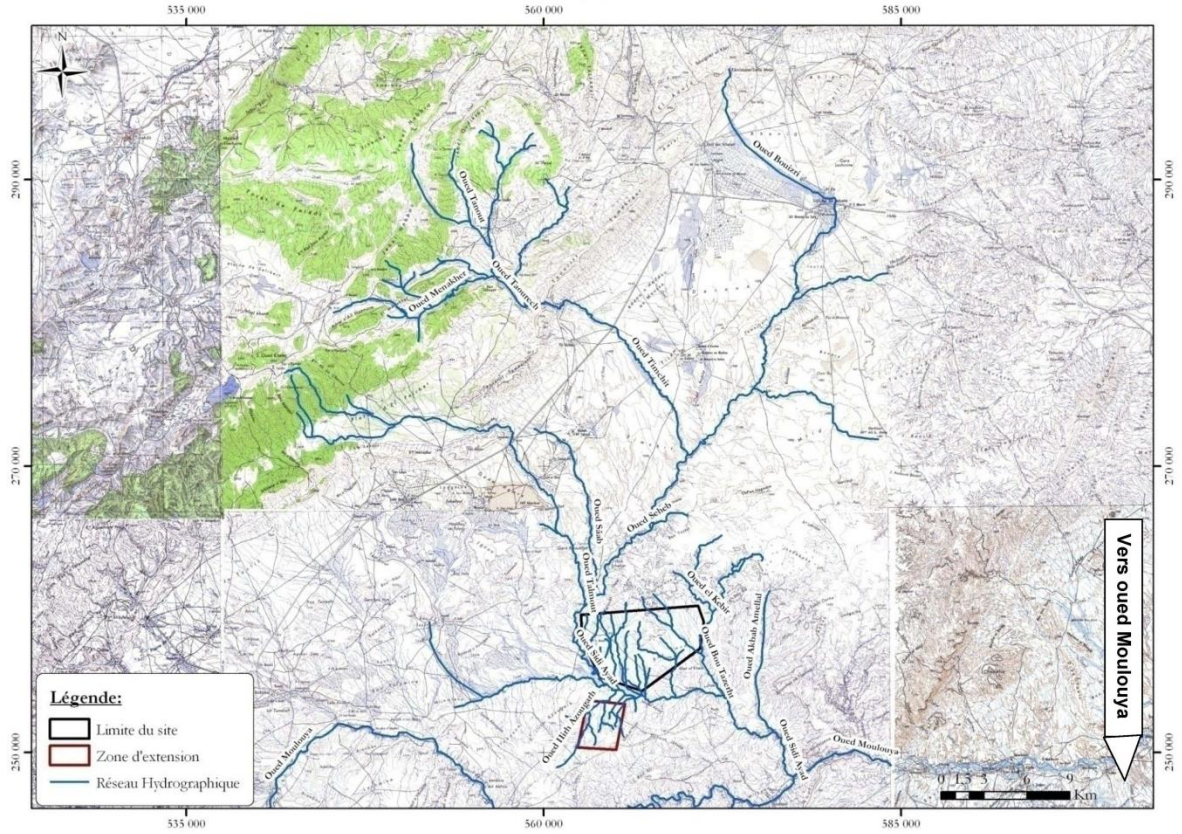


Figure25 : Hydrological network of the area (source: hydrological and hydro geological study on the Midelt site - ADI - MASEN - 2014)

MASEN has conducted a specific study on climate change impact on water resources. The results of this study will be included in the SESIA once the study provided by MASEN.

10.3.3 Risk of Flooding

In terms of flood risk, the site is a high plateau and the chaâba – not important - collects and drains all downstream storm water, therefore there is no potential flood risk on the plot.

The field analysis highlights the significance of the Sidi Ayyad and Bou Tazart bordering wadis on the eastern and western borders of the site, as well as the chaâba network crossing it. In the field, this hazard appears to be moderate, given the good organisation of flows at the site's plateau.

The design of the man-made storm water drainage will have to consider the natural drainage pattern and as a consequence the flow rates and flood risks should remain similar under the construction of the drainage system.

10.4 Sensitive receptors

The table below outlines the identified receptors in relation to storm water management as well as the determined sensitivity of those receptors.

Table 45 : Storm water - Receptor's sensitivity

Receptor	Sensitivity	Explanation
Chaâba (onsite)	Average	The chaâbas crossing the site will be altered and converted in a ditch and channel network (man-made storm water drainage system).
Border wadis (wadi Bou Arich and wadi Sidi Ayad)	Average	Drainage and flow system changes resulting from storm water events will affect the volume and quality of the running water in the bordering streams
Soil/Geology	Weak	The project will modify the current topography and soil characteristics of the site

Storm water will need to be managed according to an adequate internal drainage system, to the discharge points planned at the edge of the site and approved by the Moulouya Hydraulic Basin Agency,and therefore these temporary flows will not be subject to any potential impacts coming from the plant site. Divertion points from chaaba on the site will be reduced as stormwater will be discharged to channel built by MASEN.

10.5 Construction assessment

10.5.1 Impacts

Soil erosion risk will potentially be higher due to earthworks and loosened soil particles on the plant's site.

Earthworks on the site will disrupt natural drainage especially at the level of chaâbas currently crossing the site from north to south.

However the main drainage channels will be designed following the natural chaabas present on the site before construction. As far as possible, natural routes will be respected and earthworks will be minimized. The preliminary drainage system is illustrated in the following figures.

A north-south and east-west grid of ditches and canals will drain rainwater to the east and south of the site (Figure 26). 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. The discharge point to the MASEN drainage channel shall suvject of an agreement with MASEN.

Ditches and canals will be sized according to the flow of rainwater to be drained. The materials used will differ depending on the section, slope and soil type as shown in Figure 27 and Figure 28.

Only canals located in areas of high erosion (sandy soil and steep slope) will be concreted to limit erosion. Many ditches will be left in the natural state, only the profile will be modified. In other cases, the channels and ditches will be made with drainage materials (gravel) or partially vegetated.

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 current chaaba network on the site does not harbour specific biodiversity. The reorganisation of rainwater drainage will therefore have no impact on biodiversity.

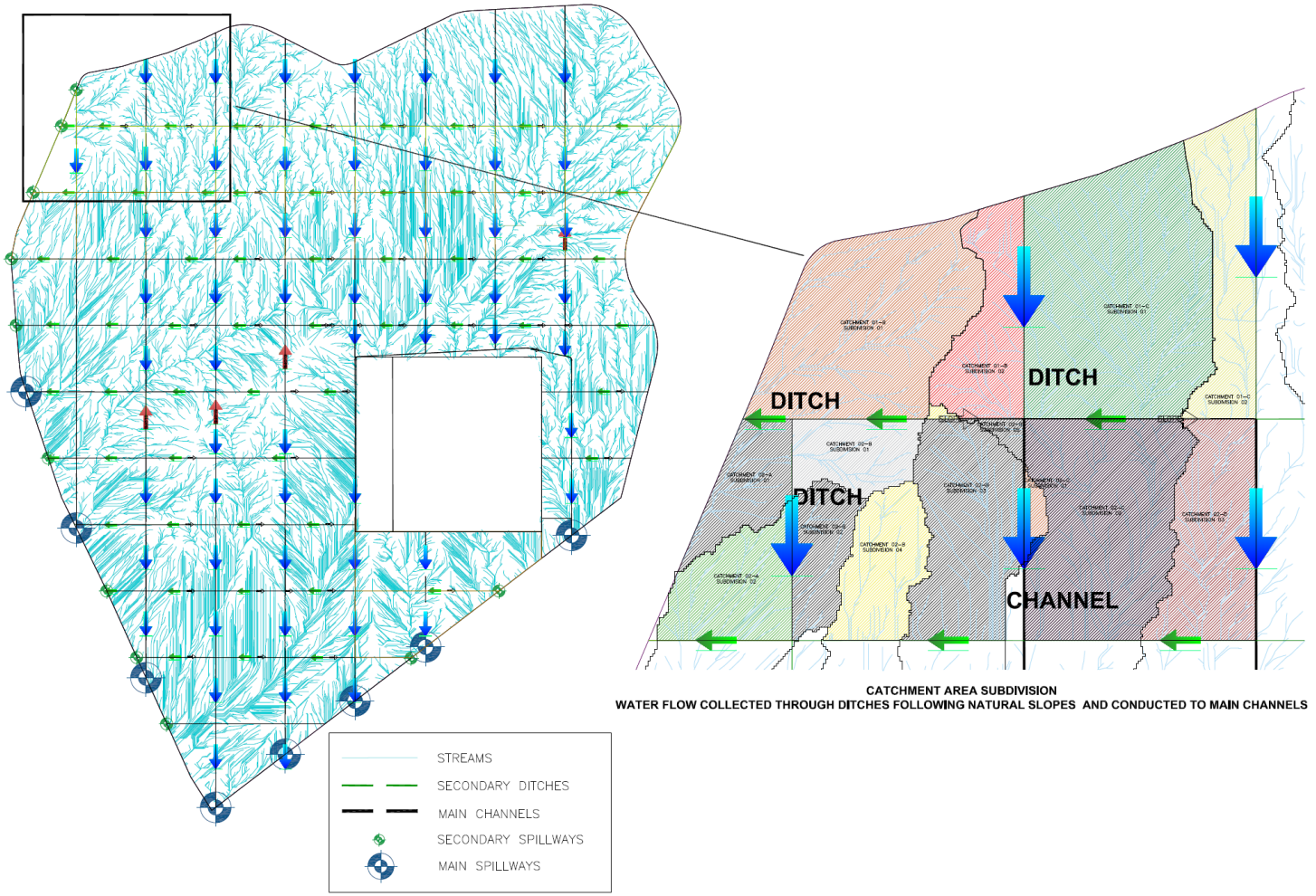


Figure 26 : Drainage network for Midelt I

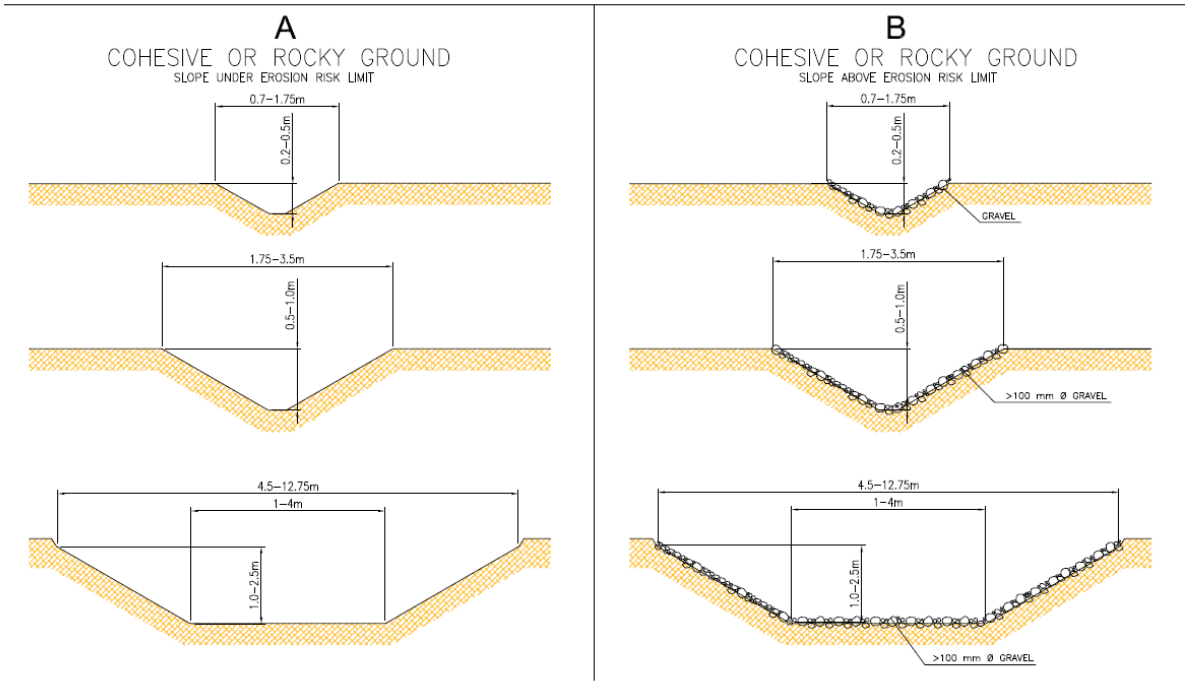


Figure 27 : Ditch and channel description in cohesive or rocky ground

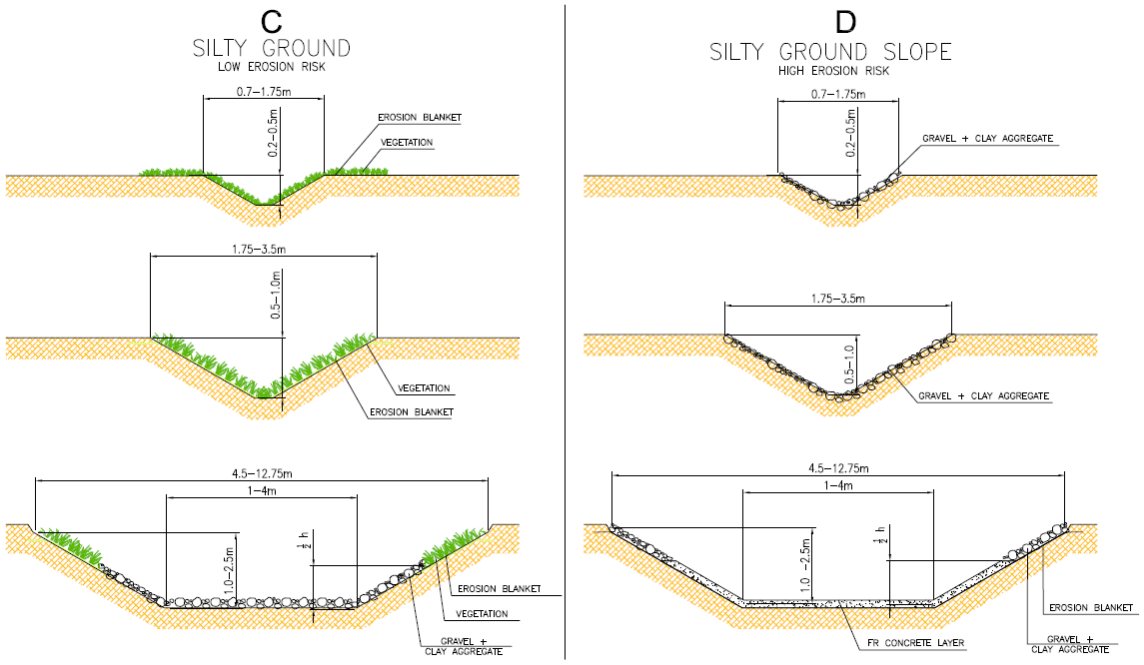


Figure 28 : Ditch and channel description in silty ground

Flooding on the plateau is not an issue, and is unlikely to change as a result of construction activities.

Table 46 : Storm water – Significance of construction impacts

Impact	Receptor	Sensitivity	Impact significance
Flooding Low Intensity	Chaâba (onsite)	Average	Average
	Wadi Sidi Ayad	Weak	Low to zero
Erosion Low Intensity	Chaâba (onsite)	Average	Average
	Wadi Sidi Ayad	Weak	close to zero
	Soils/Geology	Weak	close to zero

10.5.2 Mitigation measures

Table 47 : Storm water management - Mitigation measures during Construction phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Soil erosion	The site will be fenced in order to ensure that no soil disturbance occurs outside of the site's area. The areas requiring excavation/filling shall be clearly demarcated to ensure that the soil is not disturbed outside this area. This fence will be compliant with MASEN requirements.	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
	From the outset of works, plan, select and define areas for clearing, stripping and access routes in order to minimise unnecessary stripping of vegetation	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
	Minimise the disturbed areas	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
	Reduce cuttings as much as possible (the volume of cuttings / embankments should be balanced)	EPC and subcontractors	Design phase and as soon as the works start and throughout construction period.	included in the contract no specific additional cost
	Pathways and access routes will be defined to avoid slopes of more than 15% and adapted to the site topography to facilitate drainage of the surface through gutters. In areas selected as access roads, the longitudinal slope of the road must facilitate the flow of surface water and to avoid the accumulation of sediment in the gutters. The height of embankments and slopes will be reduced, and	EPC and subcontractors	Design phase and as soon as the works start and throughout construction period.	included in the contract no specific additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	vegetation will be recovered on slopes and embankments Excavation work will be interrupted when the soil is extremely wet or saturated. Surface Soil Recovery: This will primarily be used to cover out-of-service areas, such as access areas that will not be used. Cross-sections will be made in the most stable areas, taking into account the geological conditions of the land. Steep slopes will be avoided on lands susceptible to landslides. Concrete gabions and barriers will be built for containment, wire mesh and nets, drains and gutters will be used in slopes for ground stability. Lands that have been removed and stacked for later use will be stored in order to limit soil compaction and erosion.			
	Excavated materials will be kept in the stockpile for as short a time as possible and, once an area is back-filled with soil material, it will be compacted in a short period of time	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
Storm water drainage	The storm water drainage system will minimise and control surface run off and soil erosion within the boundaries of the site. The rainwater drainage system must respect the results of the flood protection study of the NOOR Midelt solar complex and be part of the general drainage scheme. The rainwater drainage system will have to be done in consultation with the technical services of the Moulouya's water basin agency. The connection of the drainage channels to the hydro-graphic network should be made from upstream to downstream The rainwater drainage system must take into account topography and geology site conditions.	EPC and subcontractors	Design	included in the contract no specific additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	The storm water drainage system will include the necessary sediment retaining system to ensure that runoff is free of excessive sediment and other constituents at the discharge point. For this purpose, the following measures will be implemented: • Soil stabilization quickly: Soils will be stabilized where construction activities have ceased temporarily or permanently and stabilization measures will be put in place after the cessation of leveling activities. • Protection of storm sewer entrances. All inputs that could receive rainwater from the project must be protected until the final stabilization of the solar complex. • Establishment of perimeter controls. Areas without construction must be protected and complemented by an erosion control fence and fiber rolls around the perimeter of the Solar Complex to prevent soil erosion and prevent sediment from leaving the site. • Retains sediments on the solar complex and controls dewatering practices. The use of a temporary sediment trap or sediment basin will be considered when sediment retentions from larger areas are required. • Establishment of stabilized construction outlets. The locations where construction vehicles will enter and exit the solar complex must be clearly marked and stabilization measures must focus on these locations. • Inspections and maintenance of controls. Erosion and sediment control measures will be regularly inspected and maintained, including regular and ad hoc inspections	EPC and subcontractors	Design and as soon as the works start and throughout construction period.	included in the contract no specific additional cost

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	Hazardous materials storage areas will be covered to prevent rainfall from entering such areas and avoid emissions of wastewater to the soils, chaâbas, or storm water drainage system. The maintenance of vehicles will only be undertaken offsite in appropriate premises.	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
	The design and location of permanent/temporary storage areas will consider the potential ground contamination risks. Runoff will not be able to enter areas where hazardous materials are stored, handled or transferred. If runoff can potentially enter contaminated areas, a dedicated drainage system will direct the run off to dedicated tanks so as to avoid impacts on soils and groundwater. The fluids contained in these tanks will be collected by licensed operators and processed as hazardous wastewater.	EPC and subcontractors	As soon as the works start and throughout construction period.	included in the contract no specific additional cost
	The storm water drainage system will include a system that retains waste carried by storm water. The system will be located at the project's boundary and will allow easy access to the collection of retained materials.	EPC and subcontractors	As soon as the works start and throughout construction period.phase	included in the contract no specific additional cost
Flooding	The storm water drainage system will be able to accommodate and evacuate runoff so that it protects equipment during the worst case scenario according to the local rain conditions and site's area (funnelled to the channel) and according to the soil and vegetation coverage conditions.	EPC and subcontractors	Design	included in the contract no specific additional cost

10.5.3 Residual Impacts

Following the implementation of the mitigation measures (CESMP), the potential impacts of soil and groundwater on site is expected to be significantly reduced to minor negative impact.

10.6 Assessment during Operation phase

10.6.1 Impacts

There is no identified risk for the power line.

The risk of soil erosion will be reduced in operational phases after completion of construction work, partial revegetation and slope fixation.

The rainwater drainage will have been installed and not have any significant impacts, especially since the network follows the natural chaabas present on the site before construction.

