

NOORo II SPC Plant,  
Ouarzazate, Morocco

Environmental and Social Management Plan  
Guidelines (Volume 3)



ACWA Power

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## Table of Contents

<b>1 INTRODUCTION</b> .....	<b>1</b>
<b>2 PURPOSE OF AN ESMP</b> .....	<b>1</b>
2.1 Environmental and Social Policy.....	2
2.2 Objectives of Environmental and Social Management Plan.....	3
<b>3 CESMP REQUIREMENTS</b> .....	<b>4</b>
3.1 Environmental Management Staff: Roles and Responsibilities.....	5
3.2 Applicable Legislation, Policy and Environmental/Social Principles.....	7
3.3 Environmental/Social Requirements and Compliance.....	7
3.4 Site Description and Existing Conditions.....	7
3.5 Description of the Construction Works.....	8
3.6 Environmental/Social Training and Awareness Program.....	8
3.7 Identifying the Environmental and Social Issues.....	9
3.8 Monitoring, Recording, Inspection and Auditing Program.....	9
3.9 Communication.....	10
3.10 Document Control and Review.....	10
3.11 Management Structures and Procedures.....	10
3.12 Mitigation Measures, Regulations and Procedures.....	15
<b>4 OESMP REQUIREMENTS</b> .....	<b>15</b>
4.1 Operational Environmental and Social Management Plan (OESMP) Requirements	15
<b>5 MITIGATION MEASURES</b> .....	<b>18</b>
5.1 Air Quality and Emissions.....	19
5.2 Soil Protection.....	23
5.3 Noise and Vibration.....	26
5.4 Waste Management.....	27
5.5 Water Quality, Drainage and Hydrology.....	29
5.6 Terrestrial Ecology.....	32
5.7 Socio-Management.....	34

5.8	Traffic and Transport .....	42
5.9	Archaeology and Cultural Heritage .....	44
5.10	Consultation Process .....	44
<b>6</b>	<b>EMERGENCY RESPONSE PLAN .....</b>	<b>46</b>
<b>7</b>	<b>ENVIRONMENTAL MONITORING PLAN.....</b>	<b>50</b>
7.1	Monitoring Program for Construction Phase .....	52
7.2	Monitoring Program for Operation Phase.....	54
7.3	Monitoring Plan Template .....	57
<b>8</b>	<b>RISK ASSESSMENT AND MANAGEMENT .....</b>	<b>70</b>
8.1	Identification of Hazards .....	71
8.2	Deciding on Control Measures.....	75
8.3	Implementing the Control Measures .....	77
8.4	Monitor and Review .....	78
8.5	Record the Risk Management process .....	78

## Tables

Table 5-1	Air quality mitigation measures – construction phase .....	19
Table 5-2	Air quality mitigation measures – operational phase.....	22
Table 5-3	Soil mitigation measures – construction and operation phases .....	24
Table 5-4	Noise and Vibration mitigation measures – construction phase .....	26
Table 5-5	Noise and Vibration mitigation measures – operation phase.....	27
Table 5-6	Waste Management mitigation measures – construction and operation phases....	28
Table 5-7	Water quality mitigation measures – construction phase .....	29
Table 5-8	Water quality mitigation measures – operational phase.....	31
Table 5-9	Socio-Management mitigation measures – Construction phase .....	35
Table 5-10	Socio-Management mitigation measures – Operation phase .....	39
Table 5-11	Traffic mitigation measures – construction and operation phase .....	43
Table 7-1	Construction and Operational Phase Monitoring Activities.....	52
Table 7-2	Basic Monitoring Template .....	58

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Table 8-1 Potential EHS Impact and Potential Incidence Consequences Rating.....	73
Table 8-2 Probability of Occurrence .....	74
Table 8-3 Risk Assessment Matrix.....	74
Table 8-4 Hazard Controlling Measures .....	75
Table 8-5 Hazard and Safety Hierarchy of Controlling Hazards.....	76
Table 8-6 Environmental hierarchy of Controlling Hazards .....	77
 <b>Figures</b>	
Figure 6-1 Incident Response .....	50
Figure 8-1 Process for Contractor and FM Company .....	70

