

NOOR Boujdour 20 MW Photovoltaic Power Project Boujdour Province



SESIA Vol 3 - Environmental
and Social Management
Plan

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
ACWA	ACWA Power
BMP	Best Management Practice
CESMP	Construction Environmental Social Management Plan
ESMP	Environmental and Social Monitoring Plan
EMS	Environmental and Social Management System
EPs	Equator Principles
EPC	Engineering, Procurement and Construction
ERPs	Emergency Response Plans
ESIA	Environmental and Social Impact Assessment
FESIA	Framework Environmental Impact Assessment
GHG	Green House Gas Emissions
GIIP	UN Voluntary Principles on Security and Human Rights
IFC	International Finance Corporation
MASEN	Moroccan Agency for Solar Energy
MSDS	Material Safety Data Sheet
MW	Megawatt
O&M	Operation and Management
OESMP	Operational Environmental and Social Management Plan
PPA	Power Purchase Agreement
VOCs	Volatil Organic Compounds
5 Capitals	5 Capitals Environmental and Management Consulting

1 INTRODUCTION

This document presents an outline Environmental and Social Management Plan (ESMP) prepared as part of the Specific Environmental and Social Impact Assessment (SESIA) for the NOOR Boujdour 20 MW PV project being sponsored by the Moroccan Agency for Solar Energy (MASEN) and developed by ACWA Power. The Project Company, ACWA Power, will be responsible for development and management of the construction and operation of the project. An EPC and O&M contractors will be selected and managed by the Project Company to engineer and construct the project, in conformance with the design specifications (MFS), regulatory environmental and social requirements, and the mitigation and monitoring measures discussed in the SESIA, this Environmental and Social Management Plan (ESMP) and supporting management plans.

The outline ESMP provided in this SESIA Vol. 3 is consistent with previous measures recommended in the Main Text (SESIA Vol 2). It provides detailed environmental and social actions and initiatives that will be developed within the EPC's Construction Environmental and Social Management Plan (CESMP) and the O&M's Operational Environmental and Social Management Plan (OESMP), and will therefore be implemented during the construction and operational phases of the project. This ESMP is a requirement of ACWA Power's policy to develop projects in line with Good International Industry Practice (GIIP).

The action items proposed in this ESMP are the minimum requirements that the EPC and the O&M must follow during construction and operation. The EPC is the party responsible to prepare and implement the CESMP and the O&M is the party responsible to prepare and implement the OESMP. The information provided in the following chapters is mandatory for use and application by the EPC/O&M and, in some instances, the Project Company. Further management plans and other documents are mentioned on this report, and these will also need drafting and implementation by the EPC or the O&M. In addition to the CESMP/OESMP, the EPC and the O&M may develop their own EHS plans, provided that it meets or exceeds the specific requirements in these cleared documents.

With regards to the decommissioning phase, it should be noted that the PV Plant will be handed over to MASEN at the end of the 25-year Power Purchase Agreement (PPA) period and, consequently, the responsibilities for the decommissioning of the plant will fall under the responsibility of the owner. MASEN will ensure that a suitable Decommissioning E&S Management Plan is prepared for the decommissioning phase, fully aligned with all Moroccan and International requirements, and compliant with the requirements of the SESIA.

The aim of this report is therefore to outline systematically all the requirements that the EPC and O&M will have to consider and address in the preparation of all necessary documents

and procedures to ensure the successful implementation of the mitigation and monitoring strategies and to prevent any environmental and social impacts.

2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN – CONTENTS AND STRUCTURE

This ESMP includes a detailed set of measures and procedures designed to ensure the implementation of the mitigation measures, which have been outlined in the SESIA Vol. 2, in order to eliminate, offset or reduce adverse environmental and social impacts to acceptable levels. These measures will be implemented at all stages of the project development, from construction, commissioning, and operation to decommissioning.

The ESMP also outlines the environmental and social management structure that will be responsible for implementing the procedures of the ESMP, therefore this structure includes roles and responsibilities of team members.

Finally, the management plan is iterative in nature and will be amended and configured prior to and during all phases as circumstances or activities change on site. The ESMP measures designed to ensure and assess the long-term effectiveness of the ESMP include:

- Program of audits and inspections;
- Procedure for recording and reporting environmental and social incidents;
- Procedures for recording complaints regarding environmental and social issues;
- System for liaising with the environmental regulatory authorities;
- Procedures for regular review of the ESMP; and
- Program for environmental and social monitoring.

The key benefits of a CESMP/OESMP are to:

- Establish a baseline against which environmental performance can be assessed;
- Provide a system for the formal identification of potential environmental and social impacts;
- Enable the identification of objectives and targets; and
- Provide a mechanism for monitoring and measuring of performance.
- Provide the organisation structure and responsibility to manage the environmental and social issues.

The content of this chapter will be used as a basic structure to provide a foundation upon which the development of a CESMP/OESMP can be achieved. All elements described below will need to be included as part of the CESMP/OESMP.

2.1 Applicable Legislation and Policy

The CESMP/OESMP will need to include a section that:

- Specifies the overall policy statement for the project which will include the EPC/O&M's approach to environmental and social issues aligned with IFC requirements.
- Identifies the applicable national and international legislative requirements, guidelines and standards such as legislation in relation to pollution control, endangered species, hazardous waste standards, contaminated land, heritage and archaeology, and employment and social rights issues.
- Describes a grievance redress mechanism that should be implemented during the construction of the project

To ensure compliance with applicable requirements, all applicable laws, regulations and standards need to be documented. For the first draft of the CESMP, the laws and regulations included in the SESIA will be used. Then the legislative section of the CESMP / OESMP will be updated yearly.

2.2 Site Description and Existing Conditions

The CESMP/OESMP will be required to include the following:

- Location of the Project, including a site plan, showing construction site boundaries;
- Position of the project in relation to any sensitive receptors identified in the SESIA and new sensitive receptors that may be identified in the future; and
- Access roads to the sites.

2.3 Description of Works

The CESMP/OESMP will provide a detailed programme of the construction/operational activities of the NOOR Boujdour 20 MW PV project and will include, as a minimum:

- Proposed dates and sequences of the planned works with relation to the environmental and social issues outlined within this report in order to minimise disturbances to the local communities;
- Details of proposed normal working hours and intended start up and close down times;
- List of the equipment to be used;
- List of required equipment and site services such as water supply, sanitation, solid waste facilities, power supply, etc.;

- Details of the storage facilities required, e.g. for fuels, hazardous substances, chemicals, etc. and describe the method and minimum requirements for building these storage facilities;
- Vehicle access routes/points;
- Methods of the delivery/removal of materials/wastes and equipment;
- Details of proposed site accommodation (only construction); and
- Location of storage facilities for pipe sections, tools, equipment, chemicals etc.

2.4 Identifying the Environmental and Social Issues

A summary of the environmental/social issues and aspects will be included within the CESMP/OESMP and prepared based on the findings and various risks identified in the SESIA. This summary will be updated to reflect any additional risks resulting from the contractors/subcontractors selected methods of working, changes in site conditions, changes in program, and changes in design.

Given the nature of the project and as per the social and environmental assessment, risks would be identified within the CESMP/OESMP, which would include the categories for the environmental and social aspects outlined within this SESIA.

2.5 Environmental/Social Requirements and Compliance

The CESMP/OESMP will cover compliance requirements, monitoring and auditing procedures, roles and responsibilities and remedial actions. The CESMP will be agreed with the Environmental Authority and will include the requirements set out in the SESIA and in the approval permit. It will therefore include:

- Procedures for monitoring construction/operational processes against the national and international standards and with regard to the project environmental and social objectives; and
- Procedures for dealing with major pollution incidents that could unexpectedly occur during the construction or operational phase (including the reporting to the relevant authorities) and which are particularly related to air quality (e.g. dust), ecology (e.g. protected fauna/flora), ground/soil quality (contamination issues), noise and vibration, water resources, waste management, or cultural heritage (e.g. archaeological finds).

The mitigation measures that will be required, as a minimum, for the construction and operational phases are outlined on chapters 3 and 4 respectively. Monitoring measures are outlined on Chapter 6.

2.6 Monitoring, Recording, Inspection and Auditing Program

Daily inspections of work areas by the E&S Coordinator and weekly inspections as a minimum by the Site Manager will also need to be conducted to identify any issues or non-compliance with the CESMP and to monitor the daily work practices.

An inspection checklist will be prepared and will be provided to the External Auditors for evaluation, which will involve all the subcontractors to discuss environmental and social issues and their rectifications.

External audits will also need to be undertaken during both construction and operation by an external, independent auditor in order to satisfy the international requirements applicable to this project. This audit will take place in order to ensure the following:

- Compliance with all standards and regulatory requirements, CESMP/OESMP and method statements;
- Auditing the contractor and subcontractor activities for non-conformances,
- Checking monitoring records, inspection checklists, and other relevant documentation; and
- Identifying the requirements for corrective actions.

The outcomes of the audit will also need to be documented including the recommendations and corrective actions.

2.7 Environmental/Social Training and Awareness Program

Training and awareness programmes are an extremely important part of the CESMP/OESMP and of the overall project development. All staff and labourers working on site will be required to attend an environmental/Social awareness and training program prior to commencing work, which will include, at least, the following:

- Induction training for general environmental and social awareness and the content of the CESMP/OESMP;
- Site induction training that will highlight the specific environmental (and health safety requirements described in a separate specialist framework management plan) requirements and activities being undertaken at the worksite including hours of operation, noise and vibration limits, necessary mitigation measures, soil and water control measures, sensitive receptors and local community issues, traffic access, site entrance and exits etc.;
- Dealing with and handling hazardous and non-hazardous wastes;
- The importance of waste recycling and associated procedures;
- Training on the emergency preparedness plan;
- Training on incident notification, investigation and reporting;

- Training for traffic monitoring and management;
- Induction training for construction site visitors, etc.

Specific training will apply for security employees.

It is recommended that this be incorporated with a safety training programme, which will also be required for all employees working on the Solar Power site.

2.8 Environmental Management Staff: Roles and Responsibilities

Documentation detailing the management structure that includes the organisational structure encompassing all staff responsible for environmental work will be outlined within the CESMP/OESMP.

The CESMP/OESMP will need to define the respective roles and responsibilities with regard to the environment and identify the site's responsible Environmental Manager. Descriptions of individual environmental team responsibilities will also be detailed and include, but not be limited to, the following team members:

Project Director/Manager is responsible for the delivery of the project, which includes environmental and social management requirements.

Construction/Operational Manager and Site Manager are responsible for ensuring that Environment, Health and Safety (EH&S) measures are managed during construction and operational phases.

Contractors are responsible for consistently implementing environmental and social management measures in accordance with the mitigation and monitoring measures outlined in the SESIA and are in compliance with the national and international applicable regulations.

The Subcontractors' responsibilities parallel those of the Contractor's project personnel, and therefore all persons working on site will comply with the environmental and social requirements detailed in the CESMP/OESMP.

The assigned EPC/O&M will be required to employ a dedicated and experienced Environmental/Social Coordinator at all times on site, to ensure the CESMP/OESMP mitigation measures are followed and resolve issues as and when they may arise.

Furthermore, the EPC/O&M will be required to engage an independent Environmental and Social Consultancy to undertake external audits against the environmental and social requirements established in the SESIA and the future CESMP/OESMP.

The contracts placed on the Contractors will need to clearly specify the environmental and social requirements expected of contractors working on the NOOR Boujdour 20 MW Project.

Resources

All levels of management are accountable to ensure that the necessary resources are available for implementing and accomplishing environmental and social responsibilities. Therefore, the following issues will be provided and assured:

- Appointed Environmental/Social Managers will be competent and experienced in the relevant issues;
- Suitable time will be allocated to manage these issues;
- Environmental and Community awareness training will be provided;
- Suitable documentation will be provided;
- Appropriate equipment will be appropriated; and
- Suitable budget will be allocated for managing environmental and social incidents.

2.9 Communication

Communication, both internally and externally, is an important aspect of successful project delivery. Internal communication includes arranging regular meetings for the Project team to review and co-ordinate project progress with regards to environmental and community issues. External communications, with the local representatives will also need to be conducted regularly.

In addition, as a mechanism by which community members can lodge grievances, the fence of the project boundary will include sign boards listing the contact details of the Social & Environmental coordinator, general inquiry phone number, company mailing address and website address. In this manner, members from the local community can either obtain more information regarding the project and /or lodge any concerns and complaints. This contact information will also be provided in municipal and/or public service buildings of the closest residential areas.