Table 48 : Storm water – Significance of operational impacts

Impact	Receptor	Sensitivity	Impact significance
Flooding Low intensity	Chaâba (onsite)	Average	Minor
	Wadi Sidi Ayad	Minor	Low to zero
Erosion Low intensity	Chaâba (onsite)	Average	Minor
	Wadi Sidi Ayad	Minor	Low to zero

10.6.2 Mitigation measures

Table 49 : Storm water management - Mitigation measures during Operation phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Erosion/siltation/ flooding	The discharge point of the drainage system will be subject to the approval of the Moulouya Watershed Agency and MASEN	EPC / O&M	Design Phase	Included in the contract
	The runoff collection system will be inspected monthly and at the start of a rain event to ensure that no blockages leads to overflowing.	O&M	As soon as the operation start and throughout operation period	Included in the O&M budget
	The effectiveness of erosion prevention and mitigation measures at rainwater discharge points will be verified after storm events to ensure the adequacy of the design measures. Otherwise, these should be upgraded to keep up with storm water flows.	O&M	As soon as the operation start and throughout operation period	Included in the O&M budget
Storm water drainage	The site will be inspected regularly to ensure that no spills (power block and CSP solar field) have occurred in areas that may be susceptible to storm water runoff. All spills must be immediately contained and cleaned, in order to prevent direct and indirect contamination to soils and water sources	O&M	As soon as the operation start and throughout operation period	Included in the O&M budget
	The storm water drainage system will include a system that retains jams. The system will be located at the project's boundary and will allow easy access to the collection of retained materials.	EPC	Design phase	Included in the contract

10.6.3 Residual Impacts

Residual impacts following the implementation of mitigation measures are low to zero.

11. Biodiversity

11.1 Introduction

Protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The impacts on biodiversity can often adversely affect the delivery of ecosystem services, impacting over human beings and biodiversity.

11.2 Methodology

The biodiversity of the project area has been extensively studied preliminary in FESIA. In order to update the available information, additional studies were conducted for NOOR Midelt I projects at the proposed project site and the project area.

11.2.1 Initial considerations

The sites of the NOOR Midelt solar complex, and more specifically, the influence of NOOR Midelt I was visited in mid-April 2018 for 5 days (out of avifauna survey). The environment was dry, but there had been some light rainfall in the previous months. Perennial species were all identifiable, while annual species were scarce. From the second day, the wind was strong.

The fauna was scarce and not very active on the site.

The study area was thus defined:

- The planned area for the construction of the power station (site's area and site for Midelt II), on an area of 1880 ha;
- A halo of one km around the power station (extended zone), on an area of2270 ha.

An overall study area of 4150 ha.

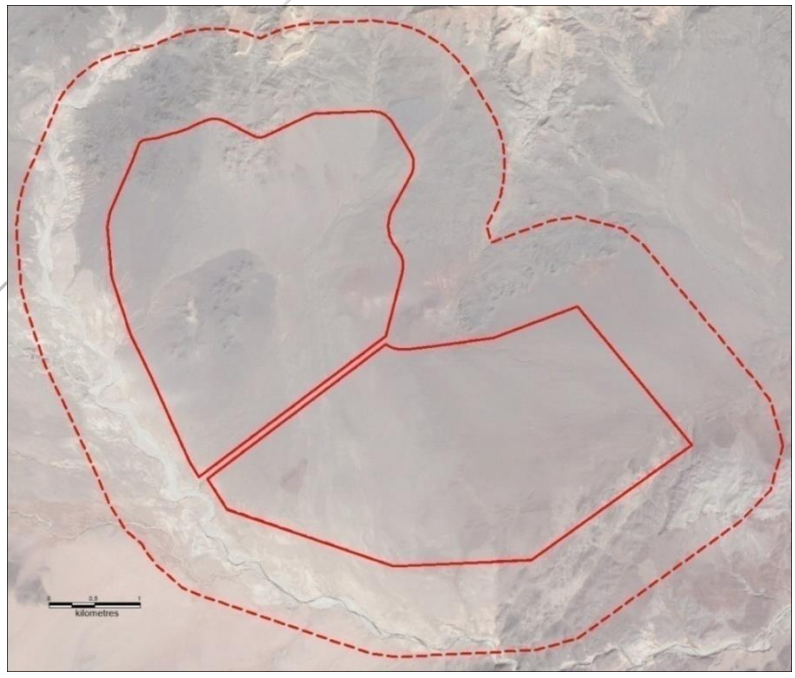


Figure 29 : Power plants' area (red line) and study area (red dash) on Google Earth background

All sites are in the steppe-type area of the Moroccan Oriental. The meteorological station of Midelt, nearby, comes from the arid bioclimatic stage, with a cold variant, according to Emberger.

11.2.2 Methodology and field survey (Fauna Flora excluding birds)

Before the field phase, a list of potentials species was established, based on the available data (scientific works, databases, study reports...).An inventory of flora was made in the field. Simplified vegetation surveys, according to the phytosociological method, were carried out to determine the units of the natural environment.

Various types of vertebrates' fauna indications (cries and songs, traces, faeces, molts, corpses, preys...) were reported. The sites with the highest concentration of fauna have been meticulously visited. The following specific means were implemented:

- At night, ultrasound recordings of bats, using an Elekon Batlogger M recorder detector, which allows continuous recording; the recordings have been studied and identified on a computer using the Batexplorer software;
- Installation of Bushnell HD and Reconyx Hyperfire photographic traps especially on sites of interest detected during the day, possibly with olfactory baits, depending on the target species.

All the itineraries were tracked continuously by GPS (Garmin Oregon 450), with topographic background and satellite recorded on the GPS.

The environmental units were defined on the basis of the vegetation reported. After the fieldwork, the use of the collected data, combined with the Google Earth satellite imagery, produced a map of the environmental units using the Mapinfo v11.02 software.

The heritage interest of the species found on the site was evaluated, according to the national and international legislation (Conventions), but also according to the current knowledge on these species. Based on current knowledge, probable but undetected species were also assessed.

The heritage interest of the environmental units has been classified.

Period survey :

The presence of different species is dependent on winter and spring weather conditions related to rainfall and temperature. The interannual variability of these parameters does not make it possible to definitively identify a specific period favourable to observations. The seasonality of the species is not systematically in line with the calendar seasons.

The biodiversity report is in Appendix 4.

11.2.3 Methodology and Field Survey (Avifauna)

Known for housing the famous DuPont's lark, this area was visited many times by birdwatchers and professionals.

In addition, several surveys have been carried out in the region as part of ornithological impact studies on wind farm projects.

Bird observations are reported in the syntheses (including that of Thévenot *et al*. 2003) and are very rarely the subject of scientific publications.

The consultation of these documents enabled to establish a rather exhaustive inventory of the birds in the Midelt region.

The project site itself has not been the subject of bird-specific investigations to our knowledge.

On the basis of the bibliographical data, the ornithological interest of this region has been evaluated, notably by the presence of threatened, rare or remarkable populations both internationally and nationally.

As part of this assessment study, surveys were conducted on the site and its immediate surroundings during the spring of 2018 (from March 28 to 30 and April 18 to 23). The detailed report for avifauna survey is in Appendix 5.

The surveys were conducted by two observers during the March mission (A. Qninba & MA El Agbani[6]) and by an observer during the April mission (F. Cuzin).

The survey was planned according the breeding and migratory seasons for the relevant species, the available datas and the potential adverse impact of a solar park on avifauna :

- Houbara Bustard : (sedentary species but can move erratically). Bridal parades of males at leks in March and April (sometimes in September and October after good autumn rains), Egg laying occurs in March and April).
- Egyptian Percpopter : (strict passage migratory bird) : Postnuptial migration (autumn) from mid-August to mid-September essentially ; Prenuptial migration (spring) from late February to mid-May.
- Dupont's lark : (sedentary species) : Egg laying from early March to late June."

For a solar park project, the most potentially sensitive species are local breeding species, not migratory species. The field mission, therefore, focused on assessing the presence of local breeding species. Observations made in March and April covered the breeding season of these local breeding species. During this season, the birds are very attached to their nesting territory. As far as migratory species are concerned, the data processed during our various expert appraisals for wind farm projects in the region and our expert opinions, allowed the experts to conclude that additional missions are not necessary.

11.3 Baseline conditions

11.3.1 Flora and vegetation of the site

The site is located on a plateau inserted in areas of greater variations, gently sloping to the south. The plant's field is essentially composed of alluvium, more or less covered with a sandy veil, and weakly dissected by a network of temporary wadis. Basaltic variations are found mainly on the margins of the site, as well as in the north, high limestone plateaus. The course of the wadi Sidi Ayyad also crosses the west and south of the study area.

The following environments are distinguished:

- The reg with Harmel (Peganum harmala), where 95% of the biomass is constituted by this species refused by cattle; the species sought by livestock are rare and in poor condition, such as Stipagrostis ciliata.

Photo 1: Reg with Harmel (Photo Fabrice Cuzin – 2018)

[6] Mrs Qninba and El Agbani are ornithlogist experts funding and active member of GREPOM.

Photo 2: Clumps' state of *Stipagrostis ciliata,* very overgrazed

- The wadis, with Retama sphaerocarpa, have a very weak cover, and a notable accumulation of sand.

Photo 3 : Wadi in *Retama sphaerocarpa*

- Steppes of rugged area, on rugged rocky land, which present the greatest diversity of the study area; Genista Scorpius is frequently found there.

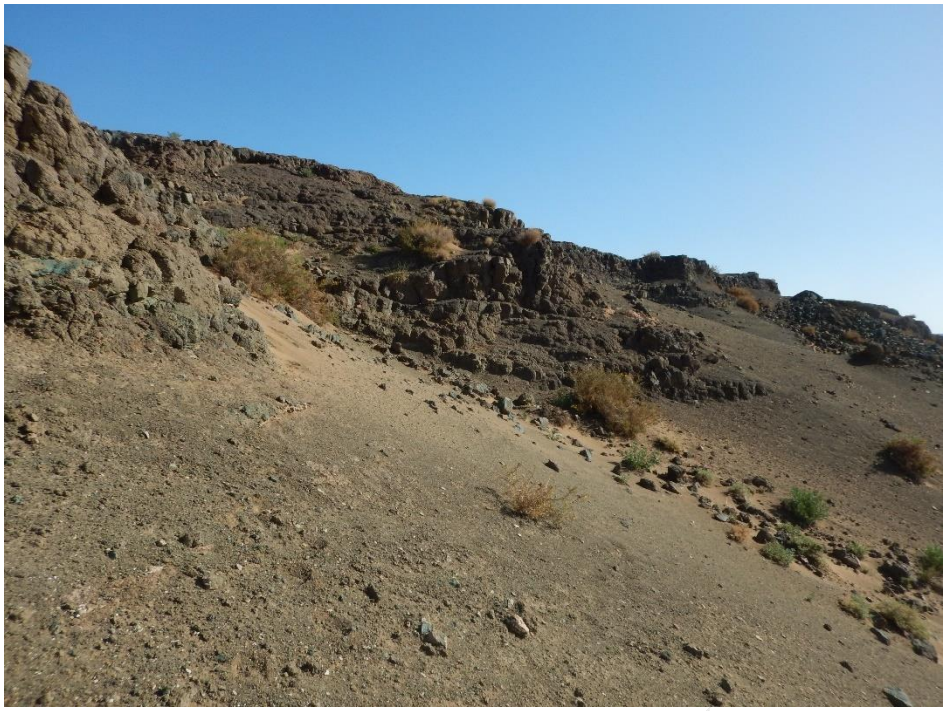


Photo 4 : Steppe of hilly environment, with *Genista Scorpius*

- On both sides of the Wadi Sidi Ayyad's beds, on silty alluvial terraces, there is a halophilic reg (on salty silt), with species of Amaranthaceae (ex Salsola) indicating the salinity of the environment (Noaea mucronata, Salsola oppositifolia, Salsola brevifolia).

Photo 5 : Halophilic Reg

- The Wadi Sidi Ayyad's beds, where vegetation is almost absent due to the floods that ravage it regularly, with rare oleanders.
- In the north, on the high limestone plateaus, on the edge of the study area, a Halfah grass steppe (Macrochloa tenacissima) is fairly well preserved.

Photo 6 : Halfah grass steppe on the Upper plateau

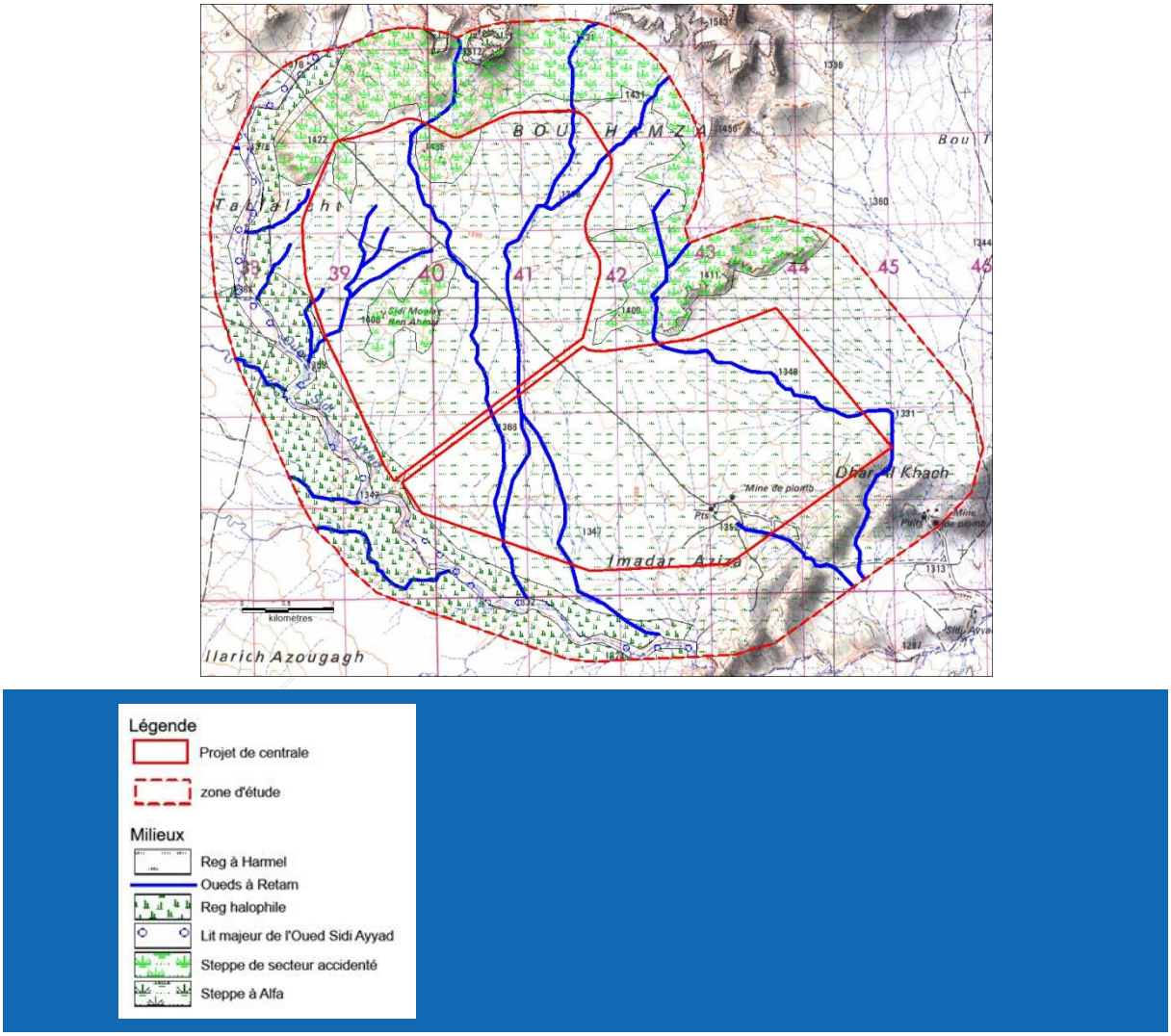


Figure 30 : Natural areas of the study area (on topographic map background at Mibladen's 1 / 50.000)

At the level of the plant's project, the Reg in Harmel is particularly observed, as it is predominant, and crossed with Wadis in Retam. Two rugged steppe-type areas are also present, as well as, at the extreme western edge, the halophilic reg.

At the heritage level, all the natural environments observed in the study area are widespread in the region. It is necessary to underline the exceptional state of degradation of the reg with Harmel, very

probably linked to the degradation of pre-existing Halfah grass tables: this species is overgrazed by the cattle, and still harvested at the moment to feed them, in particular by the use of delivery tricycle. The settlement of farmers of the vicinity of the site[7] and their herds is an essential cause of the degradation of these pastures.

No critical habitat was found in the study area for fauna.

Harmel reg is clearly the result of overgrazing, and can be considered as modified habitat. Others habitats are closer to natural habitats (though more or less degraded when approaching to Harmel reg).

Photo 7 : Cattle grazing exclusively on the Halfah grass

In all, only 20 plant species were found in the study area (see Appendix 4). After a correct development of the vegetation (during good years, ie after good rainfalls[8]), it is probable that one finds more than 50 species in these types of environments: the annual species, very few during the mission, escaped the identification.

Among these species, only one species has a heritage character, according to Fennane and Ibn Tattou (1998): Euphorbia megalatlantica is an endemic species of Morocco (High Atlas and Middle Atlas), not threatened (probably because it is refused by the livestock), which is in the sector located on the edge of its area, much more centred on the mountain ranges. Note also the Halfah grass (Macrochloa tenacissima), major organising species of the Oriental steppes, in sharp decline in the region. IUCN status for all species is identified in Appendix 4.

Analysis of the relevant observations for flora:

- The field observation period in April 2018 was carried out during the best season: after the winter and spring rains, when temperatures increase and plants bloom. Observations during dry and warm periods (June to October) are not of interest because species are invisible
- The field mission of April 2018, following a rainfall below the average, made it possible to identify 20 species, mostly woody species of which none is patrimonial. According to the expert's experience, about 50 species are likely to be found in this type of environment after a very rainy period. The species that could not be observed are the annual species of which few are likely to be endemic.
- Thus, the mission enabled to have a sufficient appreciation of the site's low heritage value concerning the flora. Conducting a follow-up during the construction and operation phase for several years, adapted to the weather conditions on site and around the site will complete this analysis and allow to identify additional measures if necessary.

[7] Land use and impact project are addressed in chapter 17.3.3 and 17.5.1

[8] Good rainfalls in winter at least equivalent to the average of the last 10 years

11.3.2 Site's fauna (except avifauna)

The global inventory comes from various sources (see Annexes 4: Bibliography), and from the Moroccan mammal database (Aulagnier, Cuzin & Thévenot, 2017).

Three species of reptiles have been observed: the Moorish tortoise, the red-tailed acanthodactyl (subsp belli) and the Bosk acanthodactyl (subsp asper). Seemingly there aren't any Amphibians in the study area, as there is no permanent water point. If we consider all the species on the site and in the study area, the probable presence of 6 heritage species is to be reported:

- The Moorish Tortoise is a Vulnerable species;
- The Seps with many scales, the Hooded snake, are endemic species of Morocco, not threatened except for the last one (category NT);
- Spotted acanthodactyl, yellow trogonophis and Mauritanian viper are endemic species of the Maghreb, non-threatened, except the Viper, and NT category;

IUCN status for all species are identifies in Appendix 4.

Photo 8 : *Testudo graeca* (photo A. Qninba)

Photo 9 : *Acanthodactylus erythrurus* subsp *belli* (photo A. Qninba)

For mammals, 3 species of bats (Vespers de Savi, Pipistrelle de Kühl, and Cestoni's Molossus) have been detected; traces of great Gerboise have been observed; testimonies concerning the Hare, the Red Fox, the Golden Wolf of Africa and the Cuvier's Gazelle were collected.

At the heritage level, there is at least one probable presence of the following species:

- 3 endemic species to the Maghreb, the Rozet Macroscelide, the Maghreb Murin, the Gaisler's Ear, non-threatened species; and the Cuvier's Gazelle, present on the Halfah grass highlands to the north and east, outside the study area;
- 1 endemic species to North Africa, Shaw's Merione, a non-threatened species.

The large fauna (Barbary sheep, Striped Hyena) disappeared from the area at least 20 years ago. These are the only endangered species on the list. The Cuvier's gazelles observed over the last ten years in the region are located more than 6 km from the site, in areas of less disturbed highlands.

IUCN status for all species are identified in Appendix 4.

Analysis of the relevant observations for reptiles and mamals :

The duration of the mission allowed to draw up a list of the species probably present on the site. The duration of the mission is initially established on the potential presence of based on existing bibliographic data and field expertise.