## List of Abbreviations

Abbreviation	Meaning
ACWA Power	Arabian Company for Water and Power
AGCE	Autorite Gouvernemental Charge de L'Environment
ALARP	As Low As Reasonably Practicable
AP	Action Plan
As	Arsenic
AAQS	Ambient Air Quality Standards
BAT	Best Available Techniques
BMP	Best Management Practice
BOO	Build, Own and Operate
BOP	Balance of Plant
BS	British Standards
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CBD	Convention on Biological Diversity
CCR	Central Control Room
Cd	Cadmium
CDSI	The Central Department of Statistics and Information
CESMP	Construction Environmental Management Plan
CEMS	Continuous Emission Monitoring System
CIA	The Central Intelligence Agency
CN	Cyanide
CNEIE	Committee National de EIE
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
Cr	Chromium
CREIE	Committee Regional de EIE
Cu	Copper
DA	Degraded Airshed
dB(A)	A-weighted decibels
dB( C )	C-weighted decibels
DCMS	Distributed Control and Monitoring System
EHS	Environmental, Health and Safety
ESMP	Environmental Management Plan
EMS	Environmental Management System
EPs	Equator Principles

EPC	Engineering, Procurement and Construction
EPFIs	The Equator Principle Financial Institutions
ESF	Electrical Special Facilities
FCF	Fuel Connection Facilities
FESIA	Framework Environmental and Social Impact Assessment
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
ha	Hectares
HCE	Heat Collector Element
HDI	Human Development Index
Hg	Mercury
HTF	Heat Transfer Fluid
IFC	International Finance Corporation
Laeq	A-weighted Equivalent Continuous Sound Level
Lamax	A-weighted Maximum Sound Level
Lcpeak	C-frequency weighted Peak Sound Pressure
LEL	Lowest Explosive Limit
LP	Low Pressure
MASEN	Moroccan Agency for Solar Energy
MEMEE	Moroccan Ministry of Energy, Mines, Water and Environment
Mm <sup>3</sup>	Million cubic meter
MSDS	Material Safety Data Sheet
MTA	Ministere de Tutelle de l'Activite
Ni	Nickel
NO <sub>x</sub>	Nitrogen Oxide
NO <sub>2</sub>	Nitrogen Dioxide
O <sub>2</sub>	Oxygen
OECD	The Organisation for Economic Co-operation and Development
OESMP	Operational Environmental Management Plan
O&M	Operation and Maintenance
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCOD	Project Commercial Operation Date
PM <sub>10</sub>	Particulate matter with an aerodynamic diameter of less than 10 micrometers.
PM <sub>2.5</sub>	Particulate matter with an aerodynamic diameter of less than 2.5

	micrometers.
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
RfP	Request for Proposal
SCA	Solar Collector Assembly
SCE	Solar Collector Element
Se	Selenium
SESIA	Specific Environmental and Social Impact Assessment
SF	Solar Field
SGS	Steam Generation System
SO <sub>2</sub>	Sulphur Dioxide
SPC	Solar Power Complex
TES	Thermal Energy Storage
TSS	Thermal Storage System
TOR	Terms of Reference
TPH	Total Petroleum Hydrocarbons
UNESCO	United Nations Educational, Scientific and Cultural Organization
VOC	Volatile Organic Compounds
WB	World Bank
WI	Work Instructions
WHO	World Health Organisation
WSC	Water-Steam Cycle
WTO	World Trade Organization
WWTP	Wastewater Treatment Plant
Zn	Zinc
5 Capitals	5 Capitals Environment and Management Consultancy



## 1 INTRODUCTION

This outline Environmental and Social Management Plan<sup>1</sup> has been prepared as part of the SESIA for the NOORo II Concentrated Solar Plant (CSP) project being sponsored by MASEN and developed by ACWA Power. The outline ESMP provided in this SESIA takes into account the mitigation measures provided in the FESIA's ESMP and is consistent with previous measures recommended.

This document is Volume 3 of the SESIA and provides detailed environmental and social actions and initiatives that will be developed within the contractors CESMP and the operators ESMS and OESMP, and will therefore be implemented during the construction and operational phases of the project. This plan is a requirement of the lending banks.