The following minimum procedures shall be implemented when a grievance is submitted:

- All grievances will be logged and reviewed by the Environmental/Social Coordinator.
- The Site Environmental/Social Coordinator will identify the mechanism to redress the grievance, will identify the party responsible for accomplishing the task and will issue the instruction to complete the action.
- The site environmental Manager will review the adequacy of the action and approve the completion of the action.

- All steps of the process will be logged in the Grievance register and the relevant environmental issue of the CESMP/OESMP will be updated accordingly (i.e. monitoring, training, material supplies, budgeting, staffing...etc.).

2.10 Document Control and Review

All documents relevant to the CESMP/OESMP will be controlled. The controlled documents include the CESMP/OESMP report, procedures, audit reports, incident reports, records, and community complaints. The EPC Environmental/Social Coordinator will be responsible for the quarterly review of the CESMP, its procedures and its implementation on site. If any new machinery or process is introduced on site, the existing CESMP will be updated accordingly. The O&M Environmental/Social Coordinator will be responsible for the annual review of the OESMP, its procedures and its implementation on site. If any new machinery or process is introduced on site, the existing OESMP will be updated accordingly.

2.11 Management Structures and Procedures

All personnel in the EPC/O&M Project Team are responsible for protecting the environment and community by ensuring that appropriate protection measures are implemented.

The table below offers a general representation of the likely general management structure and assigned responsibilities. The EPC/O&M must assign these responsibilities to the concerned personnel and incorporate the roles within the CESMP/OESMP.

Role	Environmental Responsibility
Project Director/Manager	<ul style="list-style-type: none"> • Understand the requirements and objectives of the CESMP/OESMP; • Ensure resources (personnel and financial) are provided to prepare and implement the CESMP/OESMP; • Overall responsibility for environmental and social performance; • Approve reports of environmental issues and non-conformance to the client in the regular reporting and when any issues arise; • Facilitate proactive communication between all role-players in the interest of effective environmental and social management; • Implement temporary work stoppages where serious environmental or social infringements and noncompliance occur; • Enforce compliance with CESMP/OESMP and all legal regulations; • Ensure all employees undergo environmental and social training; and • Ensure the CESMP/OESMP is updated and approve the final updates
Environmental/Social Coordinator	<ul style="list-style-type: none"> • Set up program for regular monitoring; • Follow up community complaints; • Conduct inspections to monitor environmental performance and compliance with the CESMP/OESMP by contractors; • Check CESMP/OESMP compliance with legal requirements on regular basis; • Ensure the environmental and social meetings are held on a regular basis; • Communicate and advise PM and subcontractors on environmental and social aspects;

Role	Environmental Responsibility
	<ul style="list-style-type: none"> Participate in regular site meetings, so that environmental and social issues are on the agenda; Report, investigate and follow up on incidents (environmental and social); Establish corrective action plan for any non-compliance including action plan for prevention of such misconduct or incident; Develop, implement and manage the environmental and social training program Has been trained to identify environmental and social issues in order to convey any observed issues.
(Construction) HSE Site Manager	<ul style="list-style-type: none"> Responsible for overall environmental performance of the contractor and subcontractors; Allocate sufficient resources to ensure compliance and effectiveness of CESMP/OESMP; Ensure sub-contractors have a copy of the CESMP/OESMP and are aware of their environmental obligations; Enforce compliance with CESMP/OESMP and all legal regulations; Communicate environmental and social aspects with PM and HSE managers; Ensure Environmental training is undertaken; Ensure internal/external complaints are addressed; Ensure that an Environmental and Social coordinator is assigned to the team; and Maintain document registers for training, incidents, waste management and other related environmental reporting requirements.
Sub-contractor-foreman	<ul style="list-style-type: none"> Implement the requirements of the CESMP/OESMP; Allocate the necessary resources to ensure compliance and effectiveness of the CESMP/OESMP; Cooperate with the Environmental/Social Coordinator to ensure that site inspections and training are conducted; Comply with the observations and requirements for corrective actions, which are issued by the inspector; Report all incidents and non-compliance to Site manager; Notify the Construction Manager/Site Manager of any changes on the program, construction/operational method which may affect the environmental mitigation measures and ability to comply with the CESMP/OESMP and regulations; Maintain a register of incidents and waste management for future audits; Maintain a register of complaints and correction actions
Workers	<ul style="list-style-type: none"> Undergo environmental and social awareness training; Undergo Health and Safety awareness training (provided by an H&S specialist in accordance with H&S guidelines provided under a separate study) Understand environmental procedures and environmental /social aspects relevant to activities; In case of any accident or non-compliance report that immediately to foreman.
Visitors	All visitors must comply with the CESMP/OESMP, must receive an induction before entering the site and must comply with the instructions given by site staff.

3 CONSTRUCTION PHASE – MITIGATION MEASURES

3.1 Introduction

In order to ensure compliance with environmental legislation, both national and international, the CESMP will be developed to manage environmental risks during the construction phase. The complete CESMP will need to be prepared by the EPC and all sub-contractors will be obliged to adhere to procedures that are outlined. This also includes following and enacting proper management structures.

The CESMP will be required to cover all construction components of the proposed PV project and will provide detailed specifications for individual activities. The purpose of these is to reduce the severity of impacts of the construction of the Project through avoidance, prevention, reduction and rectification. The actions to be set out in the CESMP are intended to act as a guide and tool for anticipating, recording and ameliorating any potential or actual impacts that may arise. In this regard, the CESMP will be designed to specify timing and technical aspects of optimising or reducing positive and negative impacts, respectively and will evolve as the construction progresses to ensure that its content reflects the current construction programme.

As a more practical approach, the specific requirements of the CESMP may be finalised in accordance with the developing stages of construction.

Managers and supervisors are responsible for providing assurance that their work unit is following the CESMP, including actions in the work method statements and conducting regular audits of the management system. A documented auditable trail will be established for verification purposes.

The content of this chapter will be used as a basic structure to provide a foundation upon which the development of a CESMP can be achieved. The following chapters describe the anticipated key contents of the full CESMP.

3.2 Mitigation Measures for Construction

This section outlines the mitigation measures for the potential environmental and social impacts in the construction phase identified through the SESIA process (SESIa Vol2).

Design phase mitigation measures have also been identified for consideration during the detailed design of the NOOR Boudour 20 MW PV Project's various facilities. Typically, the recommendations involve the use of pollution control technologies to minimise the environmental and social impacts.

The activities and measures suggested in these tables are for general working practices and typical working activities and conditions during the construction phase of the proposed project. These mitigation measures have been developed in accordance with Good International Industry Practice (GIIP).

The table below outlines the following information:

- Environmental and Social Aspects;
- Details of required Mitigation measures;
- Parties responsible for implementations/Monitoring;
- Implementation Timetable/Costs;
- Initial impact significance, and
- Anticipated residual impact significance.

With regards to cost, it should be noted that the majority of the recommended mitigation measures relate to integrating appropriate management strategies and work practices. Therefore, few of the proposed mitigation strategies require the purchase of additional materials or the construction of additional structures that have not been already integrated in the design and operation activities.

The cost of the mitigation measures, which require the services of 3rd parties, can only be estimated once the EPC/O&M has negotiated specific contracts with local service providers.

However, wherever possible, estimates have been provided for information purposes only. The costs for the implementation of the mitigation measures are part of the overall project costs.

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during the construction and operation phases of the project. The monitoring activities will also be designed to evaluate the project's compliance against environmental and social guidelines.

Environmental and social monitoring for the construction and operational phases is discussed in Chapter 6. Monitoring measures will be included in the CESMP.

3.2.1 Air Quality

Table 3-1 Air quality mitigation measures – construction phase

Issue	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Dust Generation due to site preparation and site activities	Minor to Moderate	Site preparation and levelling will be undertaken during periods of low winds (<15 km/h).	EPC	As soon as the works start and throughout construction period..	Minor
		Material stockpiles of dusty materials higher than 5 metres will be avoided where possible, with dust suppression sprays being utilised on any piles during periods where the wind speed exceeds 15km/h. Alternatively, stockpiles of dusty materials can be covered.			
		Adding to stockpiles of dusty materials will be stopped when high winds are present (15 km/h).			
		Dusty material stockpiles will be located only onsite and away from the site boundaries and be effectively contained			
		Where sand and other dusty materials are transported to site, trucks will not be overloaded and will be appropriately covered / sheeted to avoid losses en-route.			
		Powdery materials (e.g. cements) will be stored and transported in sealed containers			
		No burning of wastes or other materials will be allowed on site through the construction phase			
		Undertake daily visual assessment of dust levels and take actions (dust suppression) to reduce emissions, when these are identified as excessive.			
		Transport of uncovered dusty loads (materials and waste) is strictly forbidden.			
Gaseous and Particulate	Minor to Moderate	Onsite/offsite speed limits are included in the Traffic and Road Safety Section of this SESIA. Besides road safety, these limits will contribute to reduce exhaust gases resulting from traffic movements.	EPC	As soon as the works start and throughout construction period..	Minor

Issue	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Emissions from Vehicles		Efficiently manage deliveries of equipment/plant to the site, to reduce the number of trips			
		Minimise exhaust fumes and particulates 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 worthiness and when deemed inadequate will not be permitted to enter the site.			
VOCs and other Fugitive Emissions	Minor to Moderate	Hazardous materials stored and used on site with potential gas emissions (e.g. Volatile Organic Compounds) will be located in well-ventilated, secure low-risk areas.	EPC	As soon as the works start and throughout construction period.	Negligible
		Fires and material burning is prohibited on the Project site.			
General	Minor	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	As soon as the works start and throughout construction period.	Negligible

3.2.2 Noise and Vibration

Table 3-2 Noise and Vibration mitigation measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Construction Noise and vibration	Moderate to Major	Diesel compression equipment or generators will be equipped with effective silencers when necessary	EPC	As soon as the works start and throughout construction period.	Minor to Moderate
		Electrically powered equipment will be preferred, where practical, to mechanically powered alternatives. All mechanically powered equipment will also be fitted with suitable silencers when necessary.			

Impact/Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		Items of plant on site operating intermittently will be shut down in the intervening periods between uses.			
		Construction employees will, at all times, carry out all work in such a manner as to keep any disturbance from noise and vibration to a minimum.			
		Where appropriate, noise barriers /attenuation to be employed (e.g. for generators) to ensure that the maximum noise level at 1 m distance from a single source will not exceed 85 dB(A).			
		Where noise levels exceed 85dB(A) for an 8-hour time-weighted average, hearing protection devices shall be provided to personnel on-site. No unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C)			
Vehicle Noise	Moderate to Major	Vehicles will be equipped with effective silencers when necessary and switched off when are not in motion for more than 2 minutes	EPC	As soon as the operation start and throughout operation period..	Minor
		Deliveries of fuel and materials and removals of waste are to be undertaken during day hours, when possible.			
		All vehicles will be adequately maintained in order to minimise sound emissions.			
		Onsite/offsite speed limits are included in the Traffic and Road Safety Section of this SESIA. Besides road safety, these limits will contribute to reduce noise levels resulting from traffic movements particularly in residential areas without bypass road. These limits will be included in the Traffic Management Plan that will be prepared by the EPC prior to the construction works.			