Available **herpetogical data** from the region are numerous (Bons & Geniez 1996 and further articles, see bibliography), and allow to make a list of very probable species, correlated with observed species. Detectablity of Reptiles depends upon multiple factors: previous rainfall, thermical factors (which are acting in a different way if we compare Lizards, Skinks and Snakes). More specifically, Skinks are badly known, and observed only episodically by herpetologists, due to their very special thermic requirements: one endemic species caught in the wild in Eastern Morocco, and kept in captivity in a terrarium during years, in conditions close to wild ones, showed only a few days of activitiy during its annual cycle.

Fieldwork allowed to elaborate a list of observed **Mammals** species, and this list was completed with data from the work of Aulagnier, Cuzin & Thévenot (2017), and from the database of Mammals of Morocco, still updated by the expert (about 22.200 observations in Morocco presently). Patrimonial species are mainly large species, which disappeared from the study area a long time ago; small endemic species (as Elephant shrew) are still widespread and not threatened.

Last, it is necessary to emphasize upon the degradation of the study area, which is unfavourable to a high level of species diversity.

11.3.3 Protected areas

According to the Master Plan for Protected Areas, the closest Sites of Biological and Ecological Interest (SIBE) are:

- SIBE Jbel Ayachi, about 30 km south of the site;
- SIBE Aguelman Sidi Ali, about 33 km northwest of the site;
- The Ifrane National Park, about 40 km northwest of the site.

11.3.4 Ornithology

Ornithological issues relating to the Noor-Midelt solar park project

The site, in the strict sense, planned for the installation of the solar park is characterised by three landscape components:

- steppe mainly composed of Harmel (Photo 10); the Halfah grass appearing on the northern edges of the main area or on the south of the extension area (Photo 11),
- the watercourse (Wadi Sidi Ayad) (Photo 12),

- the hills limiting the main area of the project site on the north side, covered by Halfah grass (Photo 13).

No critical habitat has been identified.

In the area adjacent to the site, the most interesting ecological habitats in which birds may be impacted in one way or another are represented by:

- the reservoir built on the Wadi Moulouya river and located a few kilometres to the southwest of the site (Photo 14),
- the Wadi Moulouya valley on both sides of the reservoir (Photo 15).

The information thus collected makes it possible to identify the main ornithological issues that would arise from the installation and operation of the future solar park, at least during the spring period.

Photo 10 : Steppe with Harmel, the main ecological habitat identified within the two zones of the main project and extension.

Photo 11 : Halfah grass steppe, one of the most represented original ecological habitats in the Midelt region.

Photo 12 : Watercourse (Wadi Sidi Ayad).

Photo 13 : Hills just north of the main project area, covered with Halfah grass. In the distance the mountains of the Eastern High Atlas can be seen.

Photo 14 : Dam lake in the south-west of the Noor-Midelt solar park project site.

Photo 15 : Valley of Wadi Moulouya with its rocky banks.

Annotated inventory of birds from the Midelt region

158 species are known in the region of Midelt and its surroundings; they are spread over 45 families (Appendix 5); the most represented are Muscicapidae (20 species), Alaudidae (15 species) and Accipitridae (13 species). IUCN status are identified in table in Appendix 5.

125 of the species mentioned breed in the area; an important figure for an area with a landscape, supposedly, homogeneous and monotonous.

It is therefore a fairly rich and diverse stand, despite the apparent dominance of a single type of habitat: the steppes.

Indeed, some natural shreds of tree habitat exist; they are also reinforced by arboreal fruit crops (especially apple trees); this explains the presence of many forest species whereas one would expect the preponderance of steppe species.

The rock species are also well represented because of the presence of steep hills sometimes (practically small mountains) and the rocky banks of the Wadi Moulouya and other rivers (certainly of less importance).

The ornithological stand of Midelt has, in addition, a remarkable characteristic: the co-existence of Mediterranean species and Saharan species: the plateau of Midelt would represent a Saharan enclave within a Mediterranean environment.

Thus, the Black-eared wheatear (Mediterranean) meets the Desert and Gray Headed Wheatear; the Skylarks and Calandra larks (Mediterranean) are found next to Temminck's and Thick-billed larks as well as Bar-tailed and Desert larks.

Another remarkable characteristic of the birds of the Midelt region, which concerns exclusively the breeding quota: in general, the birds are very interested in the banks (more or less steep of the wadis) to establish their nests and rest there; this has been found even for a number of birds supposed to be in steppe-like environments. Many bird species use steep and often shaded banks to establish their nesting supports. But birds nest in these areas during spring; yet spring is the season of greatest hydrological stability. As a result, the middle and upper parts of the banks are virtually not inundated.

In fact, the harsh climatic conditions that prevail in this region in late spring and early summer cause many species to search for nesting supports and shelters in the shady areas of the wadi's banks. Compared to Chaabas, large wadis with high banks attract breeding birds or birds seeking refuge from high temperatures.

Finally, a biological curiosity recently discovered in the area (Qninba *et al*. 2013): the gray Flycatcher (a forest species) uses roots (especially Halfah grass) and hanging branches in ravines and small streams to build its nests. This is an adaptation of the species to an environment where tree supports are lacking or are very rare.

Heritage interest of the bird population of the Midelt region

Three species are of great interest for biodiversity on a global scale (IUCN status):

- the Houbara Bustard, classified "Vulnerable",
- the Egyptian Vulture, classified "Endangered",
- DuPont's lark, classified as "Near Threatened".

It's been reported, however, that the Egyptian vulture is only a migrant in the region. This species does not breed in the area and its immediate surroundings; it does not even have favourable nest sites.

The other two species, typical in arid steppe areas, represent ornithological values of high importance.

The Houbara Bustard was the subject of a rehabilitation programme (Missour ECWP project) that successfully remedied the alarming trend of the stand's state; it is increasingly easy to observe this species in favourable areas in Morocco, including the Midelt plateau.

At the national level, 22 species are considered as heritage:

- 8 Maghrebi, North African or Ibero-Maghrebi endemic species (Barbary Partridge, Red-necked nightjar, African blue tit, DuPont's lark (already almost globally threatened), the

Isabelline Warbler, the Iberian Chiffchaff, the Flycatcher of the Atlas and the House Bunting of the Sahara.

- 5 species threatened as breeding species but among which only one species actually breeds in the area: the Houbara Bustard (already classified as "Vulnerable" on an international scale).
- 4 rare species in Morocco as nesting but only the Eurasian Coot is found breeding on the plateau of Midelt; No evidence of breeding has been found for Gray Heron, Golden Eagle, or Lesser Kestrel. These last two species are reported to be nesting further on the cliffs of the Middle Eastern Atlas and the Eastern High Atlas.
- 2 vulnerable species in Morocco (the Black-crowned night heron and the Collared pratincole), of which no definite proof of reproduction has been found in the region.
- 2 mountain species with a very localised Moroccan distribution (Horned Lark and Alpine Accentor). The first was found in the area at 1700 m altitude; the second must only frequent the area outside the breeding season since it does not breed at heights greater than 3,000 metres.
- 1 remarkable species in Morocco (the white stork) which establishes its nests on urban supports such as mosque minarets or on metal supports of telecommunications stations (pylons and others), rarely on trees.

List of birds surveyed during the spring of 2018 on the site and its immediate surroundings

45 species have been identified (table below) of which 2 were not previously reported for the region but which were considered as potential: the Ruddy Shelduck and the Pin-tailed sand grouse.

38 correspond to breeding species; the others are either migratory migrants or erratic birds.

Within the boundaries of the site, 32 species have been identified, of which 26 are breeding.

The vast majority of species are steppe birds such as the Houbara Bustard, the Gangas (black-bellied and pin-tailed), some Shoreline birds (Eurasian stone-curlew and Cream-coloured courser), the Larks (Skylarks and Crested larks) and some Wheatear (desert and gray headed).

Others are rock species that have been found either at the steep banks of the Wadi Sidi Ayad separating the two areas of the site or on the heights of the hills bordering the site: Common Kestrel, Little Owl, European Bee-eater, Black Wheatear and Black-eared Wheatear, Trumpeter Finch.

Finally, two aquatic species were observed on the bed of the Sidi Ayad wadi: the Ruddy Shelduck and the Little Ringed Plover.

Heritage interest

Among the 26 breeding species, two are of significant heritage interest:

- the Houbara Bustard, a "Vulnerable" species on an international scale and "Endangered" in Morocco,
- the Ruddy Shelduck, "Vulnerable" nationwide.

Two other species remain potential (not encountered during surveys conducted during the spring of 2018) but their distribution throughout the region strongly suggests their presence in the site:

- the Barbary Partridge, endemic to North Africa and game species,
- the DuPont's lark, near-threatened on the international scale and Ibero-Maghreb endemic.

Table 50 : List of birds found within the boundaries of the study site and in its immediate vicinity.

Scientific name	English name	Identified on Site (blue cell)	Identified on Immediate surroundings (blue cell)	IUCN Status

Scientific name	English name	Identified on Site (blue cell)	Identified on Immediate surroundings (blue cell)	IUCN Status
Anatidae				
Tadorna ferruginea	**Ruddy shelduck**			
Anas platyrhynchos	**Mallard duck**			
Columbidae				
Columba livia	**Rock dove**			
Streptopelia decaocto	**Eurasian collared dove**			
Pteroclidae				
Pterocles orientalis	**Black-bellied sand grouse**			
Pterocles alchata	**Pin-tailed sand grouse**			
Caprimulgidae				
Caprimulgus europaeus	European nightjar			
Apodidae				
Apus pallidus	**Pallid swift**			
Otididae				
Chlamydotis undulate	**Houbara bustard**			**VU**
Ciconiidae				
Ciconia ciconia	**White stork**			
Burhinidae				
Burhinus oedicnemus	**Eurasian stone-curlew**			
Charadriidae				
Charadrius dubius	**Little ringed plover**			
Glareolidae				
Cursorius cursor	**Cream-coloured courser**			
Strigidae				
Athene noctua	**Little owl**			
Accipitridae				
Milvus migrans	Red kite			
Upupidae				
Upupa epops	**Eurasian hoopoe**			

Scientific name	English name	Identified on Site (blue cell)	Identified on Immediate surroundings (blue cell)	IUCN Status
Meropidae				
Merops apiaster	**European bee-eater**			
Falconidae				
Falco tinnunculus	**Common kestrel**			
Corvidae				
Corvus corax	**Northern raven**			
Alaudidae				
Ramphocoris clotbey	**Thick-billed lark**			
Ammomanes cincture	**Bar-tailed lark**			
Ammomanes deserti	**Desert lark**			
Melanocorypha calandra	**Calandra lark**			
Calandrella brachydactyla	**Greater dhort-toed lark**			
Eremophila bilopha	**Temminck's lark**			
Galerida theklae	**Thekla's lark**			
Galerida cristata	**Crested Lark**			
Galerida macrorhyncha	**Long-billed lark**			
Hirundinidae				
Delichon urbicum	Common house martin			
Hirundo rustica	Barn swallow			
Phylloscopidae				
Phylloscopus ibericus	Iberian chiffchaff			
Phylloscopus collybita	Common chiffchaff			
Sylviidae				
Sylvia melanocephala	**Sardinian warbler**			
Sylvia conspicillata	**Spectacled warbler**			
Sturnidae				
Sturnus unicolor	**Spotless starling**			
Turdidae				
Turdus merula	**Common blackbird**			

Scientific name	English name	Identified on Site (blue cell)	Identified on Immediate surroundings (blue cell)	IUCN Status
Muscicapidae				
Oenanthe oenanthe	Northern wheatear			
Oenanthe deserti	**Desert wheatear**			
Oenanthe hispanica	**Black-eared wheatear**			
Oenanthe moesta	**Red-rumped wheatear**			
Oenanthe leucura	**Black wheatear**			
Passeridae				
Passer domesticus	**House sparrow**			
Motacillidae				
Anthus trivialis	Tree pipit			
Motacilla flava	**Western yellow wagtail**			
Fringillidae				
Bucanetes githagineus	**Trumpeter finch**			
Number of species found		**32**	**45**	

Justification for only one survey in spring

The field survey was planned according to the breeding and migration seasons for the relevant species, the available data and the potential negative impact of a solar park on birdlife:

- "Houbara Bustard : (sedentary species but can move erratically). Courtship ritual of males at leks in March and April (sometimes in September and October after good autumn rains), Egg laying occurs in March and April).
- Egyptian Percpopter : (strict passage migratory bird) : Postnuptial migration (autumn) from mid-August to mid-September essentially. Prenuptial migration (spring) from late February to mid-May.
- Dupont's lark : (sedentary species) : Egg laying from early March to late June.

For the survey, the relevant thing to do was to focus the research on breeding populations, that are much more sensitive to projects such as solar parks. Breeding birds are more attached to nesting sites than wintering and migratory birds (except water birds). In this context, the spring survey (corresponding to the peak breeding season in this area) provides the most relevant scientific data to accurately assess the impact of a solar park project on ornithological populations. For migratory birds, datas gathered by the expert team during previous investigations in the area particularly for windfarm project is sufficient for assessment and no additional surveys are required.

Houbara Bustard presence

Our surveys have confirmed the presence of the Bustard several times both within the boundaries of the site and in its immediate vicinity. These observations have also identify a parade male within a steppe-covered area in Alfa, located 6 km the south of site of Midelt 1 (Figure 31 ; Photo 16).

The family structure of the Houbara Bustard is not traditional. During the breeding season, males gather in places called "leks"; they parade and the dominant males successively attract the females for mating. After the mating and parrying period, the females disperse and each lay two eggs often very far from the lek area. These females can establish their nests anywhere and within all habitat

types in the Midelt region except in wooded areas. This laying area is very large and cover all the Midelt Plateau.The site is a potential area where females can lay. Mapping these nesting sites isn't possible.

Photo 16 :.Male Houbara bustard parading in Harmel steppe.

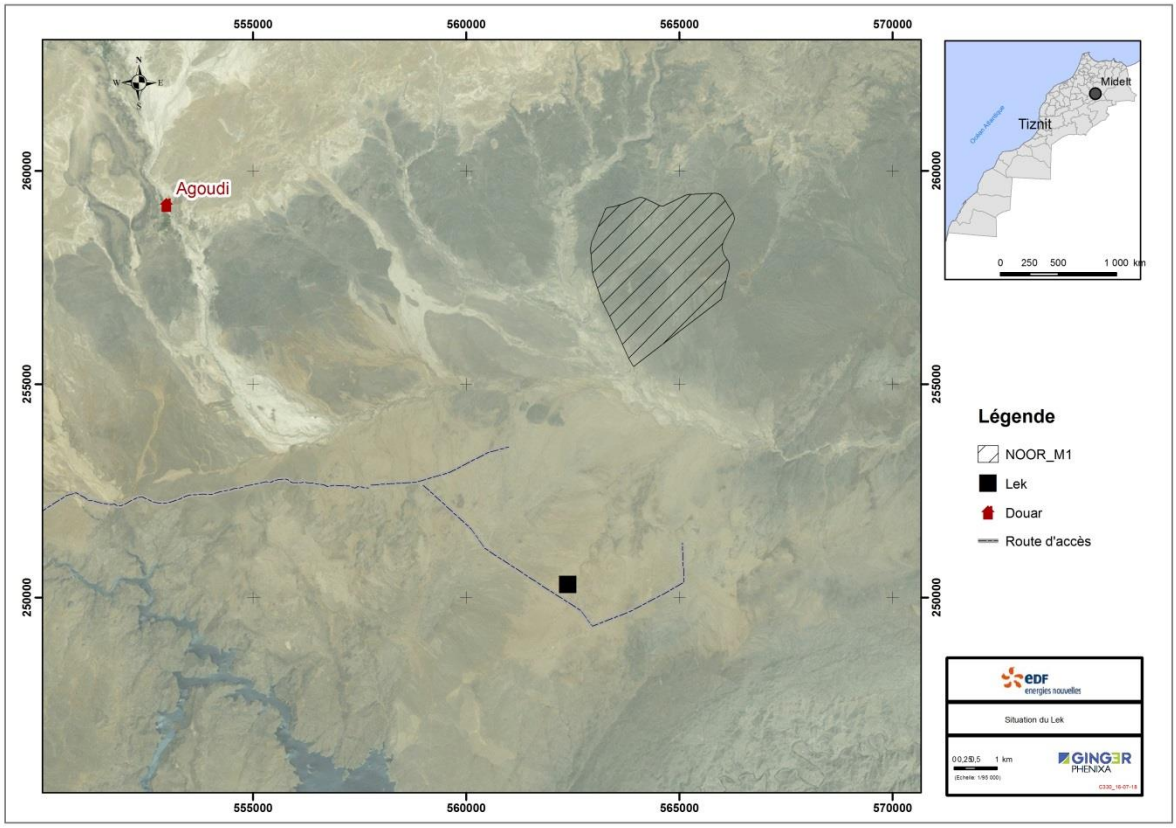


Figure 31 : Houbara Bustard lek location

DuPont's lark presence

During the survey, the ornithologist did not observe the Dupont's lark within and in the immediate vicinity of the site. They even went back to attract the species, to no avail (Dupont's lark was observed in May 2013 southeast of Midelt, cf photo 17). The reason for the absence of the Sirli de Dupont results in particular from a strong degradation of the habitat by the pastoral activities on site. Ecological conditions improvement could enable the Dupont's lark comeback. If there is ecological condition improvement with the project the possibility of (re)colonisation of the site by the Dupont's lark is not excluded[9].

In case of presence, mapping the nests of the Dupont's lark (even when it is possible to spot a nest or two) isn't possible because this bird (which nests in a group and pairs remain scattered) can choose to build its nests at the base of any tuft of vegetation.

[9] There will be no more grazing in the area of the project. We can expect revegetation in the project's area. We can also expect that grazing will be reduced just around the site.

Photo 17: DuPont's lark photographed in May 2013 southeast of Midelt.

11.4 Sensitive receptors

The site itself is poor in species, due to a long over-exploitation by the breeders, related to the accessibility of the site, and to the proximity of the surrounding villages. Currently, the site itself is operated by breeders, of local origin; overgrazing is manifest, resulting in a sharp decline in Halfah grass;

At the heritage level: the best preserved habitats are at the edge of the study area: the Halfah grass steppe of the high plateau is the best example, followed by the steppe on uneven ground. It is in the Halfah grass steppe that Cuvier's Gazelle can currently be found, but outside the study area;

The Noor-Midelt solar park project will have as a negative impact the reduction of the vital area of the Houbara Bustard. This is the main ornithological issue of the project. This species (Vulnerable globally and Endangered in Morocco) is quite common and uses the whole area (Site and Surroundings) as feeding grounds, courtship and breeding (surveys of the local population confirmed nesting and spawning throughout the area).

DuPont's lark **(**threatened species at international level and endemic to Ibero-Maghreb) could be an important issue but it wasn't observed due to the degradation of ecological conditions.

The table below outlines the identified receptors in relation to biodiversity as well as the determined sensitivity of those receptors.

Table 51 : Biodiversity - Sensitivity Receptor

Receptor	Sensitivity	Explanation
Local wildlife	Weak	The study area has a low biodiversity value and no species with a particular conservation status were identified.

Protected areas	Weak	All protected areas under the Master Plan are located at a distance from the plant site, at least 30 km from the site.
Houbara Bustard (feeding and breeding ground for females)	High	Vulnerable species on a global scale and endangered in Morocco. Present species that uses the entire area included project's site as a feeding and breeding ground
Houbara Bustard (lek for males)	High	Vulnerable species on a global scale and endangered in Morocco.. The lek (courtship area) is located 6 km southern project's site
DuPont's lark	High	Threatened species at international level and endemic to Ibero-Maghreb). Probably presence in the area in case of ecological conditions improvment.
Bank wadis	High	Many bird species use steep and often shaded banks to establish their nesting supports. But birds nest in these areas during spring; yet spring is the season of greatest hydrological stability. As a result, the middle and upper parts of the banks are virtually not inundated.

11.5 Impacts and measures during the construction phase

11.5.1 Impacts

Impacts on the biodiversity of the site

The field survey showed that the biodiversity of the plant site was limited. Most of the vegetation and wildlife identified in the study area were on wadis outside the site.

The requirements related to the design and planning of the plant will include earthworks (cut / fill), resulting in loss of flora on the site and disturbance of wildlife at and / or near the site.

Disposal of soils for the site's excavation can reduce seed quantities for future growth of vegetation. It is possible that re-growth occurs to some extent where the field areas are not developed.

Inadequate design and storage of waste could result in contamination of soils and groundwater and attract pest species and spread disease.

The equipment and machinery used on site might cause direct mortality of terrestrial fauna.

It should be noted that the installation of solar power plants over large areas is a recent phenomenon: the impact of these projects is still poorly known, and the scientific literature in this area is limited.