The information provided in the outlined ESMP, CESMP and OESMP (following chapters) are for use by the contractors and operators to develop their activity and project specific CESMP and OESMP. Therefore mention of any further management plans in the mitigation measures, is intended as a guide to the contractor and operator, that such documents will also need drafting by the Contractor and Operator. . The action items proposed in the ESMP are the minimum requirements that the contractors and operators must follow during construction and operation. The contractors and operators may develop their own EHS plans, provided that it meets or exceeds the specific requirements in these cleared documents. The purpose of this report is therefore to ensure that the contractors and operator have considered and addressed the preparation of all necessary documentations and procedures to ensure the successful implementation of the mitigation and monitoring strategies and to prevent any environmental and social impacts.

## 2 PURPOSE OF AN ESMP

The Environmental and Social Management Plan (ESMP) is a detailed set of measures and procedures designed to ensure the implementation of the mitigation measures, which have been outlined in the NOORo II SPC SESIA, 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, which will be responsible for implementing the procedures of the ESMP, therefore this structure includes roles and responsibilities of team members.

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<sup>1</sup> For the purposes of the World Bank OP 4.01, this is to be considered the ESMP - Environment and Social Management Plan”

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.

## 2.1 Environmental and Social Policy

### **World Bank Group Performance Standards (World Bank Safeguard Policies and IFC Performance Standards) and Equator Principles (EPs)**

Each IFI has its own environmental and social requirements to ensure the sustainability of its operations, and all of these requirements have been reviewed in the main SESIA report. The requirements of all the IFIs are relatively similar, as these are based on international best practice, however, the specific terminology used and the details of the reports required differ. It should be noted that all the specific requirements of each IFI cannot be incorporated into the ESMP, as some requirements are inconsistent. This was recognised by the IFIs in the Second High Level Forum on Aid Effectiveness (2005), which recognised harmonisation as one of the pillars to increase the effectiveness of aid. This is particularly relevant when a single project is co-financed by several IFIs. The requirements of all the lending banks have been taken into consideration for the SESIA documentation (including the ESMP). For the details of the ESMP, such as structure and format, and when there are incompatibilities between different requirements, the ~~WB Environmental Safeguard Policies and the IFC standards and guidelines~~ more stringent prevail.

Principle 4 of the Equator Principles covers the requirements for a Environmental and Social Management Plan for all Category A and Category B projects located in non-OECD countries or in OECD countries not designated as High-Income. The NOORo II SPC falls within Category A (Equator Principles) project, and is consistent with a Category A classification established by the lending banks and as noted previously, Morocco is a non-OECD country.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan:

*“For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS).”*

*Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards".*

The ESMP may range from a brief description of routine mitigation measures to a series of documents (e.g. resettlement action plan, indigenous peoples plan, emergency preparedness and response plan, decommissioning plan, etc.). The level of detail and complexity of the ESMP and the priority of the identified measures and actions will be commensurate with the project's potential impacts and risks. Consistent with Performance Standard 1, the internal Environmental and Social Management System (ESMS) will incorporate the following elements:

- (i) Environmental and Social Assessment;
- (ii) Management program;
- (iii) Organisational capacity;
- (iv) Training;
- (v) Community engagement;
- (vi) Monitoring; and
- (vii) Reporting.

Therefore, the ESMS will address the management of these impacts, risks, and corrective actions in compliance with applicable laws and regulations, and requirements of the latest available version of World Bank Group Performance Standards (World Bank Safeguard Policies and IFC Performance Standards) (WB/IFC).

As defined in the Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

*'The client will establish and maintain an Environmental and Social Management System (ESMS) appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts.'*

## **2.2 Objectives of Environmental and Social Management Plan**

The main objective of the ESMP is to ensure that the various adverse impacts associated with the project are properly mitigated and managed. The objective of the ESMP at various stages of the project planning and implementation are as follows:

### **Construction Phase**

- To prevent and reduce the negative environmental and social impacts of the project by implementation of mitigation measures; and
- To ensure that the provisions of the ESMP are strictly followed and implemented.

### **Operation Phase**

- To prevent deterioration of environmental and social components regarding air, water, soil, noise, community, society; and
- To improve the safety of the end users and communities.