3.2.3 Soil and Groundwater Protection

Table 3-3 Soil mitigation measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
Spillage and leakage	Moderate	Chemicals, fuels, lubricants and paints will be stored in dedicated locations on impermeable surfaces to prevent leakage into the ground and contained inside a secondary bund (110% of largest container). Additional mitigation measures are included in the Non-hazardous Waste and Hazardous Materials section.	EPC	As soon as the works start and throughout construction period. Plans to be prepared before the construction works start.	Minor
		Permanent/temporary storage areas will be designed and located considering potential ground contamination risks. Runoff will be prevented from entering areas where hazardous materials are stored, handled or transferred. If runoff can enter potentially contaminated areas, a dedicated drainage system will direct the run off to dedicated tanks to avoid impacts to soils and groundwater. The fluids in these tanks will be collected by licensed operators and managed as Hazardous wastewater.			
		Hazardous materials storage areas will be positioned away from major transport corridors and construction activities, in order to avoid potential collisions from vehicles or other machinery.			
		All chemicals will be handled in accordance with relevant instructions (MSDS).			
		Reduce quantity of chemicals and fuels on site to minimum practicable levels.			
		Regularly inspect drip collectors and containers for spills and leaks.			
		Provide spill kits at all areas where hazardous liquids are stored.			
		Develop and implement an Emergency preparedness and Response Plan, to immediately remediate the affected area in the event of a spill or leakage of chemicals, fuels, paints, and any hazardous material.			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
		Develop a Vehicle Maintenance Plan			
		Washing of equipment, machinery, and vehicles will not be permitted on site and will only be carried out in adequate premises.			
		Vehicle maintenance will not be undertaken in the project site and will be carried out only in offsite permitted premises			
		If vehicles and machinery are too large to be moved off site, or if it is not practicable to move the machinery for regular maintenance during the construction phase, then measures to protect the soils from spills and leaks during the cleaning/maintenance activity must be implemented (impermeable hard standing area with dedicated drainage system).			
Cross contamination of soils	Minor	Implement good housekeeping practices during construction activities including procedure and requirements for proper handling, storage, and transport of hazardous chemicals and waste	EPC	As soon as the works start and throughout construction period.	Negligible
		If contaminated soil is observed during construction activity, the identified contaminated soil will be excavated separately, and stored onsite in accordance with environmentally adequate measures for waste management, to avoid cross-contamination. A licensed operator will collect the contaminated soil for disposal.			
		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.			
Storage and waste management	Moderate	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 septic tanks will be properly maintained and stored in bunded areas equivalent to 110% of the storage capacity.	EPC	As soon as the works start and throughout construction period.	Minor
		Wherever possible, reduce the quantity of chemicals and fuel stored on site to minimum practical level. Infrequently used chemicals will be ordered just			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
		before they are needed.			
		All servicing, refuelling, stockpiles, waste disposal and storage areas will be located as far as possible from the run-off drainage system to reduce potential of pollution via spillage or windblown debris.			
		No hazardous material will be stockpiled.			
		Minimise the size and height of the stockpile as far as possible.			
Removal of natural site drainage / Soil erosion / Compaction	Moderate	<p>The storm water and drainage system will minimize and control surface run off and erosion. This will include the necessary sediment retaining systems.</p> <p>Minimise disturbed areas</p> <p>Road gradient will be avoided or minimized (contour and slopes) in order to reduce run-off induced erosion.</p> <p>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, compacted in a short time</p> <p>Disturbed areas will be stabilized to minimise further erosion.</p> <p>Runoff from the PV site will be free of excessive sediment and other constituents.</p>	EPC	As soon as the works start and throughout construction	Minor
Soil Compaction	Minor	Areas where visiting vehicles are allowed to circulate or park will be minimized and located only inside the project boundaries or access road.	EPC	As soon as the works start and throughout construction period.	Negligible

3.2.4 Wastewater Protection

Table 3-4 Wastewater mitigation measures – construction phase

Impact/Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Sanitary wastewater	Moderate	Develop a Wastewater Management Plan.	EPC	Before the start of construction works and throughout construction period	Negligible
		The reuse of wastewater on site is allowed if the following conditions are met: Wastewater is treated in the ONEE STEP; Analysis are provided to Masen showing that national and international water quality standards are met before its discharge into the environment; Authorizations are obtained from local authorities allowing the reuse of the water.	EPC	As soon as the works start and throughout construction period.	
		Chemical toilets/ septic tanks will be available at the construction site in sufficient number to attend the number of employees expected	EPC	As soon as the works start and throughout construction period.	
		No domestic wastewater will be discharged outside the chemical toilets / septic tanks			
		Wastewater from chemical toilets/ septic tanks will be collected by licensed operators. Each chemical toilets/ septic tank will generally be collected and emptied before its contents reach 80% of its capacity. The required authorizations and contracts shall be obtained by the EPC before the construction works start			
		Septic tanks must be completely emptied before demobilisation to avoid contamination to the site area. The demobilisation procedure will ensure that tanks are not destroyed or damaged during the removal process.			
		Storm Water Drainage	Moderate	Construct a specific area for site equipment maintenance (lubrication, oil and filter changes, repair work, etc.). A waterproof concrete area or impermeable geo-textile liner shall be provided with a tank or perimeter ditch to collect any liquid waste that will be stored in a dedicated septic tank and collected by a licensed operator. Maintenance of vehicles will only be undertaken offsite in appropriate premises.	

Impact/ Source	Potential Impact	Mitigation Measure	Respo nsibilit y	Implementation Schedule/Cost	Residual Impact
		<p>Hazardous materials storage areas will be roofed to prevent rainfall entering such areas and avoid polluted runoff</p> <p>Permanent/temporary storage areas will be designed and located considering potential ground contamination risks. Runoff will be prevented from entering areas where hazardous materials are stored, handled or transferred. If runoff can enter potentially contaminated areas, a dedicated drainage system will direct the run off to dedicated tanks to avoid impacts to soils and groundwater. The fluids in these tanks will be collected by licensed operators and managed as Hazardous wastewater.</p> <p>The stormwater drainage system will be able to accommodate and evacuate runoff so that it protects equipment during the worst case scenario as per local rain conditions and site area (funnelled to the channel) and soil and vegetation coverage conditions.</p> <p>The stormwater drainage system will need to consider the increase on speed of the water flow with a concrete channel and consider the flood conditions that can potentially be caused downstream (particularly at the discharge point) to avoid erosion.</p> <p>Adequate drainage systems will be provided to minimize and control infiltration. Sediment traps (i.e. filter fabric) will also be installed.</p> <p>The stormwater drainage system will include a system to retain garbage carried by the runoff water. The system will be at the project boundary and allow easy access to collect retained materials.</p> <p>The site will be fenced to ensure that no soil disturbance occurs outside of the site area. The areas requiring excavation/filling shall be clearly demarcated to ensure that the soil is no disturbed outside that area</p> <p>Internal roads/routes gradients should not exceed 15%</p> <p>The longitudinal slope of the road must be at least 3% in order to facilitate surface run-off of water and to avoid the build-up of sediment in gutters</p> <p>Reduce height of any built up embankments and slopes, if possible.</p> <p>Restore vegetation on slopes and embankments where possible and in areas away from electrical equipment to avoid fires</p>		As soon as the works start and throughout construction period	

Impact/ Source	Potential Impact	Mitigation Measure	Respo nsibilit y	Implementation Schedule/Cost	Residual Impact
		Construct gabions and concrete barriers for containment, use metal mesh and nets, drains and gutters in slopes for terrain stability			
		From the outset of work, plan, select and define areas for clearing, stripping and access routes in order to minimise unnecessary stripping of vegetation			
		Reduce cut-offs and embankments, if possible.			

3.2.5 Biodiversity

Table 3-5 Ecology and Biodiversity mitigation measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Habitat loss	Minor	The following Moroccan endemic species were identified within the project footprint: <i>Ononis hesperia</i> , <i>Teucrium chardonianum</i> , <i>Helianthemum canariense</i> , <i>Pentzia hesperidium</i> and <i>Zygophyllum waterlottii</i> . These endemic species will be selected for landscaping, where practical, at the end of construction phase, to mitigate site clearance. This can be undertaken by collection of seed within the Region for sowing on site If agreed by the relevant stakeholders, the project company will support efforts for habitat restoration in the region (project area or nearby protected areas).	EPC	As soon as the works start and throughout construction period.	Minor
		The laydown areas of the site will be minimised in size wherever possible, and preferably located in areas with little or no vegetation, wherever possible. Post construction restoration may include sowing seed from local endemic species.			
		The contractor will ensure that no encroachment to the nearby, adjacent land will occur.			
		All construction vehicles adhere to clearly defined transportation routes. Transport routes will be identified and training provided to emphasise the need to adhere to the designated routes in order to protect the existing vegetation and reduce encroachment on adjacent land, and reduce dust fall across the site.			
		Restoration will take place where colonization is difficult or in the interest of accelerating the process will be carried out in areas where vegetation will not be a safety concern during the operational phase. Particular effort will be placed in selection of endemic species and location of planting in order to successfully achieve 'in-kind' ecological restoration.			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		Restoration will only be conducted in sites away from electrical equipment to avoid future fire hazards. Therefore, planting will be limited to the herbaceous species that currently inhabit the site.			
Poaching/Hunting/Trade	Moderate	Hunting, falconry and fauna/flora trade will be strictly forbidden on site. Warning signs will be placed around the site.	EPC	As soon as the works start and throughout construction period.	Negligible to Minor
Direct mortality of fauna	Minor to Moderate	Prior to vegetation clearance, the EPC will engage an ecologist to advise on the removal of reptiles that may be found on the site. A procedure will be prepared including photographs of any species found on site during previous surveys and potentially present onsite, and a procedure to safely remove them from the site. The HSE team will ensure that all workers are trained on the procedure. Alternatively, an ecologist can be deployed onsite to implement a translocation programme. All removals of reptiles from the site will be documented with photographs.	EPC	As soon as the works start and throughout construction period. Plans to be prepared before the construction works start	Negligible to Minor
		Speed limit will be imposed across the construction site in order to avoid direct mortality of fauna. Speed limits onsite are specified on Chapter 14 Traffic.			
		Workers will be trained to report trapped herpetofauna or small mammals encountered inside any trenches. Trapped wildlife will be released on the natural areas outside the construction area. Photographs of captured / released fauna to be retained by HSE Manager for inspection during external audits.			
		Establish procedures for the occasion any species are found on the construction site including procedures for reporting, identification and potential relocation.			
		Fires will be forbidden onsite			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		<p>Induction training will include content to raise awareness of fauna that may be encountered, including reptiles and insects and protocols for alerting HSE Manager and avoiding harm to the fauna.</p> <p>In order to avoid the destruction of active nests/burrows, vegetation clearance works will be scheduled before the commencement of the breeding period (end-February 2017)</p> <p>Training on conservation awareness on bird nests and burrows will be undertaken onsite.</p> <p>Fencing design will minimise the permeability for fauna, where practical, as there is a direct mortality risk due to the operation of vehicles onsite during both construction and operations.</p>			
Displacement due to Human disturbance	Minor	<p>No floodlights will be directed to the natural environment around the project site by controlling light spill.</p> <p>No noisy activities will be undertaken outside the project site.</p>	EPC	As soon as site works are completed	Negligible to Minor

3.2.6 Non-hazardous Waste and Hazardous Materials

Table 3-6 Non-hazardous Waste and Hazardous Materials measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Solid waste volumes/quantities	Minor	Prepare a site-specific Waste Management Plan (WMP) including hazardous and non-hazardous waste. The plan will include training of staff.	EPC	Before the start of the construction works and throughout construction period.	Negligible
		Waste masonry should be re-used in the internal road construction and base fillings, when possible. Reasonable levels of utilization would be 60 to 80%	EPC	As soon as the works start and throughout construction period..	
		100% waste metal will be recycled			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		Ordering materials that have reusable packaging and/or in bulk can significantly reduce waste generated			
		Request suppliers to use minimal packaging.			
		Chemicals should be ordered in returnable drums.			
		"Buy-back" arrangements should be made with key suppliers so that any surplus chemicals or materials can be returned			
		Refillable containers will be used, where possible, for collection of solid and liquid wastes			
Housekeeping	Minor	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.	EPC	As soon as the works start and throughout construction period.	Minor
		A waste log will be kept onsite and will contain, at least, information about quantities, management solution (according to the waste management hierarchy described in the baseline section) types, operator, final disposal/destination, etc.)			
		Install adequate storage facilities for non-hazardous waste in designated areas to prevent waste from dispersing throughout the site			
		Include in the employees' inception training sections to increase their awareness of waste management protocols including proper handling and storage of waste, and emergency response and contingency plans.			
Waste Storage	Moderate	Food waste must be stored within a sealed metal or plastic skip or	EPC	As soon as the works	Minor

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		bin with self-closing lid, in order to prevent birds/vermin/pests gaining access		start and throughout construction period	
		Lightweight waste e.g. paper, cardboard, plastics: Must be stored within a skip sealed with a secured tarpaulin/netting sufficient to prevent any material being dispersed.			
		Heavy waste can be contained within an open skip, providing that segregation occurs effectively enough to remove all lightweight material that could be blown away.			
		Litter, bins for different types of waste (food waste, domestic waste) categories will be placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. Portable separate bins will also be placed at areas where works will be undertaken (interconnection point, power line, access road, etc.)			
		No underground waste containers will be deployed.			
		Waste containers will be clearly marked with appropriate labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, and securely attached. Wherever possible, chemicals will be kept in their original container			
		Waste generated during construction will only be transported off-site for disposal by an appropriately licensed vendor. This service provider will follow the proper protocols to ensure that all waste handling and disposal from the site is carried out according to the environmental regulations. A record for all waste streams will be kept onsite.			
		Regular training of site personnel in proper waste management and chemical handling procedures will be conducted at regular intervals.			
		Incineration/burning of wastes will not be allowed onsite			
Hazardous Materials	Moderate	Implement best practice and regulations procedures for adequate	EPC	As soon as the works	Negligible