Impacts on protected areas and surrounding ecosystems

No impact is predictable given the distance of protected areas.

Impacts on the avifauna

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 and have plenty of space in the region and elsewhere in Morocco.

The reproduction period of the Houbara Bustard, especially the assembly phase in the lek won't be disturbed during construction work as it is located 6 km south the site of Midelt 1.

The site is a potential area where females can lay. The laying area is very large and cover all the Midelt Plateau. All the area of the project's site (950 ha) can no longer be used as a laying and breeding area for females. As the laying area is very large the impact is moderate.

As DuPont's lark is no longer present, the impact is negligible.

Potential positive impact

After the delimitation and the closing of the solar park for its protection, the original habitat (Halfah grass or Sagebrush steppe) will be able to regenerate in the interstitial spaces between the panels if the park's configuration allows it[10]. If this is the case, it could be favorable for a large contingent of steppe birds such as Gangas, Courvite, Oedicneme and Alouettes (including possibly the famous DuPont's lark who could live with presence of panels. If this is the case, it could be favourable for a large contingent of steppe birds such as Sand grouses, Coursers, Stone Curlews and Larks (including possibly the famous DuPont's lark) who could live with the presence of panels. This assumption has to be confirmed or not through monitoring activities.

- **Impacts bank wadis**

The banks of wadi Sidi Ayad will not be affected by the project. No work is planned on these banks, therefore, no impact is expected.

Table 52 : Biodiversity – Significance of impacts in construction phase

Impact	Receptor	Sensitivity	Impact significance
Vegetation destruction High intensity	Existing flora and fauna	Low	Low Positive
Poaching Medium intensity	Hubara Bustard	High	Medium
Avifauna disturbance during construction. Female can't use site area for laying Medium intensity	Avifauna	Medium	Medium to low
	Hubara Bustard (laying and feeding area)	High	Medium
	Hubara Bustard (Lek area)	High	Low
Impact on wadis bank Low to negligible	Nesting areas on banks	High	negligible

[10] This is not a mitigation measure. We speculate that there will be a normal development of vegetation in an area that will no longer be overgrazed. This assumption has to be confirmed or not during operation phase by monitoring activities. Houbara bustard nuptial area is located 6km southern the site and won't be impacted by the project. For the area around the site, we can expect that grazing will be reduced. Vegetation development and peaceful atmosphere may have positive impact on Houbara Bustard presence. This will be confirmed or not according to the monitoring results. For small passerines, they may fly over the site for mating/breeding/nesting in case of the improvement of the environmental conditions (as vegetation development). These also will be confirmed following the monitoring results.

11.5.2 Mitigation measures

Table 53 : Biodiversity - Mitigation measures during Construction phase

Impact	Mitigation	Responsibility	Schedule	Cost
Habitat Loss (the habitat isn't Natural Habitat)	The living space of the Houbara Bustard (especially feeding, laying and breeding area on project's site) will certainly be affected. Monitoring will be implemented to assess the impact. Following the monitoring results (if they show an important reduction of Houbara Bustard presence assessed by an expert)measures could be implemented such as the rehabilitation of the Halfah or Sage bush steppe on a limited area and/or around the space occupied by the solar park. This measure will be subject to discussion and agreement of all stakeholders.	Stakeholders	Before starting or during construction	To define
	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 (refer chapter 11.3.4 in SESIA report)	EPC	Before starting construction (if starting is in spring period).	30 KDHS
	Fencing is that species such as bustard can be prone to fence collisions so adding high viz tape to any fences to make them more obvious to flying or running birds	EPC	Design phase	Included in the contract
	The contractor will be careful in not encroaching on nearby, adjacent lands. The construction site facilities and the construction infrastructures will be located at the project's site and will be removed as soon as possible after the commissioning start-up, just after the reception.	EPC and subcontractors	As soon as the works start and throughout construction period.	Included in the contract
	During phase construction, vehicles will circulate on the designated routes in order to prevent unnecessary land encroachment, thus protecting the natural resources and	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

Impact	Mitigation	Responsibility	Schedule	Cost
	reducing dust emissions			
	When it is possible, vegetation by local species in areas where colonisation is difficult (or in order to promote the vegetation process) will be carried out in areas where vegetation is acceptable during the operation phase. These areas are inside the site at the boundaries of PV field (only few hectares). The effort will focus on the selection of local species to achieve a natural restoration. Re-vegetation will only occur in areas remote from electrical equipment (main power block and CSP solar filed) to prevent future fire hazards. Vegetation could be the same that initial cover (Halfah, Sage bush). The areas have to be identified between EPC and biodiversity expert (according to monitoring mission for biodiversity). Large trees or shrubs are not recommended because they attract birds, reptiles and other wildlife to the site, which could lead to increased mortality. Therefore, planting will be limited to locally present herbaceous species.	EPC and subcontractors	At the of construction period	Included in the contract
	Invasive species will be avoided for vegetation.	EPC and subcontractors	Design phase and end of construction	Included in the contract
	The personnel in charge of the works must be made aware of the requirements to reduce the risk of wildlife destruction. Works (including the movement of machinery) must be strictly confined to the project area.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Poaching/Hunting/Trade	Hunting, falconry and trade will be strictly prohibited and sanctioned. Information notes will be posted.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Direct Mortality of Fauna	A speed limit of 20 km / h will be imposed on the site to reduce mortality of wildlife. Speed limits will be respected	EPC and subcontractors	As soon as the works start and throughout	Included in the contract

Impact	Mitigation	Responsibility	Schedule	Cost
	on external access routes.		construction period	
	Workers will be trained to inform the E&S team of the presence of reptiles or small mammals trapped in the trenches, and a procedure will be implemented to bring the animals safely off-site (not just outside the project site).	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Inland transportation to and from the site will be minimised through efficient transportation management to minimise the risk of animal mortality	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Include in the initial training of employees, modules about the protocols for the ecological management of biodiversity, including prohibited activities on site, protocols for wildlife discovery especially with regard to the Houbara Bustard.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Establish procedures to treat all species on the construction site, including reporting, identification and potential relocation procedures	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Direct mortality of birdlife due to electrocution with power line	The EPC will take into account guidelines on how to avoid or mitigate the impact of power lines on migratory birds in the Africa-Eurasia region established by AEWA-CMS (Agreement on the Conservation of Waterbirds Africa - Eurasian Migratory Birds) and the Convention on Migratory Species (Bonn Convention) for the technical design of power lines. This design will also conform to the recommendations specified by the "Berne Convention Group of Experts on Bird Conservation" and Birdlife "Birds and Power Lines in the Rift Valley / Red Sea Flyway". For each of these design recommendations, the EPC will clearly identify those that have been incorporated into the design and, where none of them have been incorporated, the technical reason why it is not applicable will be underlined. .	EPC	Design Phase	Included in the contract

Impact	Mitigation	Responsibility	Schedule	Cost
	The report will be submitted to the project company and reviewed by a qualified independent expert to ensure that the proposed detailed design is in line with international best practices to minimize bird mortality.			
Pest	The use of pesticides will be very limited, it will be preferred methods and / or non-harmful products when possible. The use of pesticides will be compliant with OS-4 of AfDB requirements. Only low-toxicity pesticides that do not pose a threat to human health or the environment, and that will not affect natural pest enemies. Management and disposal of pesticides would be in accordance with good international industry practice, such as the Food and agriculture Organization (FAO) International Code of Conduct on the Distribution and Use of Pesticides. Any chemical—including ozone-depleting substances and persistent organic pollutants, pesticides classified in Class Ia (extremely hazardous), Ib (highly hazardous) or II (moderately hazardous) are prohibited All food waste will be stored in lidded containers.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Human activity	Whenever possible, night work will be avoided to avoid excessive human disturbance to wildlife. Measures against light pollution (in compliance with night lighting requirements in MFS), as described in the chapter on landscape, and noise, as described in the chapter concerned, will minimise human disturbance.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

11.5.3 Residual Impacts

Following the implementation of the mitigation measures described above, and considering the partially high ecological value of the site with the Houbara Bustard, we view the negative residual impacts on the terrestrial ecology of the site as low to medium.

11.6 Impacts and measures during the operation phase

11.6.1 Power line specific impacts

The power line is of a very short length (3,6 km) however the risks of mortality of birds by electrocution or collision exist.

The raptors identified during the field mission and identified during the literature review (see § 11.3.4.), Are potentially the species with a major mortality factor due to electrocution and collision with power lines. Specific measures will need to be included in the mitigation section to avoid or minimize potential negative impacts on these species.

11.6.2 Power plant impacts

Potential impacts during the operation phase of the plant include direct wildlife mortality due to traffic, potential impacts of migratory birds' collisions with signs and the use of herbicides or pesticides on site.

- **Direct mortality**

Traffic density during operation will be very low and mitigation measures to limit speeds and avoid irresponsible behaviour are included in the traffic chapter.

- **Mortality of birds**

A change in birdlife is certain: it is likely that other species will settle or densify their population on the site, such as the Common Kestrel (small raptor willing to use artificial perches), or even the Turtledove (very anthropophilic species).

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

In general, plantations are observed on these sites on restricted surfaces Invasive species would be avoided.

An Hubara oustard partial living area will be impacted because the site is used for laying and breeding. The size of this area is low compared to the whole of Hubara oustard living area (all the Midelt Plateau). The lek located at 6km south the site won't be impacted.

The presence of panels and their luminous reflections could disturb the water birds likely to be found near the Hassan II dam reservoir.

Only one Large Migratory Raptor (Black Kite) has been identified during the ornithological surveys. Previous impact studies in the region have shown that wadi valleys with a north-south orientation (such as those of Wadis Outat and Bel Lahcen) represent passage ways used by migrants. However, migration flows do not pass over the site, the identified corridor are located further west (figure below).

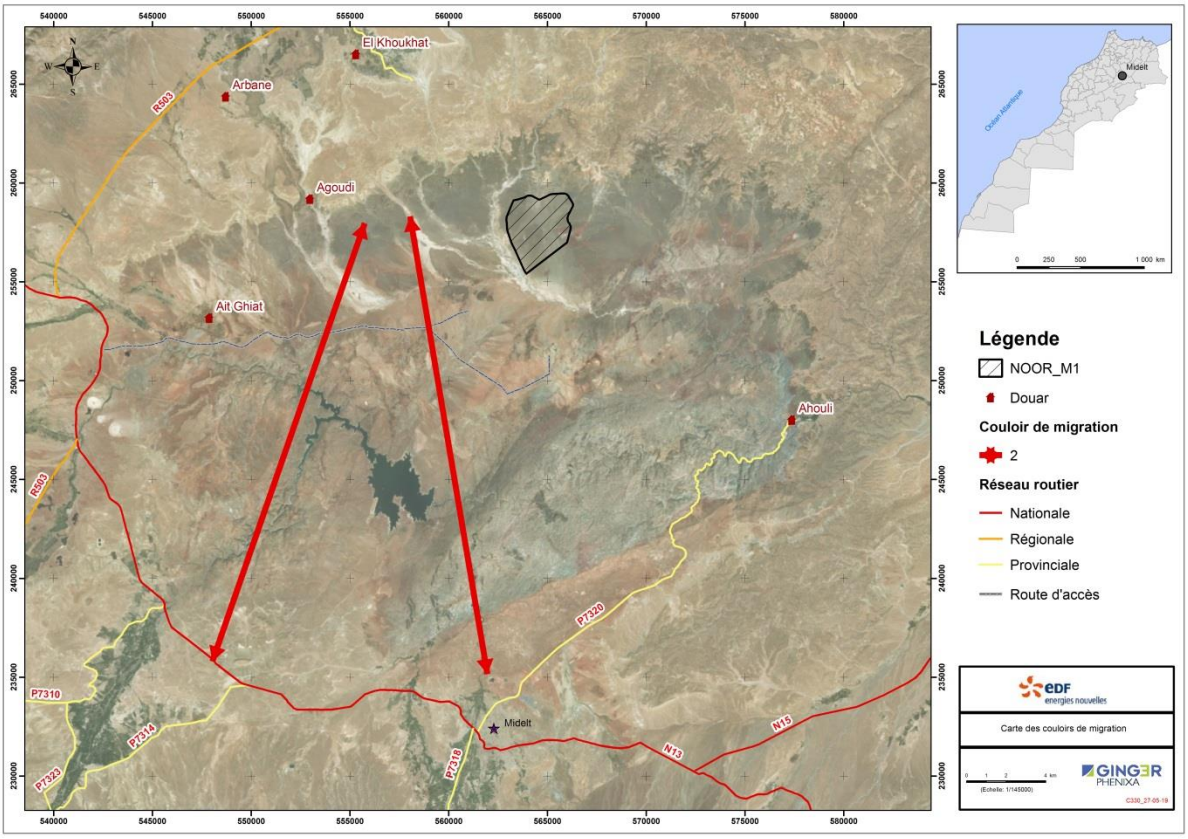


Figure 32 : Birds corridor migration

Table 54 : Biodiversity - Significance of impacts during Operation phase

Impact	Receptor	Sensitivity	Significance of the impact
Poaching Low Intensity	Houbara Bustard	High	Average
Partial living area modification of Houbara Bustard for laying and breeding Medium intensity	Houbara Bustard (females)	High	Average
Lek area Low intensity	Houbara Bustard (lek)	High	Low
Direct mortality of birdlife due to collisions with Pannels or mirrors Low intensity	Migratory birds	Average	Weak
Direct mortality of birdlife due to collisions with powerline	Migratory birds	Average	Low

Impact	Receptor	Sensitivity	Significance of the impact
Low intensity			
Direct mortality of birdlife due to electrocution with powerline Low intensity	Migratory birds / local avifauna	Average	Low
Herbicides and pesticides	Local flora	Weak	Negligible to Minor

11.6.3 Mitigation measures

The following mitigation measures are recommended to minimise the impact and potentially improve the biodiversity of the project site and the surrounding area during the operation of the power plant project.

Table 55 : Biodiversity - Mitigation measures during Operation phase

Impact	Mitigation	Responsibility	Schedule	Cost
Habitat Loss (the habitat isn't Natural Habitat)	The living space of the Houbara Bustard (especially feeding, laying and breeding area on project's site) will certainly be affected. Monitoring will be implemented to assess the impact. Following the monitoring results (if they show an important reduction of Houbara Bustard presence assessed by an expert) measures could be implemented such as the rehabilitation of the Halfah or Sage bush steppe on a limited area and/or around the space occupied by the solar park. This measure will be subject to discussion and agreement of all stakeholders.	Stakeholders	Before starting or during construction phase	To define
	The development of the vegetation inside the solar filed could be a favourable environment for the improvement of ecological conditions for DuPont'Lark which could allow a re-colonisation.	N/A	N/A	N/A
Direct mortality of birdlife due to collision (Pannels/mirrors)	Mortality monitoring will be undertaken continuously by O & M services in the operational phase. Daily monitoring by trained employees and quarterly surpervision by an expert (ornithologist) Specific training will be provided to ensure that injured carcasses or birds are properly reported and appropriate identification of species is achieved. The foreseeable change in birdlife needs to be followed-up, possibly for adaptive management.	O&M	As soon as the operation start and throughout operation period.	30 Kdhs for training 40 Kdhs / Year for supervisio n
Direct Mortality of Fauna	Regular stripping of vegetation does not seem necessary as low vegetation does not present a fire hazard. The reg habitat could thus be partially preserved, as well as its fauna. Maintenance personnel must be sensitised to avoid any destruction of wildlife.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

Impact	Mitigation	Responsibility	Schedule	Cost
	No plantation of exotic species, generally consuming water, will be considered			
	No invasive species will be used.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	A speed limit of 20 km / h will be imposed throughout the site to reduce mortality of wildlife.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Vehicles will circulate on the designated routes in order to prevent unnecessary land encroachment, thus protecting the natural resources and reducing dust emissions	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Poaching/Hunting/Trade	Hunting, falconry and trade will be strictly prohibited and sanctioned. Information notes will be posted.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Herbicides and pesticides	An integrated pest management programme will be implemented avoiding the use of pesticides and herbicides. If weeding is needed, it will be done manually. The use of pesticides will be very limited, it will be preferred methods and / or non-harmful products when possible. The use of pesticides will be compliant with OS-4 of AfDB requirements. All food waste will be stored in lidded containers. Only low-toxicity pesticides that do not pose a threat to human health or the environment, and that will not affect natural pest enemies. Management and disposal of pesticides would be in accordance with good international industry practice, such as the Food and agriculture Organization (FAO) International Code of Conduct on the Distribution and Use of Pesticides. Any chemical—including ozone-depleting substances and persistent organic pollutants, pesticides classified in Class Ia (extremely hazardous), Ib (highly	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

Impact	Mitigation	Responsibility	Schedule	Cost
	hazardous) or II (moderately hazardous) are prohibited			

11.6.4 Residual Impacts

Following the mitigation and management measures described above, which will be developed within the operation ESMP, the residual impacts will be globally low.

12. Management of waste, hazardous and non-hazardous materials

12.1 Introduction

Non-hazardous waste and hazardous materials are at the origin of many environmental impacts, if not properly stored and / or managed, such as direct soil contamination and indirect contamination of sensitive receptors, leading to serious public health and environmental issues.

Proper management can help in reducing, reuse or recycle a large amount of discarded materials; and hazardous materials can be adequately contained and managed reducing the risk of environmental and public health impacts.

12.2 Methodology

To carry out the impact assessment, specific information was reviewed as part of the desk study:

- An assessment of applicable national and international standards and guidelines identified within the IFC Performance Standards and EIB Environmental and Social standards ;

The main objectives of the chapter are to identify the following:

- Materials required or generated onsite with the potential to pose substantial or potential threats to public health or the environment;
- Alternatives available for the reduction, reuse, recycling and recovery of all waste streams;
- Opportunities to minimise waste streams from the project's inception, thereby minimising the amount of waste sent to the landfill;
- Specify methods for the segregation of waste streams within the facility, and
- Detailed display of methods for safe storage, transfer and handling of hazardous materials.

12.3 Baseline conditions

12.3.1 Non-hazardous and hazardous waste

Waste characterisation

The construction and operation phases generate different types of waste that can be classified:

- Household waste and similar: found on employees (restoration activities), even if they are not permanently on them.
- Non-hazardous industrial waste: cardboard, wood, plastic, non-hazardous packaging, mixing water, scrap metal, etc.
- Hazardous industrial waste: used oils, packaging of lubricants, paints, various dangerous products, soiled rags, contaminated land, used Li-ion batteries, defective PV panels, etc.

The detailed list is provided in § 4.4.5 and 4.5.5

Waste management hierarchy

The waste management hierarchy is a key element of waste management. Minimising the amount of waste to be stored and disposed of not only protects the environment but also has the potential to reduce costs that may be incurred by the main contractor or the proponent for handling and disposing of the waste.

In general, waste generation is evaluated according to the waste minimisation approach. This approach is common to various national and international guidelines and principles and involves the following steps in decreasing order of importance.

Initially, options to prevent or reduce the amount of waste generated will be considered. Where waste generation cannot be avoided or further reduced at source, the opportunities for reuse of materials will be explored, either for their reuse or a different purpose. Disposal to landfill is the least favoured option in the waste hierarchy and is the last resort after all other options have been considered.

12.3.2 Hazardous materials

A hazardous material is any substance or agent (biological, chemical, radiological, and/or physical) which has the potential to cause harm to humans, animals, or the environment, either separately or through interaction with other factors. Hazardous materials include chemicals which are carcinogenic, toxic, irritating, corrosive, sensitizing agents; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophoric, unstable and reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapours, mists or smoke which may have any of the previously mentioned characteristics.

Mitigation measures to ensure safe transport, transfer, storage and handling of hazardous materials are provided below.

12.4 Sensitive receptors

Table 56 : Hazardous solid – waste, Hazardous materials – sensitive receptors

Reception	Sensitive	Description
Soil and groundwater	Medium	The site is a bare site and no contamination has been observed or identified by soil contamination analysis. The soil is low in organic matter and is not very productive. There is no groundwater or permanent surface water on site. Rainwater is not contaminated and surface runoff feeds larger drainage canals into the area.
Employees on site/ construction facilities	High	Explosive could be used for earthworks. Employees on site are sensitive receptors as they be injured par explosives and/or explosion. Construction facilities in the influence area of explosion area could be damaged.
Waste treatment infrastructure (Midelt Landfill / Hazardous Waste Management Companies)	Medium	Construction and operation / maintenance activities will result in additional residual material input into regional waste management services / infrastructure. There is a landfill in Midelt and no waste sorting infrastructure. There is no infrastructure for hazardous waste collection in the province, and licensed companies are in the Casablanca area.