## **3 CESMP REQUIREMENTS**

In order to ensure compliance with environmental legislation, both national and international, the Construction Environmental and Social Management Plan (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 and procedures

With regards to the decommissioning phase, it should be noted that the project is contracted under a 25 year BOOT scheme ((Build-Own-Operate-Transfer), therefore, the ownership of the SCP will be handed over to MASEN at the end of the 25 year period and consequently the responsibilities for the decommissioning of the plant will fall under the responsibility of MASEN.

Consequently, the decommissioning measures have only been discussed in general terms; and the proposed roles, responsibilities and monitoring activities that should be implemented by the decommissioning contractor during the decommissioning procedures have been taken from the construction phase mitigation measures and management plans. The following chapters are therefore also applicable to a decommissioning management plan.

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

The key benefits of a CESMP 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 associated with construction processes;
- Enable the identification of objectives and targets; and

- Provide a mechanism for monitoring and measuring of performance during construction.
- Provide the organisation structure and responsibility to manage the environmental and social issues.

The CESMP will be required to cover all construction components of the proposed Solar Power 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 NOORo II SPC 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 Solar Power project 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 can achieve this. 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 chapter describes the anticipated key contents of the full CESMP.

### **3.1 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.

The CESMP 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 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.

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

The contracts placed on the Contractors will need to clearly specify the environmental and social requirements expected of contractors working on the NOORo II SPC.

#### *Regulatory Authorities*

The Governmental Authority in Charge of the Environment (AGCE) and the Ministry supervising the Project Activities (MTA) have the regulatory responsibility to ensure the project is executed in accordance with relevant legislation, and best practice guidelines. Routine site inspections may be carried out by representative Officers from these agencies in order to conduct compliance audits, they may also provide further guidance on any observed environmental and social issues.

#### *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.

### **3.2 Applicable Legislation, Policy and Environmental/Social Principles**

The CESMP will need to include a section that:

- Specifies the overall policy statement for the project which may include aspects such as environmental induction training for all contractors, subcontractors and staff and other social, health and safety aspects.
- 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 laws and standards it is recommended that the project documents all applicable laws, regulations and standards. It is recommended that the Consortium develop a detailed 'Environmental, Social, Health and Safety (ESHS) Guide'. The guide will be updated annually, by a qualified professional and may be used as an audit protocol.

### **3.3 Environmental/Social Requirements and Compliance**

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

- Procedures for monitoring construction 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 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, cultural heritage (e.g. archaeological finds) and land access issues by the pastoralists.

### **3.4 Site Description and Existing Conditions**

The CESMP 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

- Access roads to the sites.

### **3.5 Description of the Construction Works**

The CESMP will provide a detailed programme of the construction activities of the NOORo II SPC 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; and
- Location of storage facilities for pipe sections, tools, equipment, chemicals etc.

### **3.6 Environmental/Social Training and Awareness Program**

Training and awareness programmes are an extremely important part of the CESMP 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:

- Induction training for general environmental and social awareness and the content of the CESMP;
- 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; and
- Induction training for construction site visitors.

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.

### **3.7 Identifying the Environmental and Social Issues**

A summary of the environmental/social issues and aspects will be included within the CESMP 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, which would include the categories for the environmental and social aspects outlined within this SESIA.

### **3.8 Monitoring, Recording, Inspection and Auditing Program**

Daily inspections of work areas by the Contractor Supervisor and weekly inspections as a minimum by the Environmental/Social Coordinator will also need to be conducted to identify any issues or non-compliance with the CESMP and to monitor the daily work practices.

A weekly 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 quarterly by an external, independent auditor in order to satisfy the Equator Principles requirements. This audit will take place in order to ensure the following:

- Compliance with all standards and regulatory requirements, CESMP 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.

### 3.9 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 have grievances aired, the site along the Solar Power boundary will need the provision of contact numbers on sign boards easily viewable in order for the local community to be able to contact the Project team.

The following minimum procedures shall be implemented:

- 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).

### 3.10 Document Control and Review

All documents relevant to the CESMP will be controlled onsite. The controlled documents include the CESMP 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.