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		handling, establishment of secure temporary storage areas, and disposal of waste by approved contractors.		start and throughout construction period.	
		Hazardous wastes will be disposed in an environmentally safe manner and by licensed hazardous waste operators			
		Materials will be separated into combustible and non-combustible, and all flammable substances must be kept away from sources of ignition.			
		No underground hazardous materials storage containers will be deployed. Storage of hazardous materials will be undertaken in a fenced dedicated area with a dedicated drainage system and roofed to prevent rainwater from entering the area. This hazardous materials storage area will be located considering potential risks (e.g. traffic accidents/collisions, fall of items, drainage system, etc.).			
		Provide bunds for storing hazardous materials containers. The bunds will have the capacity to contain 110% of the total volume of stored materials and will be protected from vehicles or other risks. This area must be placed away from any sources of ignition. Storage areas will have impermeable bases (this need to cover a wider area if needed to avoid soil contamination, e.g. refuelling areas will include an impermeable base that protects the ground where the vehicles will be parked), will be roofed and be equipped with spill kits.			
		Hazardous Materials containers will be clearly marked with appropriate warning labels to accurately describe their contents and detailed technical specifications and safety precautions. Labels will be waterproof, and securely attached. Wherever possible, hazardous materials will be kept in their original container			
		Hazardous materials will only be transported to/from the site by a licensed operator. This service provider will follow the proper protocols to ensure that all hazardous materials are transported and transferred according to the environmental regulations. A			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		record for all hazardous materials will be kept onsite.			
		Only trained personnel will be permitted to handle hazardous materials.			
Waste Facilities	Minor	Only licensed waste management facilities shall be used for the disposal of non-hazardous and hazardous wastes, respectively.	EPC	As soon as the works start and throughout construction period.	Negligible

3.2.7 Traffic and Road Safety

Table 3-7 Traffic and Road Safety mitigation measures – construction phase

Impact/ Source	Potential Impacts	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Increased traffic load along National Highway and other on Residential Areas	Negligible to Minor	Develop a Traffic Management Plan	EPC	Before the start of construction works and throughout construction period	Negligible
		Determine the designated access routes for delivery of equipment, road capacity, site entrance/exit points, etc.		As soon as the works start and throughout construction period.	
		Determine requirements for regular maintenance of vehicles (currently implemented) and use of manufacturer approved parts			
		Identify areas/spots sensitive to road safety issues and implement the necessary road safety measures, including residential areas where construction-related vehicles will pass through and at the interconnection point of the access road with the N1 road. Sensitive area will be communicated in advance to all drivers who will be provided with maps to ensure awareness. Special measures will need to be implemented if deemed necessary and appropriately communicated to drivers (e.g. lowers speed at a specific vulnerable spot in the route).			
		Manage delivery times of construction materials and equipment outside of peak hours.			
		Stagger key deliveries or periods of high vehicle movements to the site and reduce waiting times for drivers and over demand on receiving staff at the site.			
		Engines will be turned off while waiting in or outside the project site.			
		Staff will not be allowed to rest in vehicles to prevent excessive fuel wastage through the need to use air conditioning. Appropriate resting facilities will be provided at the landing for the drivers.			

Impact/ Source	Potential Impacts	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		<p>Drivers should be fully competent and authorised to drive HGVs and should receive specific road safety training</p> <p>All vehicles dedicated full time for the project and circulating on roads outside the project site (owned or used by the Project Company, EPC or subcontractors) will have a clearly visible unique identification number and a sign with a telephone number for any road user that identifies reckless driving behaviour to be able to report it. Reports will be documented as grievances and investigated.</p>			
Movement of vehicles	Moderate or Major	<p>The access road will be clearly signalled and compacted (as a minimum) or tarmacked. Dust suppression measures will be conducted where and when required.</p> <p>Determine the designated access routes for delivery of equipment, site entrance points, laydown areas and parking areas, etc.</p> <p>A 30km/h speed limit will be imposed across the construction site in order to avoid direct mortality of fauna. Vehicle speeds will be restricted to 20Km/h on haul roads and unpaved areas of the site</p> <p>Post designated routes and signs for directions and speed limits onsite and along the route to access the main road.</p> <p>Specific waiting areas will be designated in suitable locations. No waiting areas will be designate in proximity to residential units or settlements.</p> <p>Inspect access and local roads (including N1) and remove construction materials</p>	EPC	As soon as the works start and throughout construction period.	Minor

3.2.8 Archaeology and Heritage

Table 3-8 Archaeology and Heritage mitigation measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Destruction of unknown archaeological remains onsite	Moderate	Implement a Chance Find Procedure	EPC	Before works start and throughout construction period.	Negligible

3.2.9 Landscape and Visual

Table 3-9 Landscape and Visual mitigation measures – construction phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Topographical impacts to landscape	Minor	The heights of building, fences and any other tall structures will aim to minimise their visibility from the road. The grading of the site, will aim to match the surrounding topography and avoid any sudden changes in ground height between the project boundary and surrounding landscape.	EPC	As soon as the works start and throughout construction period.	Minor
Light Pollution	Moderate	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 light spill, glare and sky glow.	EPC	As soon as the works start and throughout construction period	Minor

3.2.10 Socioeconomic

Table 3-10 Socio-economic mitigation measures – construction phase

Impact/ Source	Initial Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
Employment and Accommodation	Minor Positive	The project will seek to employ local workers where these are willing and available and have the skills required for the task. Non-specialist job opportunities will be offered to the local residents prior to hiring of employees from other areas when possible. The employment of women and vulnerable groups will be specifically targeted when possible.	EPC	As soon as the works start and throughout construction period.	Moderate Positive
		Establish and implement a recruiting policy and ensure that the necessary measures to mitigate negative impacts associated to labour and working conditions are implemented (e.g. child and forced labour, exploitation, excessive overtime, insufficient wages, harassment, unsafe/unhygienic living and working conditions, etc.). Labour and working conditions will be aligned with IFC standards.			
		Workers' accommodation (if required, as it is not envisaged at this stage) will comply with IFC standards.			
		Strict controls over the provision of housing shall prevent any unplanned settlements from developing.			
		A Retrenchment Plan will be prepared for moving from construction to operation.			
Purchases	Minor Positive	The EPC will only engage with reputable suppliers that do not use force or child labour and are capable to comply with the environmental and social standards established by the IFC for suppliers.	EPC	As soon as the works start and throughout construction period.	Minor Positive
		The EPC will only engage with reputable subcontractors that do not use force or child labour and are capable to implement the applicable with environmental and social measures established in the CESMP and other documents applicable to the construction of the project.			
		Purchase of goods and services within the local/regional area will be prioritized.			

Impact/ Source	Initial Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
E&S and Health and Safety Risks	Negligible to minor Negative	If any activities that have not been assessed on the SESIA are proposed, potential E&S and HS risks to the communities will be assessed prior to their implementation or development.	EPC	As soon as the works start and throughout construction period.	Negligible to Minor Negative
		The site will be fenced and access to the construction site will be controlled by the security staff.			
Dissemination of Skills	Minor Positive	Local employees will receive E&S and OHS training to enhance the development of skills. A certificate outlining the contents of the training and signed by the management of the PV plant will be provided to employees upon finalisation of the employment contract.	EPC	As soon as the works start and throughout construction period.	Minor Positive
Conflict – workforce	Negligible to Minor Negative	Training for foreign employees will include information on the cultural background of the local population.	EPC	As soon as the works start and throughout construction period.	Negligible to Minor Negative
Security Provisions	Minor Negative	Develop and implement a Policy on Security and a Code of Conduct for Security Personnel.	EPC	Before the start of the construction works and throughout construction period	Minor Negative
		The security provider and personnel will adhere to international human right code of conduct. Only security personnel and companies with no human right violations will be employed.			
		Security personnel will undergo a dedicated training program which will include, as a minimum, information on how to exercise practices following GIIP (UN Voluntary Principles on Security and Human Rights), cultural background of the area and the workforce (main groups), and the way they should interact with local communities and workers.			

Impact/ Source	Initial Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impacts
Spread of Diseases	Negligible to Minor Negative	Prevention of diseases (including STDs) will be included in the training programme through toolbox talks or separate training sessions.	EPC	As soon as the works start and throughout construction period.	Negligible to Minor Negative
Informal Settlements / Encroachment	Negligible to Minor Negative	Unplanned settlements will be monitored by onsite security personnel and reported to the authorities.	EPC	As soon as the works start and throughout construction period.	Negligible Negative
		The local public security forces will be required to deal with encroachers as per national requirements.			

4 OPERATIONAL PHASE – MITIGATION MEASURES

4.1 Introduction

The environmental & social management plan for operational phase will serve as a tool for managing all environmental and social aspects related to the operation processes of the NOOR Boujdour 20 MW PV Project. The following chapter outlines the mitigation measures that will be required during the operational life of the proposed project.

Environmental and social monitoring for the construction and operational phases is discussed in Chapter 6. Monitoring measures will be included in the OESMP.

The OESMP will be drafted at least 3 months prior to the end of construction.

The OESMP will aim to establish mechanisms for the identification and implementation of environmental and social protection, mitigation, monitoring and other measures that will be taken during the operational phase of the proposed project, which will be in accordance with the procedures outlined in the Equator Principles, and the latest available versions of the IFC Performance Standards and guidelines.

The purpose of preparing and implementing the OESMP is to mitigate the potential adverse environmental and social impacts associated with the operation of the proposed project that have been identified within the SESIA Vol. 2 and then mitigating them or, at the least, offsetting them to acceptable levels.

The OESMP will also need to identify the monitoring objectives, specify the monitoring requirements and measures which will include all the parameters required to be monitored, methods, sampling locations, measurement frequency, detection limits and the threshold where corrective actions are required (see section below).

The OESMP, to be developed three months prior to Project Commercial Operation Date (PCOD), will be site specific and clearly state what issues are of specific relevance to the site. It will need to:

- Fulfil statutory requirements;
- Highlight the applicable environmental guidelines, regulations/the legislative context;
- Establish operational Environmental and Social Objectives;
- List the identified Environmental and Social Aspects addressed in the SESIA and identify other relevant aspects (e.g. receptors) that might have been developed since;

- Develop and implement relevant procedures;
- Develop a programme of continuous environmental and social improvement
- Clearly specify roles and responsibilities; and
- Highlight the procedures to be considered in the event of an environmental monitoring trigger level being breached or an unforeseen impact arising.

The OESMP will also identify the operational briefing and training requirements. Training can be provided in different forms such as induction sessions, training packs detailing good practices, or 'toolbox talks'.

In addition, it is important for the OESMP to accommodate changes in conditions and respond to any need for further assessment requirements. Changes are most likely to arise if

- A new environmental or social sensitivity is identified as a consequence of changing environmental and social conditions and more detailed survey work, or changes are introduced to the installations/development design.
- Documentation and communication protocols will also be required to be identified within the OESMP. Communication protocol will include, as a minimum:
 - Incident/emergency communication procedure.
 - Internal communications, external communications.
 - Management of external/internal inquiries.

International good practice of OESMP structure details that the following items will be included: (source: Practitioner – Environmental Management Plan, Best Practice Series, The Institute of Environmental Management and Assessment, Vol. 12, December 2008):

- Introduction – including summary of the project and aim of the OESMP;
- Project team roles and responsibilities;
- Summary of procedures – to be followed in the event of an emergency or breaching of OESMP measures;
- Consents and permissions – this will provide a record of the consents with which the project is taking place;
- Environmentally and Socially significant changes – detailed procedures to be followed if any significant changes are encountered once a project commences on the ground which would result in any changes to the OESMP;
- Register of site-specific environmental actions and social initiatives – this information, forming the core of the document, will be detailed for each action/initiative; a tabular format is often used to provide clarity and ease of reference. In addition, it will include (i) a programme that indicates when measures will be implemented and (ii) monitoring with indicators– to detail monitoring equipment/methods, schedule, frequency, guidelines and regulatory compliance;

- Liaison with stakeholders requirements;
- Register of variation – a tabular format document to record changes to procedures, design and mitigation and the implications of these changes and authorised personnel; and
- Technical schedule – to provide further details on measures, e.g. monitoring methodologies to be followed, maps delineating boundaries/areas applicable to certain measures.

4.2 Mitigation Measures for Operation

The following chapter provides mitigation measures for potential negative environmental and social impacts resulting from the operation of the Boujdour 20 MW PV Project.

The procedural measures during operation phase typically include the use of pollution control technologies to minimise the environmental impacts and community awareness and integration initiatives. The mitigation measures presented have been developed from Best Management Practices (BMP) source controls and engineering controls.

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during the operation phases of the project. The monitoring activities will also be designed to evaluate the project's compliance against environmental guidelines and community awareness initiatives.