12.5 Impacts and measures during the construction phase

12.5.1 Impacts

During the construction of the plant and facilities, waste will be generated during earthworks, fence, roads and buildings constructions, etc.. The amount of waste generated could be significant according to the extent of works. Solid wastes have to be properly managed to reduce contamination of the soil and groundwater.

Most construction waste is often bulky and heavy and mostly unsuitable for disposal by incineration or composting. The expected construction waste is inert and does not pose a threat to human health or the environment. However, good management is needed to reduce associated secondary impacts such as resource use, dust emissions, landscape disturbance or habitat destruction. Increased pressure may impact local facilities/services and result in a reduced capacity for handling waste from municipal sources.

Construction facilities will occupy 150 000 m² covered areas. Most of this area will be reused for maintenance purposes in operation. The part not reused will be dismantled. This decommissioning phase at the end of construction phase will generate various solid waste:

- Concrete
- Metals
- Etc…

The restoration plan of the area not reused after construction phase with include at least: dismantling of all temporary structures, cleaning of the soils, backfilling in case it would have been excavated, restoration of the ground level and initial appearance as much as possible.

A decommissioning plan will be included in the general waste plan.

Hazardous materials

Hazardous materials likely to be stored on the project's site during the construction phase must be stored in order to reduce the impacts.

Transport, storage, handling of explosives must be compliant with the regulations and the GIIP.

Impacts are related to potential mishandling, accidental spills and leaks, and potentially to transport conditions.

Other environmental and social impacts that might arise from the construction activities are related to waste disposal to unlicensed landfills or increased pressure upon local licensed landfills that result in a reduced capacity for handling waste from municipal sources.

Table 57 : Solid waste - Significance of impacts during construction

Impact	Receptor	Sensitivity	Significance of the impact
Non-hazardous waste Medium intensity	Local waste treatment infrastructure	Strong	Average
	Ground	Average	Weak
Hazardous materials High Intensity	Waste treatment infrastructure	Strong	Average
	Ground	Average	Weak
	Employees and construction facilities	High	High

12.5.2 Mitigation measures

The mitigation measures provided refer to both hazardous waste and non-hazardous materials and waste. Whilst some mitigation measures are specific, many measures are applicable to both and therefore this section does not consider these measures separately, unless specified.

In addition to the ESMP during the construction phase, the EPC will have to prepare the following documents:

- Hazardous Materials Management Plan (which contains procedures, rules and training for hazardous waste handling and storage, spill response protocols, contingency plans detailing the clean-up of any spillages, etc.) ;
- Blast management plan which is a risk control plan used in explosive blasting. It aims to ensure blasts do not harm people in the area and limit damage to the environment. A BMP is prepared by the shot firer before every blast and after consulting all responsible involved in the blast.
- Waste Management Plan (which comprises the necessary measures to fully apply the waste hierarchy described in the baseline section);
- Emergency Preparedness and Response Plan.

These documents will incorporate, at least, the mitigation measures included in the table below. These plans can be stand-alone documents or be included in the construction ESMP. Plans outline are presented in chapter 20.

Table 58 - Solid Waste - Mitigation measures for the construction

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
Solid waste volumes/quantities	Prepare a site-specific waste management plan, including hazardous and non-hazardous waste. The plan will include staff training. This waste management plan will be compliant with Moroccan regulations and will be approved by MASEN.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Physical and chemical composition of waste and identification of hazards characteristics will be established.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Waste masonry will be re-used in the internal road construction and base fillings. Reasonable levels of use would be between 50 to 80%	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	The recycling of metal waste will be prioritized according to existing value chains.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Ordering materials with reusable, recycable and/or bulk packaging can reduce waste generated. These practices will be preferred when possible.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Ask suppliers to use minimal packaging.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Whenever possible, chemicals will be ordered in returnable drums (plastic or metallic)	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Whenever possible, surplus chemicals and / or non-reusable materials in operation will be returned to suppliers	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Refillable containers will be used, where possible, for the	EPC and	As soon as the works	Included in the

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	collection of solid and liquid waste	subcontractors	start and throughout construction period	contract
Cleaning	Separate waste streams to facilitate recycling. All storage areas must be well organised and waste appropriately managed through segregation of hazardous and non-hazardous waste. Waste within each category will be further segregated by type (paper, plastic, metal, masonry) and whether the material is recyclable or non-recyclable. A waste log will be kept onsite and will contain, at least, information about quantities, types of management solutions (according to the waste management hierarchy described in the baseline section) operators, final disposal/destination, etc.)	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Install adequate storage facilities for non-hazardous waste in designated areas to prevent waste from dispersing throughout the site	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Include at the beginning of the employee training, modules to increase their knowledge of waste management protocols, including proper waste handling and storage, response and contingency plans.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Storage of waste	Food waste will be stored within a sealed metal or plastic skip or bin with self-closing lid, in order to prevent birds/vermin/pests from gaining access	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Lightweight waste such as paper, cardboard, plastics will be stored within a skip sealed with a tarpaulin/mesh sufficiently secured to prevent any material from being dispersed.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Heavy waste may be contained in an open skip, provided that segregation is carried out in a sufficiently efficient way to remove any light material that may be washed away.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	Different bins for each separate category of garbage (food or household waste) will be placed throughout the site where construction workers and staff daily consume food. These will be regularly collected and taken to the main waste storage area. Separate portable bins will also be placed in areas where works will be undertaken	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	No underground waste containers will be set up.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Waste containers will be clearly marked with appropriate warning labels to accurately describe their content and detailed safety precautions. The labels will be water repellent and securely attached. Wherever possible, chemicals will be kept in their original container	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Waste generated during operation will only be transported off-site for disposal by an appropriately licensed vendor. This service provider will follow the appropriate protocols to ensure that all handling and disposal of waste from the site is done in accordance with accepted environmental regulations. A register of all waste streams will be kept on the site.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Regular training of site staff on waste management and proper chemical handling procedures will be provided on a regular basis.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Incineration / combustion of waste will not be allowed on the site.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Hazardous materials	Preparation of an explosives storage and a blast management plan	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	Implementation of best practice and regulatory procedures for proper handling, establishment of secure temporary storage areas, and disposal of waste by licensed companies.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Hazardous waste will be disposed of in an environmentally sound manner and by the approved hazardous waste operator.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	The materials will be separated according to whether they are combustible or not, and all flammable substances will be kept away from any source of ignition.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	No underground hazardous materials containers will be set up. Hazardous materials storage will be located in a dedicated fenced area with a separate rainwater drainage system which will be covered to prevent rainwater from entering the area. The location of these hazardous materials storage area will be chosen according to the potential risks (e.g. traffic accidents/collisions, falling items, drainage system, etc.).	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Establishment of retention tanks for the storage of hazardous materials. The retention areas will have the capacity to contain 110% of the total volume of stored materials and will be protected from vehicular traffic and other risks. This area must be placed away from any sources of ignition. Retention tanks for fuel storage tanks will be tested regularly with recycled water or treated wastewater (e.g. non-hazardous water already used for an activity that is not likely to be contaminated or treated wastewater). The storage areas will be waterproofed at the base (this requires, if needed, to cover a large area in order to avoid soil contamination, for example the refuelling areas must	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	include an impervious base that protects the ground where vehicles are parked), and must be covered and equipped with spill kits.			
	Hazardous Materials containers will be clearly marked with appropriate warning labels accurately describing their contents, detailed technical specifications and safety precautions. The labels will be water repellent and securely attached. Wherever possible, hazardous materials will be kept in their original container	EPC	As soon as the works start and throughout construction period	Included in the contract
	Hazardous materials will only be transported to/from the site by an appropriately licensed operator. This service provider will follow the proper protocols to ensure that all hazardous materials are transported and transferred according to accepted national/regional environmental regulations in effect. A record for all hazardous materials will be kept onsite.	EPC	As soon as the works start and throughout construction period	Included in the contract
	Only trained personnel will be permitted to handle hazardous materials.	EPC	As soon as the works start and throughout construction period	Included in the contract
Waste management facilities	Only approved waste management facilities are to be used for the disposal of hazardous and non-hazardous waste, respectively.	EPC	As soon as the works start and throughout construction period	Included in the contract

12.5.3 Residual Impacts

Residual impacts related to hazardous and non-hazardous waste are low after the implementation of mitigation measures.

12.6 Impacts and measures during the operation phase

12.6.1 Impacts

No impact for power line operation

During the operating phase of the plant, the following waste are likely to be generated: household waste, non-hazardous industrial waste and hazardous materials.

The detail is provided in § 4.5.5

Table 59 : Solid waste - Significance of impacts during operation

Impact	Receptor	Sensitivity	Significance of the impact
Non-hazardous waste Low intensity	Discharge	Average	Minor
	Ground	Average	Minor
Hazardous waste Low intensity	Discharge	Average	Minor
	Ground	Average	Minor

12.6.2 Mitigation measures

The mitigation measures provided refer to both hazardous waste and non-hazardous materials and waste. Whilst some mitigation measures are specific, many measures are applicable to both and therefore this section does not consider these measures separately, unless specified.

Operations and maintenance personnel will be required to prepare the following documents, in addition to the ESMP during the operation phase:

- Hazardous Materials Management Plan (which contains procedures, rules and training for hazardous waste handling and storage included defective battery and panels , spill response protocols, contingency plans detailing the clean-up of any spillages, etc.) ;
- Waste Management Plan (which comprises the necessary measures to fully apply the waste hierarchy described in the baseline section);
- Emergency Preparedness and Response Plan.

These documents will incorporate, at least, the mitigation measures included in the table below. These plans will be presented in separate documents or included in the ESMP during the operation phase.

Table 60 : Solid Waste - Mitigation Measures during operation

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
Solid waste volumes/quantities	Prepare a site-specific waste management plan, including hazardous and non-hazardous waste. The plan will include staff training. The waste management plan will be compliant with Moroccan regulations and will be approved by MASEN.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Metal waste will be recycled in the maximum possible level.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Ordering materials with reusable and / or bulk packaging can reduce waste generated. These practices will be preferred when possible.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Request that suppliers use minimal packaging.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Chemicals will be ordered in returnable drums.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	If Batteries Li-ion have to be changed, the original supplier will do the substitution and will recycle the used battery.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	If some panels are damaged, the original supplier will do the substitution and will recycle the used panels.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	When possible “Buy-back” arrangements will be made with key suppliers so that any surplus chemicals or materials can be returned	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
Cleaning	Separate waste streams to facilitate recycling. All storage areas must be well organised and waste appropriately managed through segregation of hazardous and non-hazardous waste. Waste within each category will be further segregated by type (paper, plastic, metal) and whether the material is recyclable or non-recyclable. A waste log will be kept onsite and will contain, at least, information about quantities, types of management solutions (according to the waste management hierarchy described in the baseline section) operators, final disposal/destination, etc.)	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Install adequate storage facilities for non-hazardous waste in designated areas to prevent waste from dispersing throughout the site	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Include at the beginning of the employees' training, modules to increase their knowledge of waste management protocols, including proper waste handling and storage, response and contingency plans.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Storage of waste	Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent vermin/pests from gaining access	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Lightweight waste such as paper, cardboard, plastics must be stored within a skip sealed with a tarpaulin/mesh sufficiently secured to prevent any material from being dispersed.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	As for litter (food waste, domestic waste), bins for separate categories will be placed throughout the site where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Waste containers will be clearly marked with appropriate warning labels accurately describing their content and detailed safety precautions. The labels will be water repellent and securely attached. Wherever possible, chemicals will be kept in their original container.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	Waste generated during operation will only be transported off-site for disposal by an appropriately licensed vendor. This service provider will follow the appropriate protocols to ensure that all handling and disposal of waste from the site is done in accordance with accepted environmental regulations. A record for all streams of generated and collected waste will be kept onsite.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Regular training of site staff on waste management and proper chemical handling procedures will be provided on a regular basis.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Incineration/burning of waste on site will not be allowed	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Hazardous materials	Implementation of best practice and regulatory procedures for proper handling, establishment of secure temporary storage areas, and disposal of waste by licensed companies.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Hazardous waste is disposed of in an environmentally sound manner and by the approved hazardous waste operator	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	The materials will be separated according to their combustibility, and all flammable substances will have to be kept away from any source of ignition.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	No underground hazardous materials containers will be set up. The hazardous materials storage will be located in a dedicated fenced area with a separate drainage system and covered to prevent contact with rainwater. The location of these hazardous materials storage area will be chosen according to the potential risks (e.g. traffic accidents/collisions, falling items, drainage system, etc.).	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Establishment of retention tanks for the storage of hazardous materials.	O&M	As soon as the operation start	Included in O&M

Impact/Source	Mitigation measure	Responsibility	Schedule	Cost
	The retention areas will have the capacity to contain 110% of the total volume of stored materials and will be protected from vehicular traffic and other risks. This area must be placed away from any sources of ignition. The storage areas will be waterproofed at the base (this requires, if needed, to cover a large area in order to avoid soil contamination, for example the refuelling areas must include an impervious base that protects the ground where vehicles are parked), and must be covered and equipped with spill kits.		and throughout operation period.	budget
	Hazardous Materials containers will be clearly marked with appropriate warning labels accurately describing their contents, detailed technical specifications and safety precautions. The labels will be water repellent and securely attached. Wherever possible, hazardous materials will be kept in their original container	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Hazardous materials will only be transported to/from the site by an appropriately licensed operator. This service provider will follow the proper protocols to ensure that all hazardous materials are transported and transferred according to accepted national/regional environmental regulations in effect. A record for all hazardous materials will be kept onsite.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Only trained personnel will be permitted to handle hazardous materials.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Waste management facilities	Only approved waste management facilities are to be used for the disposal of hazardous and non-hazardous waste, respectively.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

12.6.3 Residual Impacts

Following the implementation of the mitigation measures, the residual impacts are low.

13. Wastewater management

13.1 Introduction

The wastewater here refers to any contaminated water from project activities that have an environmental impact. Wastewater can result from many processes, both man-made (i.e. sewage, oily wastewater) and naturally (i.e. contaminated storm water runoff).

The two phases of construction and operation of the NOOR Midelt I project will generate domestic wastewater and have a potential impact on the environment.

13.2 Methodology

The assessment has been conducted by identifying the relevant local and international standards and best practice relating to wastewater and storm water runoff and erosion management during the construction and operational phases of the proposed facility. Estimates and figures relating to wastewater volumes and proposed treatment processes have been based on the data available from the technical proposal.

13.3 Baseline conditions

In the absence of waste water on the site, there are no specific reference conditions.

13.4 Sensitive receptors

The wastewater generated during the construction phase of the project will come from the sanitary facilities of the canteens and toilets, as well as the contaminated waste water generated by heavy rains with rainwater runoff on accidental spills / leakage of dangerous materials.

Sanitary wastewater from canteens / toilets and potentially contaminated runoff will be collected in chemical toilets and biological waste water treatment implemented during construction phase. Chemical toilets will also be installed during the construction. Approved operators will evacuate chemical toilets as needed. Wastewater management will not be carried out on the project site.

13.5 Impacts and measures during the construction phase

13.5.1 Impacts

Wastewater

During the construction phase, the following liquid effluents can be generated:

- Domestic and / or assimilated wastewater in urban areas.
- Effluents from the maintenance and cleaning of vehicles and machinery on the site.
- Rainwater (generally clean, although it can carry contaminants from leaks, etc., in areas at risk of leakage).
- Wastewater with oily substances (leaks, purges, etc.).

During the commissioning phase: In addition to those mentioned for the assembly phase, during commissioning, the following liquid effluents can be generated:

- Domestic wastewater and / or urban assimilation.
- Oily effluent plants.
- Effluent plants with chemical load.

A direct discharge into the natural environment will be a source of potential nuisance for the soil. If these polluted waters are drained by rain runoff, they will also impact the surface waters (Chaabat and Wadi Sidi Ayad).

Table 61 : Wastewater - Significance of impacts during Construction phase

Impact	Receptor	Sensitivity	Significance of the impact
Domestic wastewater Average intensity	Ground	Average	Average
Polluted runoff waters Average intensity	Ground	Average	Low

13.5.2 Mitigation measures

Table 62 : Wastewater mitigation measure during the construction phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Sanitary wastewater	Chemical toilets will be available at various locations on the site in sufficient numbers to accommodate the number of employees expected (at least one for every 20 workers) and cleaned at least every other day. Outdoor chemical toilets will be checked frequently for leaks. Leaks will be checked and a licensed society compliant with applicable national regulations will manage the evacuation to a wastewater treatment plant. Temporary biological treatment systems will be set up for the treatment of sanitary water (showers, canteens, etc.). Treated water will be stored in tanks to be reused for dust treatment or soil compaction according the quality and MASEN approval. If the quality is not acceptable, the water will be sent off-site by licensed society compliant with national regulations.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	No wastewater will be discharged outside any treatment system to prevent wastewater discharges into soils, chaâbas and the storm water drainage system.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Wastewater from chemical toilets will be collected by licensed operators compliant with national regulations. Each chemical toilet will generally be collected and emptied before their content reaches 80% of its capacity. Authorisations and contracts required must be obtained by the EPC prior to the commencement of construction	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Chemical toilets must be completely emptied before demobilisation to avoid contamination of the site's area. The demobilisation procedure will ensure that tanks are not destroyed or damaged during the removal process.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	All subcontractors hired by EPC will comply with the same requirements than the EPC.	EPC and subcontractors	As soon as the works start and throughout	Included in the contract

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
			construction period	
	Develop a wastewater management plan	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Effluents from cleaning operation	Cleaning, refueling, cleaning of vehicles and machinery, refuelling and maintenance operations will be carried out on watertight platforms with water recovery, passage through a de-oiler before being sent to a storage tank. The treated water could be reused according the needs and the quality. If not, it will be stored and sent to industrial wastewater treatment plant when it will be operational. Platforms for maintenance operations will be implemented in dedicated areas within the site. Theses platforms will have : • Waterproof floor (using concrete flooring, a layer of clay or other means). • Evacuation and effluent collection system. • Tank or sump adequate for the storage of generated effluents.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Effluents from solid waste storage area	Hazardous material storage areas: Storage areas for hazardous and / or contaminating materials must also be suitably conditioned by: • Adequate impervious soil (using concrete flooring, a layer of clay, or other means). • Cover to prevent toxic and / or dangerous contact with rain and / or other weather agents. • Spill retention system possible.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Temporary waste placement areas: Temporary waste storage areas must be duly conditioned by: • Waste containers adapted to each specific type of generated residue. Containers must always be closed to prevent contact with rainwater and must be in good working order, without dents or leaks ...	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
	• The generated effluents must be brought to an authorized manager for their appropriate treatment.			
Effluents from cleaning concrete	Construction of a specific area for site machinery maintenance work. A waterproof concrete area shall be provided with a tank to collect any liquid waste. Construction of a settling basin to retain wastewater. Wastewater from the cleaning of concrete discharging chutes that could include concrete waste shall be directed to this basin. Water free of sediments may be used to irrigate the site area and access routes depending on the needs and quality.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Effluents from commissioning phase	On commissioning, oily effluent and effluent containing chemicals from plant facilities will be collected in appropriate containers and managed by an authorized manager.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Wastewater from industrial process	Separate drainage system for different waters so as not to mix them.	EPC and subcontractors	Design	
	Establishment of an effluent treatment system by neutralization and homogenization	EPC and subcontractors	Design	
	Installation of oil separators managing the oily effluents from power block area	EPC and subcontractors	Design	

13.5.3 Residual Impacts

Following the implementation of the mitigation measures for waste water management, the residual impacts are low to zero.

13.6 Impacts and measures during the operation phase

13.6.1 Impacts

No impact for power line operation

The plant has several wastewater discharges: treatment effluent, sanitary water, and oily or greasy effluents.

Sanitary water will be sent to the sanitary wastewater plant to be treated through a biological reactor (cf § 4.5.4). The treated water will be sent to the neutralization and homogenization tank before reaching the evaporation ponds.

Oily effluents will go through de-oilers and then sent to the neutralization and homogenization tank before reaching the evaporation ponds.

Others industrial wastewater coming from Reverse Osmosis system, water/steam cycle, blowdown treatment and other services will be sent to a neutralization and homogenization tank before reaching the evaporation ponds.

The volume sent to the evaporation ponds will be about 156 m3/day.

The evaporation ponds will be equipped with an environmental protection double liner with a leak detection system to prevent any soil contamination.

The mirrors of the CSP plant are cleaned with demineralized water without any maintenance product, and the process therefore does not present a risk of soil contamination by the washing water.

Any wastewater will be discharged in the environment.