### 3.11 Management Structures and Procedures

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

Table 3-1 offers a general representation of the likely general management structure and assigned responsibilities. The EPC must assign these responsibilities to the concerned personnel and incorporate the roles within the CESMP.

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

Role	Environmental Responsibilities
	<ul style="list-style-type: none"> <li>• Has been trained to identify environmental and social issues in order to convey any observed issues.</li> </ul>
<b>Construction Manager and Site Manager</b>	<ul style="list-style-type: none"> <li>• Responsible for overall environmental performance of the contractor and subcontractors;</li> <li>• Allocate sufficient resources to ensure compliance and effectiveness of CESMP;</li> <li>• Ensure sub-contractors have a copy of the CESMP and are aware of their environmental obligations;</li> <li>• Enforce compliance with CESMP and all legal regulations;</li> <li>• Communicate environmental and social aspects with PM and HSE managers;</li> <li>• Ensure Environmental training is undertaken;</li> <li>• Ensure community complaints are addressed;</li> <li>• Ensure that an Environmental and Social coordinator is assigned to the team; and</li> <li>• Maintain document registers for training, incidents, waste management and other related environmental reporting requirements.</li> </ul>

Role	Environmental Responsibilities
<b>Site Manager</b>	<p>In addition to the above:</p> <ul style="list-style-type: none"> <li>• Enforce environmental measures on lower levels;</li> <li>• Ensure compliance with CESMP directly on site;</li> <li>• Communicate environmental and social aspects with Environmental/Social coordinator and lower level management and personnel;</li> <li>• Ensure that he/she is knowledgeable of Environmental and Social issues; and</li> <li>• Report all incidents and non-compliance to PM and Environmental/Social coordinator.</li> </ul>
<b>Sub Contractor - Foreman</b>	<ul style="list-style-type: none"> <li>• Implement the requirements of the CESMP;</li> <li>• Allocate the necessary resources to ensure compliance and effectiveness of the CESMP;</li> <li>• Cooperate with the Environmental/Social Coordinate to ensure that site inspections and training are conducted;</li> <li>• Comply with the observations and requirements for corrective actions, which are issued by the inspector;</li> <li>• Report all incidents and non-compliance to Site manager;</li> <li>• Notify the Construction Manager/Site Manger of any changes on the program, construction method which may affect the environmental mitigation measures and ability to comply with the CESMP and regulations;</li> <li>• Maintain a register of incidents and waste management for future audits;</li> <li>• Maintain a register of complaints and correction actions</li> </ul>
<b>Construction Workers</b>	<ul style="list-style-type: none"> <li>• Undergo environmental and social awareness training;</li> <li>• Undergo Health and Safety awareness training (provided by an H&amp;S specialist in accordance with H&amp;S guidelines provided under a separate study)</li> <li>• Understand environmental procedures and environmental /social aspects relevant to activities;</li> </ul>

Role	Environmental Responsibilities
	<ul style="list-style-type: none"> <li data-bbox="427 276 1509 300">• In case of any accident or non-compliance report that immediately to foreman.</li> </ul>
<b>Visitors</b>	All visitors must comply with the CESMP, must receive an induction before entering the site and must comply with the instructions given by site staff.

### **3.12 Mitigation Measures, Regulations and Procedures**

This CESMP Requirements recommends mitigation measures for the identified potential environmental and social impacts at the construction phase.

Design phase mitigation measures have also been recommended for consideration during the detailed design of the Solar Power Plant's various facilities. Typically, the recommendations involve the use of pollution and discomfort control technologies to minimise the environmental and social impacts.

The mitigation measures presented have been developed from Best Management Practices (BMP) source controls and engineering controls.

**It will be noted that the measures outlined in the relevant chapter of the SESIA (Volume 1) will also be implemented in addition to the ones listed in the following sections.**

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.

## **4 OESMP REQUIREMENTS**

The environmental management plan for operational phase will serve as a general tool for managing all environmental aspects related to the operation processes of the NOORo II SPC. The following chapter provides an outline of the environmental management plans, which will be required during the operational life of the proposed project, and will be provided in draft format 3 months prior to the end of construction.