For detailed mitigation measures, the relevant chapters for each environmental and social discipline in the SESIA Vol2 discuss specific mitigation and abatement techniques that must be adopted in order to minimise negative impacts.

The table below outlines the following information:

- Environmental and Social Aspects;
- Details of required Mitigation measures;
- Parties responsible for implementations/Monitoring;
- Implementation Timetable/Costs;
- Initial impact significance, and
- Anticipated residual impact significance.

With regards to cost, it should be noted that the majority of the recommended mitigation measures relate to integrating appropriate management strategies and work practices. Therefore, very few of the proposed mitigation strategies require the purchase of additional materials or the construction of additional structures that have not been already integrated in the design and operation activities.

The cost of the mitigation measures, which require the services of 3rd parties, can only be estimated once the O&M has negotiated specific contracts with local services.

However, wherever possible, estimates have been provided for informational purposes only. The costs for the implementation of the mitigation measures are part of the overall project costs.

Environmental and social monitoring for the construction and operational phases is discussed in Chapter 6. Monitoring measures will be included in the OESMP.

4.2.1 Air Quality

Table 4-1 Air Quality mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Air emission from vehicles	Negligible to Minor	Regular vehicle maintenance in dedicated maintenance areas.	O&M	As soon as the operation start and throughout operation period.	Negligible
		Third parties employed to provide services during the operation of the project which involves regular transport to site (e.g. waste or septic tanks collectors) will be required to use vehicles regularly maintained and in good condition and will be inspected before entering the site.			

4.2.2 Noise and Vibration

Table 4-2 Noise and Vibration mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Vehicle Noise	Minor to Moderate	Deliveries of fuel and materials and removals of waste are to be undertaken during daylight hours.	O&M	As soon as the operation start and throughout operation period.	Negligible
		All vehicles will be adequately maintained in order to minimise sound emissions			
Operational Noise	Minor	All machinery will be adequately maintained in order to minimise sound emissions All equipment specifications, will limit near field noise to 85 dB(A) at 1m. Where equipment and plant exceed 85 dB(A) at 1m under typical operating conditions, noise suppression techniques will be developed, these may include: silencers, noise insulation, noise attenuation barriers and housing for equipment. This will be determined and validated during performance testing	O&M	As soon as the operation start and throughout operation period.	Negligible

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		Onsite/offsite speed limits are included in the Traffic and Road Safety Section of this SESIA. Besides road safety, these limits will contribute to reduce noise levels resulting from traffic movements.			

4.2.3 Soil and Groundwater

Table 4-3 Soil and Groundwater mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Spillage	Moderate	Develop and implement a spill emergency and contingency plan	O&M	As soon as the operation start and throughout operation period.	Negligible
		Develop and implement training program 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.			
Storage and waste management	Moderate	Storage areas for domestic waste will be sealed, covered, leak tight flooring, and correct shelving / cabinets in order to prevent spillage and leakage into the ground.	O&M	As soon as the operation start and throughout operation period.	Negligible
		The storage tanks of fuels/chemicals/sewage will be properly maintained and stored within a bunded area of 110% of their storage capacity.			

4.2.4 Wastewater

Table 4-4 Wastewater mitigation measures – Operation phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Sanitary Wastewater Generation	Minor	Develop a Wastewater Management Plan.	O&M	Before the start of the operation activities and throughout operation period.	Negligible
		The reuse of wastewater on site is allowed if the following conditions are met: Wastewater is treated in the ONEE STEP; Analysis are provided to Masen showing that national and international water quality standards are met before its discharge into the environment; Authorizations are obtained from local authorities allowing the reuse of the water.	O&M	Throughout the operation period	
		Sanitary and domestic wastewater will only be discharged to chemical toilets/ septic tanks that will be available on the project site.	O&M	As soon as the operation start and throughout operation period.	
		The septic tanks will be sited away from vehicle traffic, in order to prevent any damage to the tanks.			
		Aboveground septic tanks will be bunded. The bund will be able to accommodate 110% of the capacity of the tank.			
		Underground septic tanks will be equipped with flow metres (to identify leaks) and overflow alarms.			
		Wastewater from the chemical toilets/ septic tanks will be collected by a licensed operator.			
		Storm Water	Minor	The site will be inspected regularly to ensure that no spills have occurred in	

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Drainage		areas that may be susceptible to storm water run off. Any and all spills must be immediately contained and cleaned, in order to prevent direct and indirect contamination to soils and water sources.		the operation start and throughout operation period.	
		The stormwater drainage system will include a system to retain garbage carried by the runoff. The system will be located before the project boundary and allow easy access to collect retained materials.			
		Runoff collection system will be inspected monthly and at the start of a rain event to ensure that no blockages could result with overflowing.			
		Waste storage areas have to be designed in such a way that rainwater is not in contact at any point with the waste.			
		The effectiveness of erosion prevention mitigation measures at rainwater discharge points will be verified after storm events to ensure that the adequacy of the design measures. Otherwise, these should be upgraded to meet storm water flows.			
		A re-vegetation programme on the slopes and embankments where storm water will be discharged shall be considered to reduce soil erosion. Only native species of shrubs native to the area shall be used in areas where dry vegetation do not pose a fire risk.			

4.2.5 Ecology and Biodiversity

Table 4-5 Ecology and Biodiversity mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Direct mortality of avifauna due to collision	Minor to Moderate	<p>If significant direct mortality is identified through the monitoring programme, bird deterrence measures will be implemented to avoid migratory birds from attempting to "land" on the plant.</p> <p>Since there are no comprehensive international studies for bird collision with PV panels, it is not possible to recommend a single technique to avoid collisions. The mitigation will follow the following two principles:</p> <p>The objective will be to avoid bird collisions, as this is the preferred approach in the mitigation hierarchy;</p> <p>The latest methods that are used internationally will be applied onsite. If specific guidance for PV plants is issued addressing this risk before the operational phase commences, it will be followed.</p> <p>Alternatively, the methods outlined in the guidelines to deter large flocks of birds from approaching airports (such as the UK Civil Aviation Authority 2014 Wildlife Hazard Management at Aerodromes CAP 772) will be applied.</p>	O&M	As soon as the operation start and throughout operation period.	Minor
Direct Mortality of Fauna	Minor	<p>Speed limit will be imposed across the construction site in order to avoid direct mortality of fauna. Speed limits onsite are specified on Chapter 14 Traffic.</p> <p>Vehicles will keep to the designated routes during transportation of goods in order to prevent unnecessary land encroachment, thus protecting the natural resources and reducing dust emissions</p>	O&M	As soon as the operation start and throughout operation period.	Negligible
Poaching/Hunting/Trade	Minor	Hunting, falconry and trade will be strictly forbidden on site. Notes on informative boards will be established.	O&M	As soon as the operation start and throughout operation period.	Negligible

4.2.6 Non-hazardous Waste and Hazardous Materials Management

Table 4-6 Non-hazardous waste and hazardous materials mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Solid waste volumes/quantities	Minor	Prepare a site-specific Waste Management Plan (WMP) including both hazardous and non hazardous waste. The plan will include training of staff.	O&M	Before the operation activities start and throughout operation period.	Negligible
		100% waste metal will be recycled	O&M	As soon as the operation start and throughout operation period.	
		Ordering materials that have reusable packaging and/or in bulk can to reduce waste generated			
		Request that suppliers use minimal packaging.			
		Chemicals should be ordered in returnable drums.			
		"Buy-back" arrangements should be made with key suppliers so that any surplus chemicals or materials can be returned			
		Refillable containers will be used, where possible, for collection of solid and liquid wastes			
Housekeeping	Minor	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, management solution (according to the waste management hierarchy described in the baseline section) types, operator, final disposal/destination, etc.)	O&M	As soon as the operation start and throughout operation period.	Minor
		Install adequate storage facilities for non-hazardous waste in designated areas to prevent waste from dispersing throughout the site.			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		Include in the inception training for employees sections to increase their awareness of waste management protocols including proper handling and storage of waste, and emergency response and contingency plans.			
Waste Storage	Minor	Food waste must be stored within a lidded metal or plastic skip or bin, in order to prevent vermin/pests gaining access.	O&M	As soon as the operation start and throughout operation period.	Negligible
		Lightweight waste e.g. paper, cardboard, plastics must be stored within a skip lidded with a secured tarpaulin/netting sufficient to prevent any material being dispersed.			
		For litter (food waste, domestic waste), bins for separate categories will be placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area.			
		Waste containers will be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, and securely attached. Wherever possible, chemicals will be kept in their original container			
		Waste generated during operation will only be transported off-site for disposal by an appropriately licensed vendor. This service provider will follow the proper protocols to ensure that all waste handling and disposal from the site is carried out according to the environmental regulations. A record for all streams of generated and collected waste will be kept onsite.			
		Regular training of site personnel in proper waste management and chemical handling procedures will be conducted at regular intervals.			
		Incineration/burning of wastes will not be allowed			
		Food waste must be stored within a lidded metal or plastic skip or bin, in order to prevent vermin/pests gaining access.			
Hazardous	Minor	Implement best practice and regulations procedures for adequate handling, establishment of secure temporary storage areas, and	O&M	As soon as the operation start and	Negligible

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Materials		disposal of waste by approved contractors.		throughout operation period.	e
		Hazardous wastes be disposed in an environmentally safe manner and by licensed hazardous waste operator			
		Materials will be separated into combustible and non-combustible, and all flammable substances must be kept away from sources of ignition.			
		No underground hazardous materials storage containers will be deployed. Storage of hazardous materials will be undertaken in a fenced dedicated area with a dedicated drainage system and roofed to prevent rainwater from entering the area. This hazardous materials storage area will be located considering potential risks (e.g. traffic accidents/collisions, fall of items, drainage system, etc.).			
		Provide bunds for storing hazardous materials containers. The bunds will have the capacity to contain 110% of the total volume of stored materials and will be protected from vehicles or other risks. This area must be placed away from any sources of ignition. Storage areas will have impermeable bases (this need to cover a wider area if needed to avoid soil contamination, e.g. refuelling areas will include an impermeable base that protects the ground where the vehicles will be parked), will be roofed and be equipped with spill kits.			
		Hazardous Materials containers will be clearly marked with appropriate warning labels to accurately describe their contents and detailed technical specifications and safety precautions. Labels will be waterproof, and securely attached. Wherever possible, hazardous materials will be kept in their original container			
		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 the environmental regulations. A record for all hazardous materials will be kept onsite.			
		Only trained personnel will be permitted to handle hazardous materials.			
Waste Facilities	Minor	Only licensed waste management facilities approved by	O&M	As soon as the	Negligibl

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
		national/regional authorities shall be used for the disposal of non-hazardous and hazardous wastes, respectively.		operation start and throughout operation period.	e

4.2.7 Traffic and Road Safety

Table 4-7 Traffic and Road Safety Mitigation Measures – Operational Phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Movement of vehicles along the site access road and onsite	Moderate	Determine the designated access routes for collecting and delivering, site entrance points, and parking areas, etc.	O&M	As soon as the operation start and throughout operation period.	X
		Determine requirements for regular maintenance of vehicles in line with national requirements and GIIP. Maintenance of vehicles will be undertaken in appropriate premises outside the project site.			
		Specific waiting areas will be designated in suitable locations.			
		The movement of vehicles along the access road will be minimized to essential operational and maintenance related activities.			
		All vehicles dedicated full time for the project and circulating on roads outside the project site (owned or used by the Project Company, EPC or subcontractors) will have a clearly visible unique identification number and a sign with a telephone number for any road user that identifies reckless driving behaviour to be able to report it.			
		Reports will be documented as grievances and investigated.			
		Speed limit to be established onsite (30 km).			

4.2.8 Archaeology and Cultural Heritage

It is not considered that any significant impacts upon archaeological or cultural resources could occur during the operational phase.

4.2.9 Landscape and Visual

Table 4-8 Landscape and Visual mitigation measures – construction/operational phase

Impact/ Source	Potential impact	Mitigation Measure	Responsibility	Implementation Schedule/Cost	Residual Impact
Light Pollution	Moderate	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.	Minor
		Lights required during night time will be directed onto the site, with a maximum position angle of 30° from vertical, therefore minimising any potential back spill and impacts at night to avoid disturbance to fauna.			
		Strictly monitor the light intensity, direction and duration. Design and install lighting such that light bulbs and reflectors are not visible from public viewing areas. Lighting should not cause reflected glare or sky glow.			