Table 63 : Wastewater - Significance of impacts during Operation phase

Impact	Receptor	Sensitivity	Significance of the impact
Sanitary wastewater generation Industrial wastewater generation Low Intensity	Soil /Water	Average	Negligible

13.6.2 Mitigation measures

Table 64 : Wastewater - Mitigation measure during operation phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Sanitary wastewater generation	Sanitary and domestic wastewater will only be discharged to the sanitary water treatment plant. Then treated water will be sent to the evaporation ponds.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Sludge will be collected by a licensed operator.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Develop a wastewater (sanitary and industrial) management plan	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Wastewater from industrial process	Ensure the good operation of industrial wastewater treatment facilities to avoid untreated discharge	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

13.6.3 Residual Impacts

Residual impacts related to wastewater management during the operation phase are minor.

14. Traffic and Transportation

14.1 Introduction

The construction and operation phases generate traffic increases on existing roadways.

14.2 Methodology

The basic analysis of this chapter is mainly a desk analysis, based on the technical proposal of the project.

14.3 Baseline conditions

The site will be accessible by road for the transport of materials, equipment and machinery and also by the workers. Ports will eventually be used to bring equipment to the Kingdom of Morocco. Foreign workers can use the airport of Fez (the nearest airport) or the airports of Casablanca and Rabat to access the region.

Main port facilities

The ports of Casablanca, or Tanger Med may be options to use for the transfer of cargo.

During the construction phase, the equipment will be transported from the main ports identified for the project: Casablanca, Tangier-Med and Nador.

Exceptional transports due to equipment dimensions, weight or critical aspects will be treated specifically.

Potential itineraries are presented hereafter.

All planned itineraries will have to be approved by the Roads Directorate of Morocco.

Road network

The province of Midelt is crossed by two national roads: the RN 13 coming from Meknes and leading to Azrou - Errachidia and the RN 15 leading to Missour. It is on the RN 13 which is connected to the road serving the project site, between Boulaajoul and Zaïda, more or less along the existing track. It also has a regional road: the RR 503 (under rehabilitation) leading to Khénifra and which goes quite far from the project site.

From the highway exit of Meknes, the RN13 crosses the following localities:

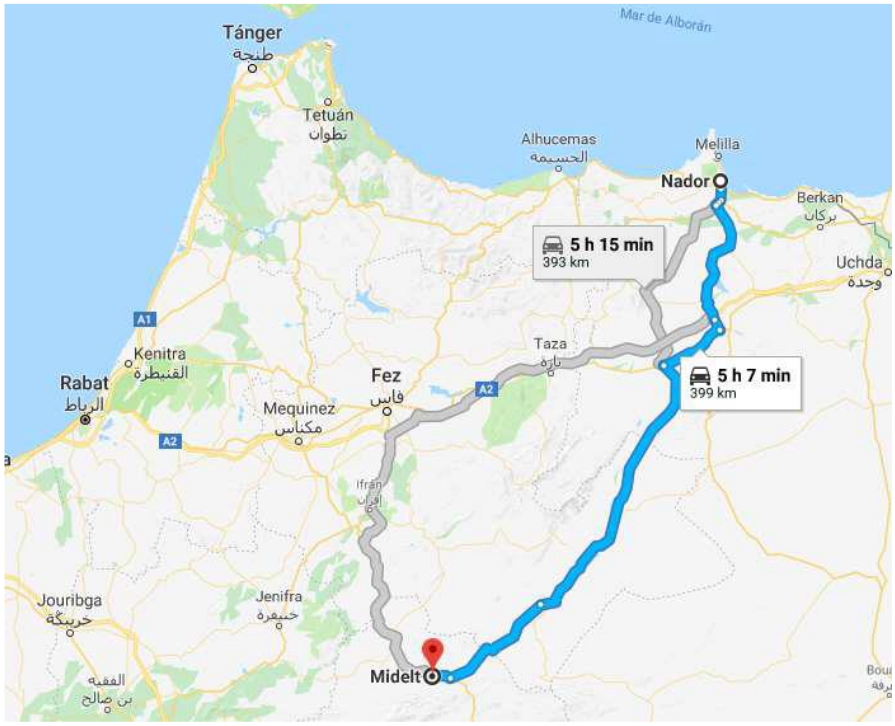
- Boufakrane
- El Hajeb
- Azrou
- Ait Oufella
- Boulaajoul
- Ait Toughach
- Zaida

The new access road to the site is located before the town of Midelt coming from Meknes. The latter will be weakly affected by traffic relating to the implementation of the NOOR Midelt I project.

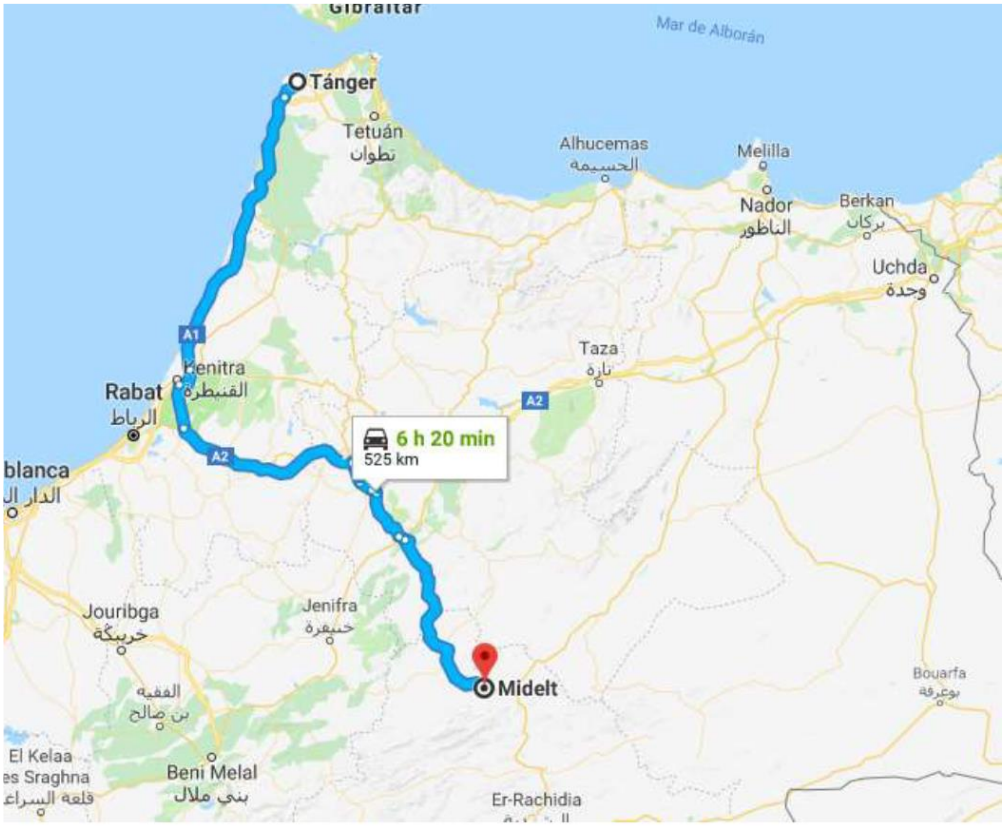
The vast majority of the equipment and supplies of the plant will be transported via the RN13.To access the site, and since there is no bypass road for many residential areas, all the traffic bringing the ports' equipment will have to go through the city.

3 itineraries have been identified for the supply of equipment at the site according the harbour.

- Itinerary 1 (cf below): : from Nador harbour, then RN 19 to Taourirt, RN 6 from Taourirt to Guercif, RN 15 from Guercif to Midelt, then RN13 to the junction for access to the site.



- Itinerary No 2 (cf below) : from Tanger harbour, highway A1, then A2 to Meknès, then RN13 to the junction to access road to the site.



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- Itinerary 3 (cf below) : Casablanca harbour, then highway A1/A5/A2 then RN 13 from Meknès to the junction to access road to the site.

For each of the routes the RN13 is used either from Meknes or from Midelt. Existing traffic are :

- Traffic for RN13 between Zaïda and Midelt is 4 917 vehicles/day[11] in 2016.
- Traffic for RN19 from Nador is about 2 000 vehicles/day[12]
- Traffic for RN15 (between Missour and Boulemane) is about 1 170 vehicle/day[13].

14.4 Sensitive receptors

Table 65 : Traffic and Transport - Sensitivity Receptor

Receptor	Sensitivity	Explanation
RN13 and the localities crossed (Boufakrane, El Hajeb, Azrou, Aït Oufella, Boulaajoud, Aït Toughach, Zaïda)	Average	The RN13 has an adapted bearing capacity. However the crossing of different localities will have impacts on homes and activities located near the road
Highway A1/A2/A5	Low	Highways have the capacity to accommodate additional traffic and have the appropriate bearing capacity
RN19 and RN15 and towns crossed ((Hassi Berkane, Taourirt, Guercif, Outat el Haj, Missour)	Medium	Capacity roads and bearing capacity are appropriate. Some localities have bypass routes (Taourirt, Guercif), for others the crossing is done in an urban environment with arrangements in two-tracks routes for certain sections (Hassi Berkane)

[11] HIGHWAY TRAFFIC COLLECTION 2016 – Ministry of transport
[12] Idem
[13] Idem

Receptor	Sensitivity	Explanation
Access to the site	Weak	Dedicated route, especially built for the site.

14.5 Impacts and measures during the construction phase

14.5.1 Impacts

Two aspects of transportation during the plant's construction have the potential to generate impacts: transportation of workforce and transportation of equipment to the site.

Two identified itineraries (2 and 3) will pass through a motorway section, then taking an exit either from Meknes or from Fez. 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 Phase I project site.The first identified itinerary coming from Nador will use only national roads : RN19/RN15/RN13

An estimation for maximum additional traffic due to the project is :

- Number of trucks : up to 75 per day
- Number of buses: up to 50 per day
- Number of vans: up to 50 per day
- Number of cars: up to 100 per day.

These figures consider the “no base camp” option on the site. In case of base camp within the complex, traffic will be obviously reduced.

Therefore, construction activities are likely to lead to an increase in vehicle numbers and traffic on the RN13 or RN19/RN15 until the new access road is reached. Approximately 75 trucks per day during peak construction activity are expected and 50 buses/day and 100 cars/day for workforce transport.

Compared to the existing traffic the maximum additional traffic represent 6,5% for RN13 in case of “no base camp option” on the site.

On the other roads the additional traffic of trucks represents also about 6% of the existing traffic.

A blast management plan will be carried out and will include transportation of explosives.

Table 66 : Traffic and Transport - Significance of impacts during Construction phase

Impact	Magnitude	Receptor	Sensitivity	Significance of the impact
Increase in congestion on the highway Low intensity	Minor	Roads: • Casablanca - Meknes • Tangier – Meknes	Weak	Close to zero
Increased congestion on local roads Low intensity	Medium	RN13 in the different localities RN15 RN19	Medium	Low to Average
Movement of vehicles on the access road to the site Medium Intensity	Minor	Access to the site	Weak	Close to zero

14.5.2 Mitigation measures

In addition to the Construction-ESMP the EPC will prepare a traffic and road safety plan in accordance with national and IFC requirements and aligned with GIIP.

These documents will incorporate, as a minimum, the mitigation measures included in the table below:

Table 67 : Traffic and Transport - Mitigation measures - Construction Phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Increased traffic load along the national road and local roads	Develop a transportation and traffic management plan (chapter 20). The blast management plan will include transportation of explosives.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Determine designated access routes for equipment delivery, road capacity, site entry / exit points, etc.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Determine the requirements for regular vehicle maintenance (currently implemented) and the use of manufacturer-approved parts	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Identify areas that are sensitive to road safety problems and implement the necessary road safety measures, including the residential areas through which construction vehicles will drive and the interconnection point of the access road with RN13. The sensitive area will be communicated in advance to all drivers who will have plans to ensure proper identification. Special measures will be implemented if deemed necessary and communicated appropriately to the drivers (e.g. the maximum speed at a specific vulnerable point on the route). Information will be provided to local authorities in sensitive areas during transportation planning. Warning signs will be put in place for sensitive public institutions (schools, health structures).	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Movement of vehicles on-site	The access road will be clearly marked and compact (at least) or paved.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Identify designated access routes for equipment delivery, site entry points, storage areas, parking areas, etc.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

14.5.3 Residual Impacts

Residual impacts are low to medium as a result of the implementation of mitigation measures during the construction phase.

14.6 Impacts and measures during the operation phase

No impact on traffic and transport for power line operation.

Road transport during the operation phase will not be significant. There will be little delivery of consumables or equipment, except periods of particular maintenance. The delivery of fuel oil for the maintenance vehicles of the plant and the few diesel consumers will be by truck but will correspond to very limited volumes.

A public bus service may be set up from the city of Midelt to the site but will not be a significant nuisance either.

Table 68 : Trafic et Transport – Importance des impacts en phase de construction

Impact intensity	Receptor	Sensivity	Impact significance
Increase in congestion on the highway Low intensity	Roads: • Casablanca - Meknes • Tangier - Meknes	Minor	Close to zero
Increased congestion on local roads Low intensity	RN13 in the different localities	Medium	Close to zero
Movement of vehicles on the access road to the site Medium Intensity	Access to the site	Minor	Close to zero

14.6.1 Mitigation measures

Table 69 : Traffic - Some mitigation measures during Operation phase

Impact/Source	Mitigation Measure	Responsibility	calendar	Cost
Movement of vehicles along the site's access road and onsite	Develop a transportation management plan	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Identify designated access routes for collection and delivery, site entry points and parking areas, etc.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Determine the requirements for regular maintenance of vehicles in accordance with national and GIIP requirements	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Specific areas will be designated in appropriate locations	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Movement of vehicles along the access road will be minimised to essential operational and maintenance activities.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

14.6.2 Residual Impacts

Residual impacts related to traffic and transportation during the operation phase are minor.

15. Archaeology and heritage

15.1 Introduction

Potential impacts on the cultural and archaeological heritage that may occur during the construction and operation phase of the NOOR Midelt I project are assessed while considering the fact that archaeological and cultural resources are limited.

Where appropriate, mitigation measures minimising or preventing potential risks to cultural heritage and archaeology have been provided.

15.2 Methodology

The assessment in this chapter has been undertaken according to the relevant local and international law, regulations and standards in effect as described earlier in this report. The assessment has included a desk-based study that included the review of the available information on the area and a site inspection.

Desk study

The purpose for conducting the desk-based assessment is to identify any relevant historic sites or the location of any artefacts on the site or the study area (including the presence or absence, character and extent, date, integrity, state of preservation and relative quality of the potential archaeological resource). The desk-based study consisted of the collation of existing written, graphic, photographic, electronic data and information from the FESIA in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource on the site in a local, regional, national and international context.

Site visit

In order to complement the information gathered during the desk-based study, a site visit was undertaken to identify the presence of any above ground archaeological structures, deposits and /or antiquities.The results and findings are discussed below.

15.3 Baseline conditions

The investigations conducted during the FESIA concluded that no site of historical or cultural interest is located within 10 km of the project site, except for sepulchral sites or burial sites. In addition, no evidence of archaeological site was found at the solar complex site during the fieldwork for the establishment of the FESIA.

During the site visit, no object or structure of cultural or archaeological significance was observed on site. However, the possibility of finding traces of historic occupation, unknown archaeological objects underneath or vestiges of cultural conservation value during the site's clearing and earthworks can not be ruled out.

15.4 Sensitive receptors

The table below describes the receptors identified in relation to cultural heritage and archaeology as well as the determined sensitivity of these receptors.

Table 70 : Cultural and Archaeological Heritage - Sensitive Receptors

Receptor	Sensitivity	Explanation
Potentially unidentified archaeological sites	Weak	There is no evidence that archaeological sites are on the site. The topography of the area and the type of soil make archaeological discoveries on the plateau highly improbable.

15.5 Impacts and measures during the construction phase

15.5.1 Impacts

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.

In the event that earthworks during the construction phase uncover unidentified sources of archaeological or cultural heritage, this will result in an impact of major negative significance prior to the implementation of mitigation measures.

Table 71 : Culture and Archaeology - Significance of construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact significance
Destruction of unknown archaeological remains onsite High intensity	Major	Potentially unidentified archaeological sites	Weak	Medium

15.5.2 Mitigation measures

The EPC contractor will be required to prepare a Construction ESMP before starting the construction works, which will consider the potential for unearthing historical sites or artefacts. The discovery of remains will be signalled to the competent authorities with the implementation of the appropriate procedure: works suspension on the identified area and within a protection perimeter, investigations implemented by the Ministry of Culture.

Training and awareness programmes will be provided to ensure that construction staff and workers are aware of the procedures relating to the Archaeological Watching Brief if any artefacts or anthropogenic finds are uncovered. In the unlikely event of any artefacts being found/uncovered, the construction works would be ceased immediately and the Minister of Culture, via the*"Institut National des Sciences de L'Archéologie et du Patrimoine (INSAP)" will be contacted by the* EPC Site Manager. The INSAP will be in charge of any archaeological investigations.

15.5.3 Residual Impacts

Given that no evidence of sites of historical or archaeological value has been observed in the area, the risk of uncovering any archaeological resources is considered very low. Equally, the implementation of the above mitigation procedures will help minimise any impact that may occur to an acceptable level.

15.6 Impacts and measures during the operation phase

There will be no significant impacts on the historic and religious heritage during the operation phase, so there are no measures identified.

16. Landscape and visual impact

16.1 Introduction

There is an impact on the landscape where the visual horizon is disturbed by a construction. Such impacts may include:

- The anthropogenic intrusion of the landscape by buildings or structures where no intrusion previously existed; or
- The change in the landscape character of an area, which could arise from new/out of place constructions or from changes in the land use.

Visual impacts may occur when the visual envelope or line of sight to and/or from a receptor (e.g. residential areas, area of natural beauty) is intersected or blocked by a construction.

16.2 Methodology

The assessment of the project's impact upon the landscape and visual amenity of the surrounding area has been informed with

site visits undertaken to identify existing landscape and visual character of the area.

16.3 Baseline conditions

The site of NOOR Midelt I is located in the NOOR Midelt solar complex on a rocky plateau, covered by chaabas and surrounded by canyons, which are typical of this part of Upper Moulouya.

16.4 Sensitive receptors

The table below describes the identified receptors with respect to landscape and visual impacts as well as the determined sensitivity of these receptors.

Table 72 : Landscape and visual aspects - receptor's sensitivity

Receptor	Sensitivity	Explanation
Landscape character	Weak	The site will be highly industrialised. There are no specific landscape designations or other outstanding features indicated to make the landscape character of this area unique. The site is not currently anthropized.
Visual receptors	Weak	The villages closest to the site (more than 9 km) are located below the site. The inhabitants will not be able to see the equipment of the power plant however, while driving along the access road to the site, or even along the RN13, the site could be visible.

16.5 Impacts and measures during the construction phase

16.5.1 Impacts

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 programme. The total covered area for construction facilities will be around 150 000 m². Most of the covered area will be reused in operation phase. Decommissioning will be undertaken for the part that won't be reused.

The construction site will be very poorly visible from the N13 road. Only people walking/driving through the neighbouring areas will be likely to notice the construction site.

Night-time works will take place and the site will likely require floodlighting for security.

Table 73 : Landscape and visual aspects - Significance of impacts during Construction phase

Impact	Receptor	Sensitivity	Impact significance
Topographical impacts to landscape Low intensity	Landscape character	Weak	Weak
	Visual receptors – drivers driving along the construction site	Weak	Weak
Part of construction facilities decommissioned	Visual receptors - drivers driving along the construction site	moderate	Moderate to positive
New elements impacting the view High intensity	Visual receivers from the RN13	Average	Average
Luminous pollution Medium intensity	Visual receivers from the RN13	Weak	Minor

16.5.2 Mitigation measures

Table 74 : Landscape and visual aspects - Mitigation measure in Construction phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Topographical impacts to landscape	The height of the fences and any other structure will be such that their visibility from the terminal access road will be reduced - complying with the Landscape Charter developed by MASEN. Construction will be compliant with MASEN requirements.	EPC and subcontractors	Design and construction phase	Included in the contract
Part of construction facilities decommissioned	Provision of restoration plan in order to recover pre-existing conditions, as much as possible and minimize visual impact.	EPC and subcontractors	Construction phase	Included in the contract
Luminous pollution	Any flood lights required during night time construction activities will be directed onto the site, with a maximum position angle of 30° from vertical, therefore minimising any potential luminous leakage and impacts at night	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract

16.5.3 Residual Impacts

Residual impacts in the construction phase will be medium to low.

16.6 Impacts and measures during the operation phase

16.6.1 Impacts

The power line will be located at the edge of the access road to the site, on an area far from all residential centers and including several anthropogenic elements (tracks, roads of the complex, etc) which characterize the landscape of the zone. The power line will not be a great additional disturbance in an already modified landscape, it will not be noticeable for the nearest residential areas including the center of Midelt.