4.2.10 Socioeconomic

Table 4-9 Socioeconomic mitigation measures – operational phase

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/ Cost	Residual Impact
Employment and Accommodation	Minor Positive	The PV will seek to employ local workers where these are willing and available, and where appropriate. All non-specialist job opportunities will be offered to the local residents prior to hiring of employees from other areas. The employment of women and vulnerable groups will be specifically targeted when possible and monitored if possible.	O&M	As soon as the operation start and throughout operation period.	Minor Positive
Employment and Accommodation	Minor Positive	Establish and implement a recruiting policy and ensure that the necessary measures to mitigate negative impacts associated to labour and working conditions are implemented (e.g. child and forced labour, exploitation, excessive overtime, insufficient wages, harassment, unsafe/unhygienic living and working conditions, etc.). Labour and working conditions will be aligned with IFC standards.	O&M	As soon as the operation start and throughout operation period.	Minor Positive
Purchases	Minor Positive	The O&M will only engage with reputable suppliers that do not use force or child labour and are capable to comply with the environmental and social standards established by the IFC for suppliers.	O&M	As soon as the operation start and throughout operation period.	
		The O&M will only engage with reputable subcontractors that do not use force or child labour and are capable to implement the applicable with environmental and social measures established in the OESMP and other documents applicable to the construction of the project.			
		Purchase of goods and services by the workforce and of construction materials within the local/regional will be prioritized			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/ Cost	Residual Impact
E&S and OHS Risks	Negligible to Minor Negative	Address potential E&S and H&S risks to the communities and workers	O&M	As soon as the operation start and throughout operation period.	Negligible Negative
		The site will be fenced and access to the construction site will be controlled by the security staff			
Dissemination of Skills	Minor Positive	Local employees will receive E&S and OHS training to enhance the development of skills. A certificate outlining the contents of the training and signed by the management of the PV plant will be provided.	O&M	As soon as the operation start and throughout operation period.	
Conflict – workforce / local residents	Negligible to Minor Negative	Training for foreign workers will include information on the cultural background of the population.	O&M	As soon as the operation start and throughout operation period.	Negligible Negative
Security Provisions	Minor Negative	Develop and implement a Security Policy and a Code of Conduct for Security Personnel.	O&M	As soon as the operation start and throughout	Negligible to Minor Negative
		The security provider and personnel will adhere to international human right code of conduct. Only security personnel and companies with no human right violations will be employed.			

Impact/ Source	Potential Impact	Mitigation Measure	Responsibility	Implementation Schedule/ Cost	Residual Impact
		Security personnel will undergo a dedicated training program which will include, as a minimum, information on how to exercise practices following GIIP (UN Voluntary Principles on Security and Human Rights), cultural background of the area and the workforce (main groups), the way they should interact with local communities and workers.		† operation period.	
Spread of Diseases	Negligible to Minor Negative	Prevention of diseases (including STDs) will be included in the training programme.	O&M	As soon as the operation start and throughout operation period.	Negligible Negative

5 DECOMMISSIONING PHASE – MITIGATION MEASURES

With regards to the decommissioning phase, it should be noted that the project will be handed over to MASEN at the end of the 25-year PPA period. Consequently, the responsibilities for the decommissioning of the plant will not fall under the responsibility of ACWA Power.

Considering that decommissioning will occur beyond 25 years from the operation of the plant, the management plans, regulatory requirements and methodologies should be revised to ensure applicability with the industrial standard practice at the time of decommissioning.

Consequently, the decommissioning contractor will draft a DESMP (Decommissioning Environmental and Social Management Plan) that will include the measures and the proposed roles, responsibilities and monitoring activities that should be implemented during this phase. The DESMP will consider the applicable mitigation measures included in the CESMP and the OESMP.

6 ENVIRONMENTAL & SOCIAL MONITORING PLAN

The objective of an environmental and social monitoring plan (Monitoring Plan) is to establish the indicators to assess the overall performance and effectiveness of the management program (CESMP/OESMP). A Monitoring Plan has the underlying objective of ensuring that the intended environmental and social mitigation is effective and that negative impacts are being avoided/minimised and positive impacts maximised. The Monitoring Plan will aid management in redefining the objectives and where necessary, re-allocate the budget for implementing pollution control systems, employees' awareness and training programs, implementing pollution prevention opportunities etc. The broad objectives of the Monitoring Plan is:

- To evaluate the performance of mitigation measures proposed in the ESMP;
- To evaluate the adequacy of Environmental and Social Assessment;
- To suggest ongoing improvements in the management plan based on the monitoring and to devise fresh monitoring on the basis of the improved ESMP;
- To enhance environmental quality through proper implementation of suggested mitigation measures; and
- To prove compliance with regulatory guidelines and standards.

The detailed monitoring plan will be developed as part of the CESMP/OESMP. The IFC's General EHS Guidelines (2007) identifies the typical monitoring parameters, and the

frequency for monitoring. The latest available version of these guidelines /requirements will be considered while preparing a project-specific monitoring plan.

At the construction phase the monitoring plan will be prepared by the EPC and approved by the regulator. At the operational phase the monitoring plan will be prepared by the O&M and approved by the regulator. The implementation of the monitoring will be done by the initiating party, however auditing from the regulator will also occur on an ad-hoc basis.

Monitoring data will be analysed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken.

A general monitoring plan for the proposed Project is also suggested in the following sections. It is suggested to incorporate these in individual monitoring plans developed during construction and operation phase.

The SESIA in conjunction with the applicable regulations requires that these environmental parameters be monitored.

Benchmarks, which are the IFC EHS and national regulatory allowable parameters and the collected baseline data during the SESIA period (include in the SESIA Vol. 2) will be used for the evaluation of the monitoring activities.

As some issues may temporarily arise, for example a spill, then additional monitoring may be required until the issue is closed out.

All monitoring results will be recorded in the site Monitoring Register.

Based on the findings of the SESIA, the following parameters will be monitored. It should be noted that this table is a summary only, and the details of the methods, parameters and frequencies are provided in the subsequent discussion.

Table 6-1 Construction and Operational Phase Monitoring Activities

Subject to monitor	Construction	Operation
Ambient Air Quality (Dust/Exhaust)	✓	
Noise	✓	
Liquid and Solid Waste Management	✓	✓
Hazardous Materials	✓	✓
Storm Water Discharge and Erosion	✓	✓
Soil/Groundwater Quality	✓	✓
Ecological Status	✓	✓
Traffic Movements On/Off-Site	✓	
Housekeeping	✓	
Recruitment of Local Population/Women	✓	✓

Subject to monitor	Construction	Operation
Complaints Regarding Environmental and Social Issues	✓	✓
Incidents / NCRs	✓	✓

6.1 Framework Monitoring Plan

The following table outlines the parameters that, as a minimum, need to be monitored for the project. It includes monitoring that was undertaken at the SESIA stage and monitoring that is considered necessary as a result of the findings of the SESIA for the construction and operational phases of the project.

Additional frequency, parameters or locations might be monitored if new activities that were not covered in the SESIA are implemented onsite, or following emergency situations, incidents (e.g. spills) or requests from stakeholders.

Table 6-2 Framework Monitoring Plan

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Construction						
Air quality - PM ₁₀ PM _{2.5}	Site boundary	Air filters or dust collectors	Weekly during site preparation activities	Dust from vehicles and earthworks	To be determined by the EPC	EPC
Air Quality - Exhausts	Equipment exhausts	Visual inspection of the smoke (follow testing equipment specifications for use)	Daily Inspections	If there is visible dark smoke, the equipment will be sent for maintenance or replaced	Not applicable	EPC/ Subcontractors
Air Quality – Exhausts	Vehicles entering to the site	Visual inspection of the smoke (follow testing equipment specifications for use)	Always	If there is visible dark smoke, the vehicles will not enter the site	Not applicable	EPC/ Subcontractors
Noise	Inside the Project Site and at Sensitive Receptors (if any)	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly during site preparation and construction of foundations. Monthly during the rest of construction.	Construction activities increase noise levels (nuisance, disturb fauna, work hazard)	To be covered by the EPC (indicative cost noise meter 2000-5000 MD)	EPC
Waste management -	-	Waste log quantities and types of solid waste reuse, recycling and disposal. Include an indication if solid waste disposal has met intended construction phase recycling, recovery	Bi-weekly	Monitor compliance with waste management targets	Not applicable	EPC / subcontractors

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
		or reuse targets				
Waste management	-	Waste log- quantities and types of solid waste taken off site, the approved handler, and where the waste was disposed. Special attention will be given to hazardous waste.	Every time waste is taken offsite. Statistics compiled monthly.	Monitor compliance with off-site disposal by approved subcontractors	Not applicable	EPC / subcontractors
Wastewater management -	-	Waste log quantities and types septic tanks taken off site, the approved handler, and where the waste was disposed;	Every time sewage is taken offsite. Statistics compiled monthly.	Monitor compliance with off-site disposal by approved subcontractors	Not applicable	EPC / subcontractors
Underground Septic Tanks, identification of leakage -;	-	Waste log quantities of sewage flowing into underground septic tank compared to sewage being tankered off	Calculations undertaken monthly.	Potential leakage from underground septic tanks.	Not applicable	EPC / subcontractors
Waste Management -	Solid Waste Storage Areas	Visual inspection non-hazardous solid waste storage collection, storage and transfer areas or evidence of accidental releases and to verify that wastes are properly labelled and stored	Daily	Monitor compliance with waste storage targets	Not applicable	EPC

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Hazardous Materials -	Hazardous Materials storage collection, storage and transfer areas	Visual inspection	Daily	Monitor compliance with hazardous materials storage targets	Not applicable	EPC
Runoff system - blockages	Runoff system	Visual inspection	Weekly and in prevision of rain	Monitor compliance with overflowing	Not applicable	EPC
Runoff system - erosion prevention	Runoff system discharge points	Visual inspection	Weekly and following intense rain events	Monitor compliance with erosion objectives	Not applicable	EPC
Soil Quality	Hazardous materials and liquid and solid waste storage areas as a minimum	Sampling methodology as described in SESIA – Soil Quality section	Soil samples will be analysed following the release of hazardous substances onto the soil and the required restoration	Monitor compliance with ground pollution targets	Quotations to be obtained by the EPC.	EPC
Ecological status – presence of fauna and monitoring of nesting areas.	Along fence line boundary and buffer zone outside of PV site.	Visual inspection of habitat around the boundary of the site and photograph of any changes Document and monitor bird nests.	Monthly	To ensure that there is no loss of habitat or fauna outside of the plant boundary fence. Monitor any impacts on nests.	Not applicable	EPC
Ecological status - Additionally, detect caught/trapped fauna. Specialist is	Onsite	Visit trenches and other risk areas as part of the daily inspections to record any trapped animals	Daily	To avoid mortality of reptiles or small mammals	Not applicable	EPC

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
not required.						
Traffic and Transportation	Within the site and in the access road	Speed meter device	Weekly	Monitor compliance with speed limits	Cost of speed meter	EPC
Housekeeping	Site and access roads	Visual Inspection and collection	Onsite: Daily Access roads: Weekly	Monitor good construction housekeeping practices onsite and at access roads	Not applicable	EPC
Lighting	Boundaries of the site and at Sensitive Receptors	Visual assessment of directional lighting	Quarterly	Minimise light spill glare and sky-glow.	Not applicable.	EPC
Recruitment policy	Not applicable	Ratio local, regional, national and international employees. Rations of women employees.	Monthly	Provide employment for local population, minimize impact immigrant labour	Not applicable	EPC
Complaints register	Point of contact to be posted at the site entrance	Register complaints and how they are addressed	Every time there is a complaint	Record, address and follow up complaints	Not applicable	EPC

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Community Grievances	Isolated households and Edchera	HSE team members from the EPC and Project Company to visit the isolated houses in the area and the village of Edchera to capture potential grievances.	Monthly	Capture grievances from potentially vulnerable social receptors	Not applicable	Project Company and EPC
Emergency monitoring	Not applicable	Register emergencies and follow-up-remediation	Every time there is an emergency	Register emergencies and follow-up-remediation	To be covered by the EPC.	EPC
Operation						
Waste management -	-	Waste log estimated of quantities and types of solid waste reuse, recycling and disposal. Include an indication if solid waste disposal has met intended recycling, recovery or reuse targets	Quarterly	Monitor compliance with waste management targets	Not applicable	O&M / subcontractors
Waste management -	-	Waste log quantities and types of solid waste taken off site, the approved handler, and where the waste was disposed. Special attention will be given to hazardous waste.	Every time waste leaves the site. Statistics to be compiled quarterly.	Monitor compliance with off-site disposal by approved subcontractors	Not applicable	O&M / subcontractors
Waste management -	-	Waste log quantities and types septic tanks taken off	Monthly	Monitor compliance with off-site disposal	Not applicable	O&M / subcontractors

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
		site, the approved handler, and where the waste was disposed;		by approved subcontractors		
Waste Management -	Waste storage collection, storage and transfer areas	Visual inspection evidence of accidental releases and to verify that wastes are properly labelled and stored	Weekly	Monitor compliance with waste storage requirements	Not applicable	O&M
Hazardous Materials -	Hazardous Materials storage collection, storage and transfer areas	Visual inspection	Weekly	Monitor compliance with hazardous materials storage requirements	Not applicable	O&M
Runoff system - blockages	Runoff system	Visual inspection	Monthly and in prevision of rain	Monitor compliance with overflowing	Not applicable	O&M
Runoff system - erosion prevention mitigation measures	Runoff system discharge points	Visual inspection	Monthly	Monitor compliance with erosion objectives	Not applicable	O&M
Soil Quality	Hazardous materials and liquid and solid waste storage areas as a minimum	Sampling methodology as described in SESIA Soil Contamination chapter	If major accidental releases of pollutants take place, following remediation.	Monitor compliance with ground pollution targets	To be covered by the O&M or responsible subcontractor.	O&M / subcontractor
Ecological status – Presence of fauna. Specialist is not	Onsite, adjacent area (~200 m	Count of fauna species and identify nesting areas.	Monthly	Monitor ecology around the site	Not Applicable	O&M

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
required.	buffer)					
Ecological status – Identify bird or other fauna mortality, presence onsite and nesting onsite.	Onsite	Identification and count of fauna species and mortality onsite (if any).	Daily inspections All O&M workers to be trained to report carcasses onsite.	Monitor ecology around the site	Not Applicable	O&M
Lighting	Boundaries of the site	Visual assessment of directional lighting	Quarterly	Minimise light spill glare and sky-glow.	Not Applicable	O&M
Recruitment policy	Not applicable	Ratio local, regional, and Moroccan to expatriate labour and women to men	Quarterly	Provide employment for local population, minimize impact immigrant labour	Not Applicable	O&M
Complaints register	Point of contact to be posted at the site entrance	Register complaints and how they are addressed	Every time there is a complaint	Record, address and follow up complaints	Not Applicable	O&M
Community Grievances	Isolated households and Edchera	HSE team members from the O&M to visit the isolated houses in the area and the village of Edchera to capture potential grievances.	Quarterly	Capture grievances from potentially vulnerable social receptors	Not applicable	O&M

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Emergency monitoring	Not applicable	Register emergencies and follow-up-remediation	Every time there is an emergency	Register emergencies and follow-up-remediation	To be covered by the O&M .	O&M
Supervision (during the construction and operation phases)						
Independent Environmental Audits – Documentation	-	The auditors will review the environmental and social documentation kept at the facility, check the adequate implementation of the environmental procedures established in the ESMP (CESMP/OESMP) and documentary evidence of the application of the mitigation and monitoring measures stated in the SESIA, including the monitoring results	Quarterly (construction) Every six months (operation –first two years) Yearly (remaining operational phase)	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP.	Project Company to hire independent external auditors.	Project Company. The auditors will be required to have auditing experience in Morocco in renewable projects and auditing experience in projects aligned with IFC requirements

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Independent Environmental Audits — Site inspection	-	The auditors will visit the plant, to ensure that the environmental and social procedures are being adequately applied onsite.	Quarterly (construction) Every six months (operation –first two years) Yearly (remaining operational phase)	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP.	Project Company to hire independent external auditors.	Project Company. The Consultancy will be required to have auditing experience in Morocco in renewable projects and auditing experience in projects aligned with IFC requirements

7 EMERGENCY RESPONSE PLAN

Emergency Response Plans (ERP) plans are general action plans to tackle emergencies that may occur within a construction site. This will enable lives to be protected and damage to be kept to a minimum in an emergency at the construction site. Contingency plans also serve as a guide to the workers at the construction site to respond to emergencies in an orderly and effective manner. The ERP will be compliant with relevant IFC EHS Guidelines, including "Community Health & Safety" (i.e. the potential risks to the communities of an emergency situation will be specifically addressed and mitigated in the plan)

The most common environmental emergency in construction site is the oil and chemical spill, which is a potential cause for ground contamination. Spills of hazardous materials may include, among others:

- Fuel;
- Solvents;
- Lubricants;
- Resins and paints;
- Batteries;
- Waterproofing compounds;
- Adhesives;
- Clean-up materials (such as rags) contaminated with the items listed above;
- Drums, containers and tins with remains of hazardous substances, or
- Fluids inside PV panels or other components (e.g. inverter) that could get damaged.

The ERP must be prepared to cover any potential risks of accidents or spills and will be made known and available to all workers within the site. Key personnel will know and understand their responsibilities as well as coordinate their response actions with their subordinates.

This outline plan serves as a guideline to organize a prompt and effective response to oil spills affecting or likely to affect the area of the site and to ensure preparedness, response and reporting following an oil and chemical pollution incident. For this purpose the following specific actions are listed:

- Preparedness;
- Response; and
- Reporting.

7.1 Preparedness

Each individual will be introduced to their prospective Supervisor and Environment Coordinator within their introduction and training. Emergency services shall be notified as necessary by the Supervisor or Environment Coordinator.

A variety of equipment and personal protective equipment may be needed to support a chemical or oil spill incident response. A list of equipment is detailed below:

- Sand;
- Sand bags;
- Buckets and shovels;
- Storage containers; and
- Spill kit.

Sand stocks will be dry and buckets and shovels readily available at appropriate locations (i.e. areas where hazardous materials are stored, transferred, handled, etc.). Mechanical loading shovels, excavators and dump trucks may also be available for sand distribution and clean up. Storage containers for contaminated materials and earth will be bunded, located in the waste storage area, and labelled and treated as hazardous waste. All equipment will be stored in a safe location on site in close proximity to the storage and waste areas. This material is to be used to contain and clean up pollution/spills, care will be taken to dispose of any absorbent materials properly. The Supervisor and Environment Coordinator will keep stocks well maintained and replenished.

7.2 Response

In the event of a chemical or oil spill the following measures will be employed:

- Notify Supervisor or Environment Coordinator;
- Only attempt containment and clean-up operations of spilt substances when it can be performed safely;
- If spilled material is flammable, eliminate sources of ignition near spill area;
- Evacuate personnel and neighbours if they are at risk; and
- Secure the area and establish perimeter control at a safe distance from the spill.

7.2.1 Oil Spill Response Options

Remedial action to collect and remove all materials contaminated by the oil spillage or leakage event is to be taken immediately. The following actions are required:

- Any oil remaining on the ground is to be collected using oil spill kit. The spill is to be contained by the use of absorbent granules or pads and then the area of the spill is to be slowly reduced by enclosing the absorbent. The absorbent pads will be used to absorb the oil. Once all of the oil on the ground surface has been collected, the absorbent agents themselves are to be appropriately stored and disposed of as hazardous waste;
- All contaminated materials are to be handled as hazardous waste. The contaminated material shall be collected and appropriately stored. A licensed hazardous waste vendor will collect this;
- Contaminated materials will be stored in plastic barrels with tightly closing lids. These barrels are to be stored in a concrete lined bund if available. In absence of such a bund at the site as a short-term storage alternative, a double plastic lined bund will be used. Barrels will be placed on plastic or wooden pallets in the temporary double plastic lined bund and not directly on the plastic; and
- Conventional metal barrels will not be used, however if there are no alternatives the materials may be stored in them providing they are covered with plastic sheet tightly fastened to prevent Aeolian distribution and again are stored in an appropriately bunded location to prevent leakage will the barrels suffer corrosion.

All contaminated materials that cannot be collected and disposed are to be cleaned in-situ. This cleaning is to be undertaken by an approved service provider.

7.2.2 Chemical Spill Response Options

The following actions are to be taken in case of a chemical spill:

- Only attempt containment and clean-up operations of spilt substances when it can be performed safely;
- If spilled material is flammable, eliminate sources of ignition near spill area;
- Liquid spills – If the spill is liquid its path will be blocked or diverted and then soaked up using an absorbent material such as sand;
- Gaseous spills/leaks – A gaseous leak must be stopped at the source as soon as possible and will then disperse in the air;
- No spills will be rinsed away;
- Contaminated soils and clean-up materials from spills will be handled properly using personal protective equipment, stored in a suitable container that is then labelled and stored in the appropriate location for subsequent disposal;
- Any stockpiles of remnant contaminated materials will be covered;
- Contaminated materials will be stored in plastic barrels with tightly closing lids. These barrels are to be stored in a concrete lined bund if available. In absence of such a bund at the site as a short-term storage alternative, a double plastic lined bund will be used;

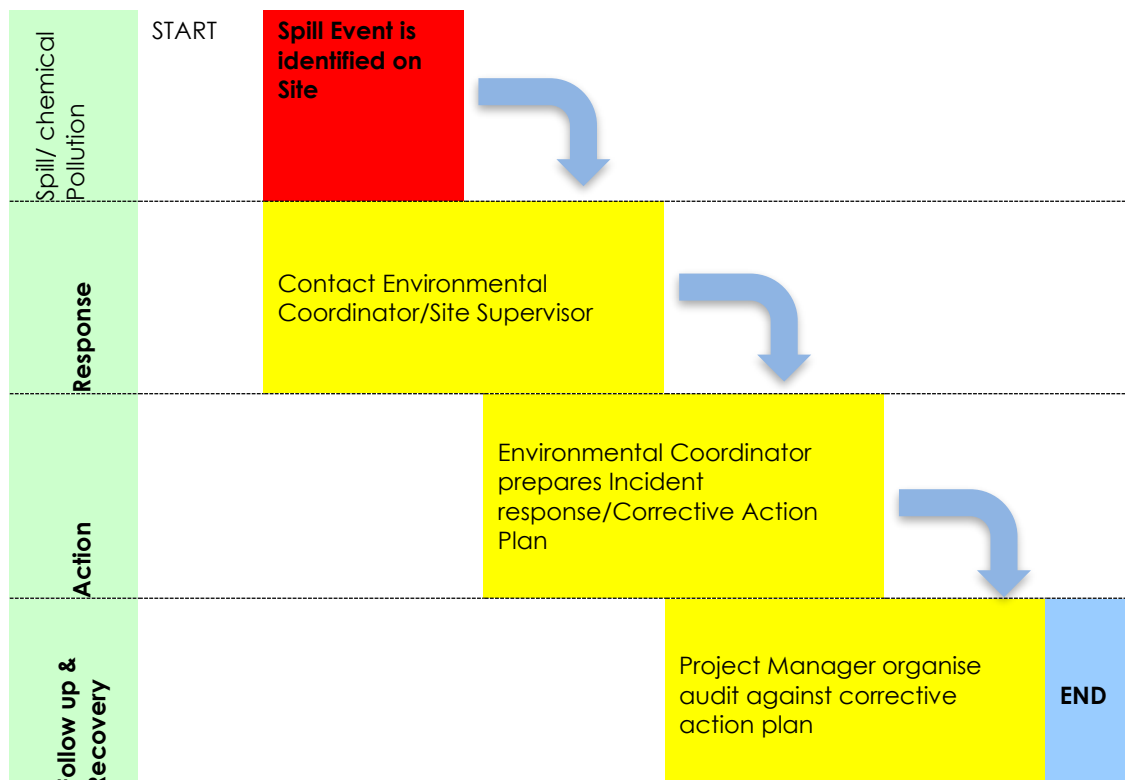
- Barrels will be placed on plastic or wooden pallets in the temporary double plastic lined bund and not directly on the plastic; and
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All contaminated materials that cannot be collected and disposed are to be cleaned in-situ. This cleaning is to be undertaken by an approved service provider.

7.3 Reporting

Any person that witnesses an incident must be able to report the incident to the responsible supervisor. The Environmental Coordinator shall be responsible for ensuring a report is filed describing the cause of the incident, action taken, the incident and recommended actions for ensuring the incident will not reoccur. A process flow that will be followed is shown in figure below.

Figure 7-1 Incident Response



8 RISK ASSESSMENT AND MANAGEMENT

The content of this chapter will be used as a basic requirement of risk assessment during construction and operation phase of the NOOR IV Ouarzazate PV Plant.