The placement of CSP/PV panel fields will change the landscape on a far reach.

These impacts can be considered positive as they enhance the region with the existence of the facilities that can be visible and thus better known to the public.

Table 75 : Landscape and visual aspects- Significance of impacts during Operation

Impact	Receptor	Sensitivity	Impact significance
New plant components in the landscape	RN 13	Average	Positive
New plant components impacting the view	RN13 / Midelt	Average	Positive
Luminous pollution	Visual impact	Average	Weak

16.6.2 Mitigation measures

Respecting the landscape charter developed by MASEN will allow for a good integration of the various constructions within the site, in particular when respecting the colours of the materials.

Table 76 : Landscape and visual aspects - Mitigation measure - Operation phase

Impact/Source	Mitigation Measure	Responsibility	Schedule	Cost
Luminous pollution	Lighting provision shall not be excessive or unnecessary – Lights for the plant will be switched on only when strictly necessary.	O&M	As soon as the operation start and throughout operation period.	Included in the O&M budget
	Lights required during night time will be directed onto the site, therefore minimising any potential back spills and impacts at night to avoid disturbance to fauna. Lighting will be compliant with MASEN requirements.	O&M	As soon as the operation start and throughout operation period.	Included in the O&M budget
	Lighting should not cause reflected glare for access roads users.	O&M	As soon as the operation start and throughout operation period.	Included in the O&M budget
Facilities design	Respect of the components of the landscape charter adopted by MASEN for the best integration in the site. constructions will be compliant with MASEN requirements.	EPC	Design	Included in the contract

16.6.3 Residual Impacts

Following the implementation of the mitigation measures, the residual impacts are low to positive.

17. Socio-Economics

17.1 Introduction

The development of this type of project has important effects on the socio-economic conditions of the populations, particularly through the creation of jobs and various services.

17.2 Methodology

Key indicators such as population, economy, labor market and social development at the regional scale are presented on the basis of existing bibliographic data. The information that will be gathered during the public consultations will make it possible to complete these elements more precisely. Once this basis was established, the report examined a more detailed assessment of the impacts of development. As the development will have different socio-economic impacts throughout the project life cycle, the impacts during construction and operation are discussed separately.

In response to the requirements of the IFC Performance Standards, the main components of this analysis are:

- An examination of local communities within the proposed development site and its immediate surroundings;
- A general assessment of the impact of the facility on the health, safety and security of the community and the labour workforce;
- Evaluation of the impact on local services; and
- The suitability of the site in light of the social / development profile of the site surroundings.

Regarding the current land use of the project site, there are no settlements on the site, which is fully owned by MASEN. The assessment of the social and economic impacts of land acquisition for the Midelt Solar Complex was addressed in the FESIA. Additionally, land acquisition procedures for the site are documented in the Land Acquisition Plan (LAP) finalized in August 2017.

17.3 Baseline conditions

17.3.1 Administrative situation

The site of the NOOR Midelt solar complex covers a total area of 4 141 ha, on a plateau in the Upper Moulouya located about 20 km northeast of the town of Midelt. It is administratively related to the municipalities of Mibladene, Aït Ben Yacoub and Zaïda in the province of Midelt and to the economic region of Draa - Tafilelt.

17.3.2 Land status

As a whole, the site of the complex is composed of collective lands. We distinguish collective lands covering about 2714 ha, belonging to the Ait Oueflla ethnic community and that of Ait Rahou Ouali and forest lands covering about 1427 ha, belonging to the water and forest administration's domain.

MASEN has already finalised the land acquisition procedure for the plant's site. This acquisition is treated as part of the acquisition plan prepared in addition to the FESIA already developed. The land acquisition plan is disclosed on MASEN website.

17.3.3 Land use

Site land use and impact on population activity on the site have been identified in the Land Acquisition Process carried out by MASEN in 2017.

According the LAP[14] :

- The activities on the site and the surroundings are pastoralist and transhumance activities performed by the villagers living in the vicinity of the site.
- No nomadism activity has been observed since 2014 (start of the acquisition process).
- The land area for the Midelt solar complex represents only 5 to 10% of the available heritage,

So we can conclude that pastoralism and transhumance activities will be very weakly impacted.

Land owners (Forestry Domain – HCEF and collectivity “Aït Oufella and “Aït Massoud Ouali”) have been compensated in compliance with Moroccan regulations and IFIs requirements.

Forestry Domain will use compensation for reforestation and population have 3 choices: distribution of moner between the members of the population, devlopement projects or conservation and settlement of funds.

17.3.4 Demographic characteristics of the municipalities concerned

The population of the three communes concerned by the project is about 20,000 inhabitants in 2014. Mibladen and Ait Ben Yacoub are two small rural municipalities. The number of inhabitants remained constant in Mibladen and decreased by 0,7% in Aït Ben Yacoub. Zaida is the most populated municipality and has been growing by nearly 3% between 2004 and 2014. Zaida, located on the route of the RN13 benefits from its accessibility and the various activities it can offer.

Table 77: Population and households in 2004 and 2014

	2004		2014	
	Total Population	Number of households	Total Population	Number of households
Zaida	9,920	2,062	13,181	3,038
Mibladen	3,087	573	3,084	580
Ait Ben Yacoub	4,310	810	4,012	820
Midelt	44,781	9,549	55,304	13,111

The area includes few human settlements and the few village localities identified in the area and worthy of mention are:

(1) Aït Ghiat - 490 inhabitants for 131 households, 14 km east the site

(2) Agoudi - 420 inhabitants for 84 households, 10 km north-east the site

(3) Arbane - 360 inhabitants for 72 households, 14 km north-east the site

(4) Ahouli - 126 inhabitants for 26 households, 15 km south-west the site

17.3.5 Socioeconomic characteristics

In Mibladen and Aït Ben Yacoub, more or less 50% of the population over 10 is illiterate. This rate is reduced to almost 40% in Zaïda. Illiteracy affects between 50% and 60% of women according to the municipalities. These rates remain well above the national average. The population of the municipality of Midelt has an illiteracy rate lower than the national average. Illiteracy rates in the municipalities of Mibladen and Aït Ben Yacoub are higher than the provincial average.

[14] LAP1 – Midelt project disclosed on MASEN website.

Table 78: Literacy rate of population aged over 10 years (in%)

	Men	Women	Illiteracy rate
Zaida	28.1	49.8	39.2
Mibladen	43.6	62.4	53.2
Ait Ben Yacoub	37.5	59.2	48.5
Municipality of Midelt	13.5	32.7	23.6
Province of Midelt	30.5	51.9	41.4
National level Reflecting diversity in the school curriculum	22.2	42.1	32.2

The enrollment rates for children aged 8 to 13 are respectively 71.1% in Mibladen, 91.1% in Ait Ben Yacoub and 95% in Zaida.

In Mibladen, 17.2% of the population has a secondary school level of education and 1.4% have a higher level. In Ait Ben Yacoub and Zaida, these figures are respectively 20.7% / 2.5% and 26.7% / 3.5%.

17.3.6 Activity and poverty

For the three communes, the net activity rate for men is almost equal to or slightly higher than the national average. On the other hand, it is very inferior for women, especially in the municipalities of Mibladen and Aït Ben Yacoub. It is in the same order of magnitude as the national level in the municipality of Zaïda.

Table 79: Net activity rate in %[15] (Source RGPH 2014)

	Men	Women	Total
Zaida	79.2	18.6	48
Mibladen	79.7	4.6	41.3
Ait Ben Yacoub	74.5	8.4	41
Municipality of Midelt	68.4	17	41.2
Province of Midelt	73.9	14.8	43.7
National level	75,5	20.4	47.6

The poverty rate of the municipalities of Zaïda, Mibladen and Ait Ben Yacoub is 3 to 5 times higher than the national rate and the vulnerability rate is twice as high as the national rate. The Draa-Tafilalet region is one of the poorest regions of Morocco.

[15] The net activity rate represents the size of the labour force aged 15 and over, made up of employed and unemployed people, out of the total population of the same age group.

Table 80: Poverty and vulnerability rate (source RGPH 2014)

	Poverty Rate[16]	Vulnerability rate[17]
Zaida	19.5%	23.3%
Mibladen	14.2%	23.6%
Ait Ben Yacoub	12.5%	23.5%
Morocco	4.8%	12.5%

17.3.7 Housing and public infrastructures

More than 50% of Zaida's population lives in modern Moroccan homes. On the other hand, the populations of Mibladen and Aït ben Yacoub live, in more than 50% of cases, in a rural housing and 34% of them in a basic accommodation.

Table 81: Distribution of households by access to water and electricity (Source RPGH 2014)

	Drinking water	Electricity
Zaida	59.5	90.3
Mibladen	69	75,5
Ait Ben Yacoub	68.9	91

According to the 2014 census data, the rate of access to drinking water almost reaches 70% in Zaïdi and Mibladen and 60% in Zaïdi. The rate of access to electricity is over 90% in Zaïdi and Aït Ben Yacoub and only 75% in Mibladen.

Liquid sanitation remains very deficient. Only 50% of households are connected to a public network in Zaida and 25% in Mibladen. Discharges in the natural environment represent more than a third of the households in Mibladen and Aït Ben Yacoub and 22% in Zaïdi.

Household waste

The municipality of Zaidi is the only one equipped with a garbage collection truck that barely collects from 50% of households (47.5%). The remaining population, including two other municipalities' population, dumps waste in the wild.

17.3.8 Health care facilities

According to the health map's data published by the Ministry of Health:

- The city of Midelt is equipped with a general hospital with 79 beds.
- The municipality of Zaïda has two primary health care facilities, a delivery unit with 4 beds and a dispensary. It also has an ambulance.
- 2 private practices as well as two pharmacies.
- The municipalities of Mibladen and Ait Ben Yacoub only have one dispensary.

[16]It is the proportion of poor people in the population, or even the percentage of individuals in a household whose per capita expenditure is below the relative poverty line. In 2007, this threshold was 3834 DH per person per year in urban areas and 3569 DH per person per year in rural areas.

[17]The vulnerability to poverty rate is the proportion of individuals whose average annual expenditure per person is between the relative poverty line and 1.5 times this threshold.

17.3.9 Schools in the province of Midelt

The province of Midelt has primary and secondary (junior and qualifying) schools according to the table below.

Table 82: Educational institutions in the province of Midelt for the 2017/2018 school year (source INDH, province of Midelt)

Education level	School year 2017/2018
Primary	114
Junior secondary schools	19
Qualifying secondary schools	03
Junior and qualifying secondary schools	9
Total	**145**

The province does not have any higher education institutions. These are located in the town of Errachidia about 140 km from Midelt.

17.3.10 Accessibility

The center of Zaida is located on RN13.

The nearest villages are accessible only by roads in poor condition (R7320) for Ahouli or by tracks for Aït Ghiat and Agoudi.

17.3.11 Socio-economics activities

The project as a whole is expected to be a major structuring economic element that will have significant repercussions throughout the sub-region characterised 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.

The province of Midelt is crossed by two national roads: the RN 13 and the RN 15 and a regional road RR 503 (See § 12). The municipalities of the periphery are sometimes extremely isolated.

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 characterising 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.

For populations living in the municipalities concerned, the local economy is dominated by agricultural activities. Earnings from paid employment shifting to other places in the province, or other cities in Morocco, are more important sources of cash income for most households. Pastoralism appears to represent a small portion of activities (practiced by about 10% of the households, especially by the oldest generations) and within a restricted area of action (a maximum of three kilometres around the villages)[18].

[18] Land acquisition Plan – August 207 - MASEN

17.4 Sensitive receptors

Table 83 : Socio-economics - Sensitivity of receptors

Receptors	Sensitivity	Explanation
Employment	Average	Employment is shared across different sectors but in a very temporary way (construction of the plant) The project is expected to provide short and long-term employment opportunities for villagers and residents in the region as a whole, where the participation rate is on average 40 to 45 percent (men and women)
National skills for management and monitoring of environmental and social impacts	High	All visitors, workers and in general any person entering on site during construction and operation of the Plant will undergo induction training whose content will be adapted to the activity performed on site. It will contain a least an EHSS induction course including Basic rules and regulations, Emergency plans, Special risks and control measures, PPE, etc.
Local / Regional Economy	Average	The project will contribute to the economic development of the region. Sensitivity is considered strong because economic growth is relatively weak
National Network	Average	The national grid will receive electricity generated by the plant. The sensitivity is considered average because the energy system in Morocco is well developed but depends heavily on fossil sources
Residents (Villages / Douars and Municipality of Midelt)	Average	The population is considered to have a medium vulnerability to socio-economic impacts since the socio-economic conditions of the region are relatively stable and moderately developed. The inhabitants will be familiar with the foreign populations, who will be expected on the project site

17.5 Impacts and measures during the construction phase

17.5.1 Impacts

For land acquisition and impact on the owners, MASEN manages the mitigation measures (i.e. 17.3.3). Population of Zaida, Mibladen and Aït Ben Yacoub are living in unfavourable conditions, the Midelt project will have positive impacts as described below but local development action have been identified with the population in order to increase these positive impacts[19]. These actions will be developed throughout the different phases of the project.

The main positive economic impact during the construction of the power plant project is likely to come from the creation of local jobs and the use of local businesses / services. The labour force that will be employed during the construction phase would around 1000 workers at the height of construction. In addition to the direct financial impact on employed families, the local workers' wages will also boost the local economy as the money earned with the project will be spent locally and injected into the local economy.

[19] Appendix 27 - LAP 1 – MASEN 2017.

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.

Training programmes have been implemented for NOOR Ouarzazate, a similar training may be provided at Midelt, so it is likely that the proportion of foreign workers will be minimised.

Conflicts could arise between communities and the project's labour force due to ethnic or religious differences, distrust of foreigners, misconduct of the project's workforce, etc. In addition, the interaction between the workforce and the local population can lead to the proliferation of diseases, with sexually transmitted diseases (STDs) being a specific risk.

To date, no conflict has been reported for NOOR Ouarzazate with the presence of an expatriate population. The same experiment would be transposed on the Midelt site.

In addition to the direct financial impact of employment created during construction, there is also a potential to promote the dissemination of the best construction techniques by the local workforce. Since development is proving to be a catalyst for regional expansion, skills acquired are likely to be easily marketable in the aftermath of the project's construction. Another secondary impact is likely to result from expenses on local goods during the construction process.

It should be noted that negative impacts on workers can occur during the construction phase, for the communities' health and safety related to traffic, noise and air quality. These impacts are presented in previous chapters.

The proximity of a project can lead to encroachment by people looking for job opportunities. Encroachment and informal settlements can have secondary impacts (habitat destruction, health and security risks).

Finally, the presence of security on site could lead to potential conflicts between local communities and security staff.

Table 84 : Socio-economy- Significance of impacts during Construction phase

Impact	Receptor	Sensitivity	Significance of the impact
Local job creation High intensity	Employment	Medium	Medium Positive
Dissemination of skills High Intensity	Local / Regional / Economy	High	Positive
Purchase of goods and materials from the local / regional economy High intensity	Local / Regional Economy	Weak	Minor Positive
Conflicts with Security Personnel Low intensity	Inhabitants of Midelt and Villages	Medium	Minor Negative
Cultural acceptance of the workforceLow intensity	Inhabitants of Midelt and Villages Work team	Medium	Minor Negative
Spread of STDs Medium Intensity	Inhabitants of Midelt and Villages	Medium	Minor Negative

Impact	Receptor	Sensitivity	Significance of the impact
Proliferation of informal settlements and encroachment Low intensity	Inhabitants of Midelt and Villages	Medium	Negligible to Minor Negative

17.5.2 Mitigation measures

The proposed mitigation and local improvement measures address socio-economic and work issues. The EPC will have to prepare the following documents in accordance with national and IFC requirements:

- ESMP in the construction phase;
- Management plan of working and employment conditions, including workforce reductions;
- Safety Management Plan (this could be incorporated into the Construction ESMP including blast management plan), and
- Emergency preparedness and response (including blast management plan) with consideration of communities' health and safety implications.

These documents will incorporate, as a minimum, the mitigation measures included in the table below. The documents can be prepared as separate plans or can be integrated into working documents (for example, several aspects can be integrated into the Construction ESMP).

Table 85 : Socio-economy- Mitigation measure during Construction phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Labour and Work Conditions	A specific Occupational Health & Safety Plan and Health & Safety Management System will be developed. This includes among others induction for all workers, and work specific risk assessment and procedures, training and supervision; also provision of first aid and medical response staff and facilities. The plan will be compliant with ILO conventions and will include at least : - Identification of hazards, evaluation of risks and determination of controls and inspections. - Identification of legal and other system requirements - Code and procedures of safe practices in the Plant - Training and information. - Communication, participation and consultation. - Safety inspections - Document control. - Operational Control : Safety standards, Work permits, Safety inspections, Revisions of equipment and installations, Revision and control of personal protective equipment, Control of Hazardous Substances, Control of Purchases and Acquisitions, Control of Works and Services, Control of Changes and New Projects, Coordination of contractors' activities and other external visitors - Preparation for and response to emergencies. - Accident management, non-conformities and corrective actions.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Provide complaints mechanism for employees and an action plan to address them.	EPC and subcontractors	As soon as the works start and throughout	Included in the contract

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
			construction period	
Worker accommodation	Workers' housing will either be located in the city of Midelt and / or the neighbouring municipalities, or on site. Housing availability and feasibility studies for an on-site base will be studied by the EPC company before the start of works.	EPC and subcontractors	Before starting construction phase	Included in the contract
	In case of any worker accommodation on site, the accommodation facilities will be compliant with IFC/EBRD Worker Accommodation Guidelines.	EPC and subcontractors	Before starting construction phase	Included in the contract
Employment	A labour management plan will be carried out.(Chapter 20).	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	As far as possible, the project according to the phases, will aim to employ local workers where simultaneously they are ready and available with the necessary skills to perform the tasks. All non-specialised job opportunities will be offered to local residents prior to hiring employees from other regions whenever possible. The employment of women and vulnerable groups will be specifically targeted where possible. The actions will be included in the labour management plan and information will be provided to population during public consultation meeting.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	All job offers / applications will be sent to the ANAPEC branch that has opened in Midelt. This will ensure the transparency of the recruitment mechanism. Information is given to the various partners to inform them of this employment mechanism.	EPC and subcontractors	As soon as the works start and throughout construction	Included in the contract

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
			period	
	Establish and implement a recruitment policy and ensure that the measures necessary to mitigate the negative effects of working conditions and employment are implemented (e.g. child labour and forced labour, operation, excessive overtime, inadequate wages, harassment, dangerous living and working conditions/.). Work and working conditions will be aligned with IFC standards	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	A downsizing plan will be prepared for the transition from construction to operation	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Environmental and social management skills	Identification of a skill development plan for all stakeholders concerned by environmental and social management. Information to population will be given during public consultations	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Purchases	The EPC will only engage with reputable suppliers who do not use force or child labour	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Procurement of goods and services for labour and building materials will be at the local / regional level when it's possible.	EPC and subcontractors	As soon as the works start and throughout	Included in the contract

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
			construction period	
SE * and HSW ** risks Social and environmental and HSW HSW: Hygiene and safety at work	If activities are developed and have not been evaluated in the SESIA, the E & S and HSW risks for the communities will be assessed before the start of the construction.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	The site will be fenced and access to the construction site will be controlled by the security staff	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Dissemination of skills.	Dissemination of skills will be included in labour management plan. Local employees will receive E&S and HSW training to enhance the development of skills. A certificate describing the contents of the training and signed by the EPC will be provided at the end of the employment contract.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Cultural acceptance of the workforce	Initial training of foreign employees will include information on the cultural background of the nearest residents	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Security measures	Develop and implement a policy on security and a code of conduct for security personnel which will comply with IFC Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts (2017).	EPC and subcontractors	As soon as the works start and throughout construction	Included in the contract

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
			period	
	The security provider and its staff will adhere to the international code of conduct on human rights. Only security personnel and companies without human rights violations will be employed. Security will comply with IFC Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts (2017).	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Security personnel will undergo a specific training programme that will include at least information on how to practice the GIIP (the United Nations Voluntary Principles on Security and Human Rights), the cultural context of the region and the workforce (main groups), the way in which they must interact with local communities and workers. Security will comply with IFC Good Practice Handbook	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Spread of illnesses/disease	Disease prevention (including STDs) will be included in training programmes through toolbox conferences or separate training sessions.	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
Proliferation of informal settlements and encroachment	Informal or clandestine settlements will be monitored by on-site security staff and reported to the relevant authorities	EPC and subcontractors	As soon as the works start and throughout construction period	Included in the contract
	Local public security forces will be required to deal with illegal immigrants who settle in accordance with national requirements.	EPC and subcontractors	As soon as the works start and throughout	Included in the contract

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
			construction period	

17.5.3 Residual Impacts

Following the implementation of mitigation measures and the promotion of socio-economic activities, it is expected that the importance of positive effects will increase.