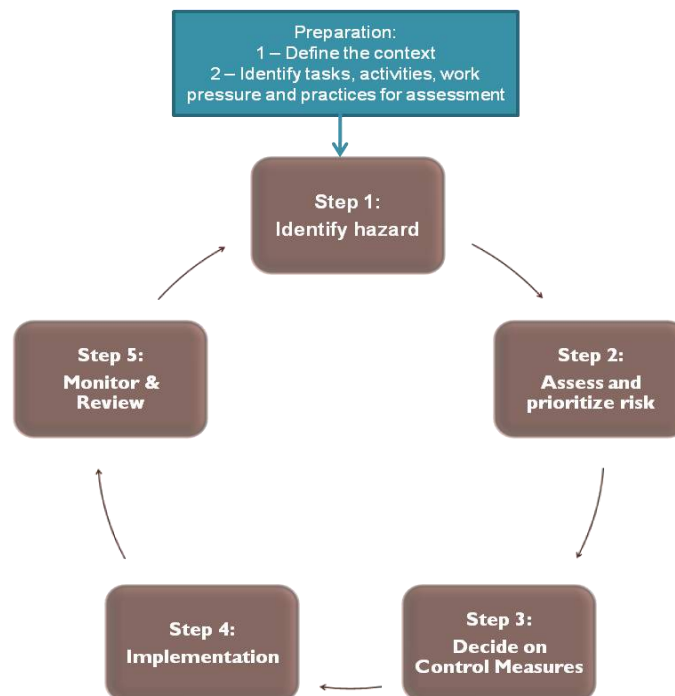
The risk assessment addresses the impacts to the environment that could occur as a result of mishaps or failures during the construction and operation phases of the project. These could be failure of equipment or material or processes. Examples of mishaps are;

- Spills;
- Leaks;
- Fires; and
- Explosions.

To account for, control and avoid such potential hazards, this section provides for;

- Identify the hazards;
- Assess and prioritise risks and hazards;
- Decide on control measures;
- Implement the control measures; and
- Monitor and Review.

Table 8-1 Process for Contractor and FM Company



These steps cover identification of the major hazards to people and the environment, analysis of the related risks, as well as implementing measures to control these risks to improve in case these measures fail.

Risk Assessment shall be carried out in the following circumstances;

- When there is a change in the workplace, e.g. new plant, equipment, etc.
- When there is a change in procedures and/or processes;
- Induction of new personnel;
- Following an incident;
- When there is a change in the legislations;
- Prior to start of work;
- At regular intervals; and
- When carrying out high risk activities.

8.1 Identification of Hazards

The first Risk Assessment Process step is to systematically identify the potential health, safety, and environmental hazards and effects of activities and operations. Hazards and effects need to be identified as early as possible and tracked through the life cycle of each activity. It is imperative that sensitive environmental components and conditions are identified and priority protection areas delineated.

Hazards can be identified and assessed in a number of ways:

- Using checklists;
- By referring to codes and standards;
- By undertaking more structured review techniques;
- Previous experience in the area, including that of third parties;
- General observation and HSE awareness;
- Audits;
- Accident / incident investigations;
- Drills and exercises; and
- EHS/Environmental meetings.

Action to be taken by individuals on identifying a hazard include –

- Eliminating or controlling the hazard immediately;
- Isolating the hazard to prevent an accident; and

- Reporting the hazard using the standard form.

It must be noted that all hazards are to be reported, including those eliminated or controlled immediately. Any situation where an Equipment Incident could cause injury or other significant loss under different circumstances will first be reported as a Near Miss.

Analysis of Risk

Every reported hazard is analysed to decide how serious it is, and this is done by using the risk matrix, based on the knowledge and experience of the person(s) conducting the analysis.

The risk matrix is used to analyse the probability of occurrence (frequency) and severity of consequence or potential consequence, producing a rating as a code. The code is then classified into four (4) risk groups: low, moderate, high, and extreme risk. The level of risk is indicative of how much effort and urgency must be put in to controlling the problem.

Table 8-2 Potential EHS Impact and Potential Incidence Consequences Rating

Area impacted (a)	Insignificant consequences (Score = 1)	Minor consequences (Score = 2)	Moderate consequences (Score = 3)	Major consequences (Score = 4)	Catastrophic consequences (Score = 5)
Atmosphere/Waste/Other	Temporary nuisance from noise, dust, odour, other air emissions, greenhouse gases, vibration, visual impact. Results in the generation of significant quantities of non-hazardous wastes.	Minor environmental impact due to contained release of pollutant (including odour, noise and dust) fire or explosion with no lasting detrimental effects. No outside assistance required. Significant use of water, fuels, and energy and other natural resources.	Creation of noise, odour, dust, other controlled/uncontrolled air emissions, greenhouse gases, vibration, and visual impact at significant nuisance level. Results in the generation of significant quantities of hazardous wastes.	Major environmental impact due to uncontained release, fire, or explosion with detrimental effects. Outside assistance required.	Catastrophic environmental impact due to uncontained release, fire or explosion with detrimental effects. Outside assistance required. Extensive chronic discharge of persistent hazardous pollutant. Results in the generation of significant quantities of intractable wastes.
Human health and safety	Minor injuries, which may require self-administered first-aid. Injured personnel can continue to perform normal duties.	Injuries requiring on-site treatment by medical practitioner. Personnel unable to continue to perform normal duties	Serious injuries requiring off-site treatment by a medical practitioner or immediate evacuation to hospital. Potential long term or permanent disabling effects.	Single fatality	Multiple fatalities

Table 8-3 Probability of Occurrence

Description	Likely Frequency		Probability
	Environment	Health and Safety	
Frequent	Continuous or will happen frequently	Occurs several times a year at location	5
Often	5-12 times per year	Occurs several times a year in similar industries	4
Likely	1-5 times per year	Has occurred at least once in Morocco	3
Possible	Once every 5 years	Has occurred in industry (World-wide)	2
Rare	Less than once every 5 years	Never encountered in the industry	1

Table 8-4 Risk Assessment Matrix

Probability	Consequence				
	Insignificant - 1	Minor - 2	Moderate - 3	Major - 4	Catastrophic - 5
Rare-1	1	2	3	4	5
Possible-2	2	4	6	8	10
Likely-3	3	6	9	12	15
Often-4	4	8	12	16	20
Frequent-5 Almost Certain	5	10	15	20	25
15 to 25	Extreme Risk Activity or industry will not proceed in current form				
8 to 12	High Risk Activity or industry will be modified to include remedial planning and action and be subject to detailed EHS Assessment				
4 to 6	Moderate Risk Activity or industry can operate subject to management and / or modification				
1 to 3	Low Risk No action required unless escalation of risk is possible.				

The Risk Assessment Matrix helps to focus attention on the risks that matter by considering the following two questions:

- What is the probability of that incident occurring?
- What is the likely consequence of that occurrence?
- Use of the Risk Assessment Matrix will:
 - Enhance appreciation of HSE risk and achieve "As Low As Reasonably Practicable" ALARP at all levels in all PP operations,
 - Assist in setting clear risk based strategic objectives,
 - Provide the basis for implementation of a risk based EHS Management System,
 - Provide a consistency in evaluating risk across all PP activities.

8.2 Deciding on Control Measures

A 'control' is anything used to manage risks e.g. procedures, work permits, Personal Protective Equipment (PPE), training, and on-site supervision.

Once the hazards of activities have been identified and assessed, controls must be put in place to manage the risks. It is also important to put steps in place to be able to recover from an unplanned hazard and return to normal operating conditions.

Information on hazards, effects, and the risks connected to these and requirements to limit ('control') them such as limits of safe operation are prepared and recorded by Management.

Table 8-5 Hazard Controlling Measures

Control	Use	Description and example
Preventive measures	To reduce the likelihood of hazards or to prevent or avoid the release of a hazards	Examples include guards or shields (coatings, inhibitors, shutdowns), separation (time and space), reduction in inventory, control of energy release (lower speeds, safety valves, different fuel sources) and administrative (procedures, warning, training, drills).
Improvement measures	To reduce or limit the consequences arising from a hazardous event or effect	<p>Active systems: Intended to detect and abate incidents, for example, gas, fire and smoke alarms, shutdowns, deluge</p> <p>Passive systems: Intended to guarantee the primary functions, for example, fire and blast walls, isolation, separation, protective devices, drain systems</p> <p>Operational (non physical) systems: Intended for emergency management, for example contingency plans, procedures,</p>

Control	Use	Description and example
		training, drills
Recovery Measures	Includes top events	All technical, operational and organizational measures which can – Reduce the likelihood that the first hazardous event or 'top event' will develop into further consequences. Provide life saving capabilities will the 'top event' develop further.

Any hazard and its associated risk are controlled by either reducing probability of occurrence or by reducing the effects. This may be achieved by one or more of the following steps shown in the figures below:

Table 8-6 Hazard and Safety Hierarchy of Controlling Hazards

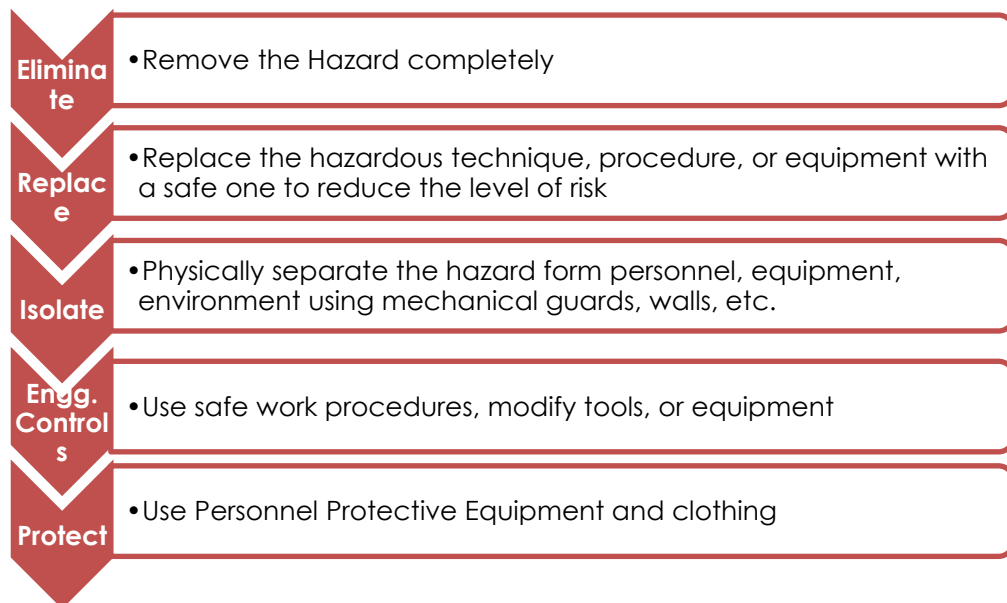


Table 8-7 Environmental hierarchy of Controlling Hazards

Avoidance	•Reduction at source
Reuse	•Reuse the material as much as possible
Recycle	•Segregate waste and recycle at facility or use third-party contractors
Recovery of energy	•Burn materials to recover energy
Treatment	•Treat the waste to reduce the harm done to the environment
Containment	•Define strategies on containment of spills, fires, explosions, etc.
Disposal	•Dispose as per EAD and International legislation
Remediation	•Define strategies and detailed information on spill-response and clean-up strategies

Note that these measures are listed from most effective to least effective. Efforts will be made to use the most effective possible measures to achieve results and several measures may be for each situation.

Once the control measures have been designed, the hazard can be re-analysed on the risk matrix to ensure that risk has been reduced to acceptable levels.

8.3 Implementing the Control Measures

- EPC/O&M shall inform all relevant personnel about the control measures being implemented;
- EPC/O&M shall provide adequate supervision to ensure that the new control measures are being implemented and used correctly;
- Any maintenance in relation to the control measures shall be defined in the Work Procedures;
- Risk will be reduced to ALARP. Consideration shall be given to;
 - Legal requirements;
 - International standards/guidelines;
 - Availability of resources;
 - Costs and benefits; and
 - The status of scientific and technical knowledge.

- The purpose of the implementation plan is to document how the chosen options will be implemented. These plans shall include;
 - Proposed actions;
 - Resource requirements;
 - Responsibilities;
 - Timing;
 - Performance measures; and
 - Reporting and monitoring requirements.

8.4 Monitor and Review

Monitoring and review is an on-going process and will not be considered as a one-off activity.

- Ongoing review is essential to ensure that everything planned is implemented. It is imperative that the Risk Management be considered a continuous process since the environment is always changing, e.g. the consequences of an event could change over time and/or the suitability or cost of mitigating the event;
- Monitoring and review also involves learning lessons from the Risk Management Process; and
- To compare the plans with the actual implementation provides a good performance measurement. Such results shall be incorporated into Performance Management, Measurement and Reporting System.

8.5 Record the Risk Management process

Procedures will be established and maintained to document the process and results of risk assessment and management. The recording shall include the following:

- Statutory requirements and codes applicable to the HSE aspects relevant to operations, products, and services;
- Identified hazards and effects in relation to HSE, Production, Services, Properties, and company reputation;
- Established risk criteria;
- Risks of consequence severity and likelihood of identified hazards; and
- Risk reduction measure