17.6 Impacts and measures during the operation phase

17.6.1 Impacts

No impact for power line operation

At a strategic level, the operation of the plant has the potential to support the sustainable growth of local and national economies, through the ability to provide a renewable energy source to the national grid.

The greatest economic impact on neighbouring communities during operation will result from employment opportunities created by the project. Direct employees will be about 60. Indirect employment will be created.

Table 86 : Socio-economy- Significance of impacts during Operation phase

Impact	Receptor	Sensitivity	Significance of the impact
Electricity supply to the National Network High intensity	National Network	Weak	Minor Positive
Local Employment Low intensity	Employment	Moderate	Minor Positive
Dissemination of skills Low intensity	Local / Regional	High	Positive
Conflicts - Workforce / Local Residents Low intensity	Local / Regional	Reliable	Minor Positive
Conflicts - Security Forces Low intensity	Midelt & Villages inhabitants	Moderate	Negligible Negative
Spread of illnesses/disease Low intensity	Midelt & Villages inhabitants	Moderate	Negligible / Negative

17.6.2 Mitigation measures

Table 87 : Socio-economy- Mitigation Measures - Operation Phase

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Labour and Work Conditions	A specific Occupational Health & Safety Plan and Health & Safety Management System will be developed. This includes among others induction for all workers, and work specific risk assessment and procedures, training and supervision; also provision of first aid and medical response staff and facilities. The plan will include at least : - Identification of hazards, evaluation of risks and determination of controls and inspections. - Identification of legal and other system requirements - Code and procedures of safe practices in the Plant - Training and information. - Communication, participation and consultation. - Safety inspections - Document control. - Operational Control : Safety standards, Work permits, Safety inspections, Revisions of equipment and installations, Revision and control of personal protective equipment, Control of Hazardous Substances, Control of Purchases and Acquisitions, Control of Works and Services, Control of Changes and New Projects, Coordination of contractors' activities and other external visitors - Preparation for and response to emergencies. Accident management, non-conformities and corrective actions.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Employment	The project will aim to employ local workers where they are ready with specific and adapted skills. All non-specialised job	O&M	As soon as the operation start	Included in

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
	opportunities will likely be offered to local residents in priority prior to hiring employees from other regions. The actions will be included in the labour management plan and information will be provided to population during public consultation meeting. The employment of women and vulnerable groups will be specifically targeted and monitored where possible		and throughout operation period.	O&M budget
Employment	Establish and implement a recruitment policy and ensure that the measures necessary to mitigate the negative effects of working conditions and employment are implemented (e.g. child labour and forced labour, operation, excessive overtime, inadequate wages, harassment, dangerous living and working conditions/.) Work and working conditions will be aligned with IFC standards	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Purchases	O & M will only engage with reputable suppliers who do not use forced labour or child labour. Corresponding contractual clause to be inserted	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	The purchase of goods and services by labour and building materials at the local / regional level will be a priority	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Skills enhancement	Local employees will receive E&S and HSE training to enhance the development of skills. A certificate describing the contents of the training and signed by the plant's management will be provided. Details will be included in the labour management plan.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Identification of a skill management plan for all stakeholders concerned by environmental and social management. This	O&M	As soon as the operation start	Included in

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
	will be detailed in the labour management plan and information will be provided to population during public consultation.		and throughout operation period.	O&M budget
	Identification of a skill management plan in solar technologies included in Labour management plan.	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
cultural acceptance of the workforce	Inception training will include information on the cultural background of the population	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
Safety Measures	Develop and implement a policy on security and a code of conduct for security personnel	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	The security provider and its staff will adhere to the international code of conduct on human rights. Only security personnel and companies without human rights violations will be employed. Security will be compliant with IFC Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts (2017).	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget
	Security personnel will undergo a specific training programme that will include at least information on how to practice the GIIP (the United Nations Voluntary Principles on Security and Human Rights), the cultural context of the region and the workforce (main groups), the way in which they must interact with local communities and workers. Security will be compliant with IFC Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts (2017).	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

Impact/Source	Mitigation measures	Responsibility	Schedule	Cost
Disease transmission	Disease prevention (including STDs) will be part of training programmes	O&M	As soon as the operation start and throughout operation period.	Included in O&M budget

17.6.3 Residual Impacts

Residual impacts are low to positive.

18. Decommissioning phase

The following section defines the general technical/environmental protection requirements for the deconstruction works to be undertaken at the end of the O&M period.

18.1 General sequence

The decommissioning work will follow the following general sequences, on every building/structure:

During all the steps, the Contractor will be responsible for taking all appropriate measures to reduce at most the quantity, and the dangerousness of the produced waste during the works. It applies a "waste hierarchy": waste prevention is best, followed by re-use, recycling and other recovery, with disposal the last resort.

18.1.1 Preliminary works and studies

The aim is to prepare the deconstruction perimeter in order to work in safety conditions by preventing the fire risk, clean-up the power plant, avoid migration of pollution, and make space for the further deconstruction operations.

It is required to realize those works (as well as the site facilities set up), before beginning any other operation on the Plant. The good realization of those preliminary works is a requisite before any other operation:

- The setting-up of the fences around the deconstruction areas,
- The setting-up of the fire-fighting system adapted to the deconstruction works,
- The studies related to the deconstruction,
- Drainage of equipment units that could be prepared for sale (transformers for instance),
- The tanks drainage,
- The preparation of hazardous waste storage areas,
- The concrete pollution survey.

18.1.2 Decontamination and cleaning-up

Curage

The cleaning operations cover the removal of all the equipment that are in the buildings and are not part of the building structure. For instance, here is a non-exhaustive list: light bulbs, furniture, electrical cabinet, doors, windows, cables ducts, etc.

The complete cleaning-up is to be realized before any dismantling operation. It shall be considered that the concrete that will be re-used for the backfilling is to be free from any type of pollution, including those waste.

The sorting, and the evacuation of those waste, will be performed according to the different type of waste.

Fluids depollution

In the depollution studies, it will be indicated all the necessary means to be set up:

- To separate the polluted materials and waste before dismantling
- To avoid any spread of the pollution, especially into the soil

It will be required the draining and cleaning of the installed equipment, rinsing of equipment that may have contained polluting or toxic products, liquid transfer operations (filling of machines, tanks, any discharge, etc.), disassembly, cutting, cleaning, of the deconstruction or dismantling of structures that may have contained effluents not likely to pollute the water, soil and sub-soil.

The fuel in the pipes shall be removed before any dismantling operation, taking into account that :

- The methods shall prevent any fuel pollution in the works area.
- The methods shall avoid the fire risk during the cutouts of the pipes.

It is required to perform such activities by using mechanisms such as placing a retention system, watertight tarpaulins, etc., to prevent the effluents from seeping into the soil or in water bodies.

When securing the facilities, the Owner shall empty the holds and the pipelines, and also degas the holds. However remnants of effluent may be present and shall be considered and treated.

The necessary measures shall be identified in the operating procedure (membranes, caps, waterproof containers, etc.) to prevent dripping during the cutting operations, the handling and storage of pipes.

Only cold-cuttings are allowed for the cutting of the fuel pipes.

Concrete depollution

It is required to set up on site all necessary means to ensure the complete or partial depollution of the waste and materials produced by the works taking into account the up to date best available technics in this field, in order to reduce at most the quantity of produced waste.

To fulfill this purpose, the operating procedures of pre-treatment or treatment foreseen for the depollution of the concrete will include:

- Surface cleaning,
- Selective deconstruction of the polluted concrete (scrapping, planning, etc.),
- On-site depollution of the polluted concrete,
- Pre-treatment at source for the liquid releases.

18.1.3 The pre-treatment at source is required when possible, to ensure a minimal level of on-site sorting.Lagging removal

Before any dismantling operation, the whole lagging removal shall be realized in order to avoid any contamination of the lagging, and to limit the dispersion of the lagging fibers in the air during the dismantling works.

All necessary means shall be set up to limit the dispersion of fibers, issued from these operations, in the air.

The lagging wastes shall be stored on a zone specifically dedicated. The wastes will have to be packaged in flexible intermediate bulk container (FIBC)

The lagging removal is realized:

- Whether directly on the process, on the pipes,

- Whether on the ground, on specific lagging removal areas. These areas shall be the closest to the depositing zone of the considered facility or equipment. The handling equipment shall be designed to ensure a controlled fall of the equipment to avoid any fibers dispersion,
- Manually, to limit the dispersion of the fibers,
- The lagging is then put into FIBCs, for the disposal.

Adapted breathing mask protection shall be provided to every worker during these operations.

18.1.4 Waste management

Responsibility

All the waste management operations shall be performed in compliance with regulations in force and the best available practices (BAT & BREF) especially by being careful about the safety and environmental impacts of its activities.

The waste management activities includes namely:

- Waste sorting,
- Waste packing,
- Waste weighting,
- Waste labelling,
- Waste evacuation,
- Waste disposal.

Waste prevention

Waste prevention is one of the main priorities during a deconstruction project. Therefore all appropriate measures will be taken to reduce at most the quantity, and the dangerousness of the produced waste during the works.

It applies a "waste hierarchy": waste prevention is best, followed by re-use, recycling and other recovery, with disposal the last resort.

It will be studied for the project at least:

- The best sorting techniques, in order to minimize the hazardous waste proportion, and to favor the best waste valorization,
- The possibility of reuse of the materials,
- The implementation of selective deconstruction means, and on-site material decontamination.

Waste management relies on programming, coordination, and operation control (sorting, packing, labeling, storing, disposal, traceability, transportation, evacuation, treatment).

Selective sorting of waste

It will be ensured that the waste is sorted, and that this is done in accordance with the regulatory requirements and the requirements of the company on the expected level of sorting.

For this reason and in order to optimize the recovery of waste, the categories and sub-categories of waste in shall undergo selective sorting on site.

It is not permitted to put recoverable waste in landfills.

With regard to waste sorting, the following will be ensured:

- Adequate signage, indicating the type of the waste
- Cleanliness of the whole site, particularly in the vicinity of the waste disposal areas,
- Information about its staff and those of its sub-contractor

Batteries

Within the storage system, battery modules are the only part subject to special recycling. The rest of the system including Battery Management Systems (BMS) and racks can be recycled according to the recycling process of general metal products.

The battery supplier will be responsible for the recycling of the batteries after the end of life or due to replacement of broken/ failing equipment. A detailed recycling concept will be developed by the battery supplier with a detailed description of the division of responsibility for the preliminary dismantling on site and transport of the batteries to the recycling facility.

Recycling process generally comprises four steps. (Collection, Dismantling, Smelting, and Metal separation) Those steps of eco-friendly recycling process, allows for end-of-life batteries to be decomposed into reusable materials.

Depending on the final battery supplier and of the exact composition of battery modules, substances such as Aluminium (Al), Calcium (Ca), Lithium (Li), slag, and metal alloy composed of Cobalt (Co), Copper (Cu), Nickel (Ni), and Iron (Fe) will be recovered in the recycling process. A gas cleaning technology will be applied to this process and only limited amount of CO2 will be emitted. Al, Ca, Li will be transferred back to metal suppliers, and slag will be re-used in construction or as aggregate for concrete. The metal alloy containing Co, Cu, Ni, and Fe will go through further refining process until recovering pure elements of Nickel and Cobalt.

PV panels

In a similar way to the battery modules, end-of-life or defective panels will be returned to the supplier for specific recycling, whereas other “standard” electrical or structural equipment of the PV subsystem will be re-used, recycled or disposed according to the waste management process and recycling process of general metal products. The Project Company will ensure that the selected PV module supplier commit in manufacturing and recycling the PV modules in a continuous cycle, thus contributing to a constant improvement of the environment.

General rules for waste storage

All the necessary means for waste storage on site will be planned and provided. Temporary on-site storage shall be provided such that it:

- Respects the health and safety of workers,
- Does not harm the environment during waste storage, especially hazardous waste (protection of soil, surface water and groundwater - e.g.: retention systems, waterproof lining, membranes, etc.)
- Does no harm to waste recovery (protection against weather, etc. - e.g. soggy cardboard, etc.).

18.1.5 General HSE requirements

Appropriate safety barriers will be provided with hazard warning signs attached around all exposed openings and excavations when the work is in progress. Permanent or temporary covers to openings shall be replaced at all other times.

All necessary adequate actions will be taken (including training, risk assessment, method statement, safety audit & safety tours, etc) whenever dangerous situations may occur regarding:

- Working at height,
- Lifting and handling,
- Hot points and fire,
- Working authorization and accreditation,
- Electrical hazards,
- Chemical hazards,
- Danger of pollution,

- Traffic management,
- Lighting and lack of visibility,
- Noise.

Other HSE requirements will applied as needed regarding superposition of the workstations, co-activity/interference with other tasks, circulation paths, electrical cables to be defined at a later stage.

19. Cumulative impacts

At this stage, no large-scale project development likely to have a cumulative effect with the NOOR Midelt I project has been reported by municipalities and local authorities. It should also be noted that site 2 of the Noor Midelt tender was not awarded by Masen.

20. Management plans

The following are sectorial plans which will be part of the ESMP for construction (CESMP) and for operation (OESMP).

20.1 Emergency plan

The emergency plan will include at least :

- Emergency situations
- Emergency response plan
- Emergency organization
- Evacuation routes and meeting point drawing
- Emergency resources

20.2 - Safety and security plan

The safety and security management plan will include at least :

Introduction

- Legal and IFC requirements
- Safety and security organization
- Roles and responsibilities
- Practices and procedures
- Safety requirements for project operation (work permits, safety training, safety meetings, activity hazards analysis, etc.)
- Fire management plan
- Security system report (suitable security systems description, car and truck parking area description, guard house description, perimeter security fence characteristics, siren system characteristics and the protection for the dust, etc.)
- Hazardous area classification report
- Preliminary thermal storage safety plan
- VOC health risk analysis report

20.3 OHS plan

The OHS management plan will include at least :

- Introduction
- OHS regulation and IFC requirements

- Roles and Responsibilities
- Training
- OHS Risk Assessment
- Right of Entry
- General OHS information
  - Emergency Procedures
  - Hazard/Injury/Incident Reporting
  - Reporting of Notifiable Incidents
  - First Aid
  - OHS Training and Induction
  - Risk Management and the Risk Register
  - Workplace Hazard Inspections
  - Purchasing
  - OHS Record Keeping
  - Documents to be displayed
  - Important Contact Numbers
- OHS requirements

  This part will identify the various situation and requirements to manage them. We can identify at least :
  - Dangerous Goods and Hazardous Substances
  - Electrical Safety
  - Confined Spaces
  - Falls from height
  - Manual Handling
  - Personal Protective Equipment
  - Slips, trips and falls
  - Vehicles

20.4 - Labour management plan

This plan must be prepared by the EPC. This plan ensures local workforce management will comply with all regulations and international good practices.

It will include at least :

- Introduction
- Description of construction activities and manpowerneeds
- Legal and IFC requirements
- Organisation, roles and responsibilities
- Hiring and Recruitment Procedure
- Training activities
- Provisions for Drinking Water, Cooking Arrangements
- Medical Facilities
- Transportation organization
- Initial training of foreign employees will include information on the cultural background of local residents

- Skill management plan in solar technologies
- Labour grievance mechanism
- Monitoring and reporting

20.5 Hazardous Materials Management Plan

The hazardous materials management plan will include at least :

- Introduction
- Legal and IFC requirements
- Hazardous materials identification
- Procedures, rules and training for :
  - handling and storage
  - spill response protocols
  - contingency plans

20.6 Blast Management Plan

The blast management plan will include :

- Introduction
- Applicable Legislation and Explosives Permits Required
- Explosives Management Plan Objectives
- Types of Explosives to be used On Site
- Explosives Quantities
- Explosives Preparation
- Explosives Storage
- Onsite Handling
- Blasting Operations
- Environmental Considerations

Blast Management Plan will be prepared after earth movement design

20.7 Waste Management Plan

(which comprises the necessary measures to fully apply the waste hierarchy described in the baseline section);

This plan must be prepared by the Main Contractor. This plan ensures the waste management will comply with all regulations and international good practices.

The waste management plan will include hazardous and non-hazardous waste. The plan will include staff training.

This waste management plan will include :

- The process for identification and classification of solid waste
- The measures to ensure, the minimization of waste (agreement with providers, recycling on site, etc..)
- The measures to sort, store the waste
- The description of the requirements of waste storage areas

- The identification of waste disposal routes for each waste stream
- The agreement with licensed waste collector for waste elimination

20.8 Emergency Preparedness and Response Plan.

It ensures that the project complies with IFC Guideline n°3.7, Emergency preparedness and response.

The plan must include the following:

- Administration (policy, purpose, distribution, definitions, etc.)
- Organisation of intervention zones (command centres, medical units, etc.) and list of sensitive elements in the immediate surroundings of the work site and potential hazards;
- Roles and responsibilities: line responsibilities must be clearly determined;
- Disclosure: at the beginning of works, the Main Contractor must post the plan so that all the employees can see it; the public must also be informed if public health is likely to be affected;
- Emergency procedures and equipment;
- Emergency resources: list and contact details of everyone to be contacted in an emergency and sequence of action. It is also necessary to plan financing for rescue/relief activities. Fire risk (facilities, farmers' fields, olive groves) and local and contractors' fire prevention resources must be assessed;
- Training and recycling: the employees must be trained so that they are familiar with the procedures for spills, fire, evacuation and any other emergency involving the workers and the local inhabitants. The plan must be revised and kept up to date with all changes in equipment, personnel and facilities;
- Check-lists (lists of roles and measures; equipment check-list);
- Sustaining the various activities and emergency plans: finding the space and additional equipment necessary for the contractor to continue the works activities after an emergency. For example, this often includes seeking alternative sources of water, electricity and fuel;
- Hydrocarbon spills are the main risk of emergency.

The Contractor must also have an emergency kit ready in the event of accidental pollutant spills. It must contain equipment that is suitable for use in the work place(s) concerned.

For example, an emergency kit for spills should usually contain the following:

- 1 drum or box containing emergency equipment for spills;
- 10 polypropylene pillows - size 430 cm3;
- 200 absorbent polypropylene pads;
- 10 absorbent polypropylene socks;
- 5 10 litre peat fibre bags for oil spills;
- 10 polyethylene 6mm thick 205 litre disposal bags for soiled absorbent equipment.

The Contractor will immediately warn the Project Manager's officially appointed representative in the event of contaminant spills whatever the size of the spill.

In the event of pollutant spills, the Contractor must immediately proceed as follows, at his own expense:

- Bring the leak under control;
- Check the extent of the spill;
- Start off the emergency procedure;
- Confine and collect the pollutant;
- Excavate and replace contaminated soil, if any;
- Handle contaminated waste accordingly depending on the degree of contamination;

- Write a report on the spill.

20.9 Traffic and transportation management plan

The traffic and transport management plan examines the routes of the parts and machinery and assesses the actions necessary to bring them to their destination.

- • The first stage consists of planning transport requirements:
  - the number of trucks necessary for the blades, towers, living quarters and equipment;
  - the human resources necessary;
  - the number of vehicles and trucks using the roads;
  - analysis of rail transport capacities;
  - approval of routes by the authorities.
- • Route planning
  - study of alternative routes and fuel consumption;
  - number of return journeys planned;
  - analysis of route-related constraints: weak points in the road system, improvements considering bend radius, maximum load, maximum headroom;
  - study of traffic and the most favourable periods for transport;
  - identification of owners and negotiations to lease land likely to be necessary for the transport and storage of the wind turbines.
- Permits and authorization planning
  - applications for permits for trucks and large convoys will be necessary;
  - Gendarmerie escorts may also be necessary in certain urban areas.

20.10 Waste water management plan

This plan must be prepared by the Main Contractor. This plan ensures the wastewater management will comply with all regulations and international good practices.

The wastewater management plan will include domestic wastewater, effluents from cleaning operation, and effluents from cleaning concrete.

This plan will identify:

- The potential quality and quantity of the effluent
- The way to reduce wastewater
- The treatment equipment and storage

APPENDIX

Appendix 1 : Air quality baseline

Appendix 2 : Noise baseline

Appendix 3 : Soil Baseline

Appendix 4 : Biodiversity baseline – report (except avifaune)

Appendix 5 : Biodiversity baseline - Avifauna

Appendix 6 : Environmental EDF Renewables policy

Appendix 7 : Air quality modelling study