### **4.1 Operational Environmental and Social Management Plan (OESMP) Requirements**

The OESMP establishes mechanisms for the identification and implementation of environmental and social protection, mitigation, monitoring and institutional measures that will be taken during the operational phase of the proposed NOORo II Solar Power project, which will be in accordance with the procedures outlined in the Equator Principles and the latest available version of World Bank Group Performance Standards (World Bank Safeguard Policies and IFC Performance Standards). A table of the relevant standards has been included in Annex 1 of this report.

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 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 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;
- Highlight the agreed social and community mitigation actions and awareness programs
- Establish operational Environmental and Social Objectives;
- List the identified Environmental and Social Aspects addressed in the SESIA;
- 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

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

International good practice of ESMP 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 and consultation 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.

#### **4.1.1 Procedural Mitigation Measures, Regulations and Procedure**

The procedural measures during operation phase will be similar to the construction phase. Therefore, similar control techniques and mitigation measures will be in place to tackle such risks. These 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.

**It will also be noted that mitigation measures outlined in the SESIA (Volume 1) will also be implemented and included in the OESMP wherever necessary.**

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.

## 5 MITIGATION MEASURES

The following chapter provide mitigation measures for potential negative environmental impacts resulting from the construction and operation of the Solar Power Complex.

The activities and measures suggested in these tables are for general working practices and typical working activities at both the construction and operation phases of the proposed project.

For detailed mitigation measures the relevant chapters for each environmental parameter discusses specific mitigation and abatement techniques that have been adopted or will be adopted in order to further minimise negative impacts.

The Action Plan provides the following information:

- Environmental and Social Aspects,
- Details of required Mitigation measures,
- Parties responsible for implementations/Monitoring, and
- Implementation Timetable/Costs

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 EPC 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.

## 5.1 Air Quality and Emissions

The primary impacts on air quality associated with the construction and operation of the NOORo II Solar Power project are identified in Chapter 7 (SESIA Volume 1).

Air quality impacts from the operation of specific plant within the Solar Power Complex have been described in detail in Chapter 7, and the proposed abatement measures that will be implemented have been assessed in the residual impacts section. This chapter provides additional general mitigation measures for minimizing air emissions resulting from general working activities during the operation of the facility.

The following table provides the suggested mitigation measures for the construction and operation phase. However, the information provided in the respective impact assessment chapters will also be consulted for the preparation of the CESMP and OESMP.

**Table 5-1 Air quality mitigation measures – construction phase**

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Dust Generation</b>	Routinely inspect dust generation and recommend corrective actions.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.  Cost should be integrated into the contract  Fence cost is 100-200DH per meter.
	Vehicle speeds will be restricted to 15Km/h on haul roads and un-surfaced areas of the site.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	No burning of wastes will be allowed on site throughout the construction phase.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Regular wetting down of haul roads by water trucks.	EPC and Subcontractor	Several times a day	As soon as the works start and throughout construction period.
	Minimise vehicles and plant movements over unsealed roads. Establish paved/tarred access roads in order to minimise dust.	EPC and Subcontractor	Several times a day	As soon as the works start and throughout construction period.
	All vehicle loads will be covered by a tarpaulin sheet and will not be overloaded.	EPC and Subcontractor	Several times a day	As soon as the works start and throughout construction period.
	Any aggregate or dusty material stockpiles will be stored in enclosed structures. Alternatively temporary piles can be covered with impervious sheeting.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Avoid or minimize excavation activities on windy days.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Re-vegetate areas, as soon as they are permanently cleared of the temporary lay down.	EPC and Subcontractor	As needed	As soon as the works start and throughout construction period.
	Contractor vehicles are to access site on newly constructed tarmac road to NOORo CSP site to avoid impact on local traffic to Tasselmant	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	A second new road constructed for sole use by villagers travelling to Tasselmant will ensure that local traffic is segregated from contractors vehicles reducing risk of accident.	EPC and Subcontractor	N/A	As soon as the works start and throughout construction period.
<b>Exhaust Emissions</b>	Regular maintenance and inspection for all construction plant, vehicles and vessels (to be documented and checked by site supervisor's representative).	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period. Cost should be integrated

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
				into the contract.
	Routinely check equipment for smoky exhausts, and recommend appropriate corrective actions.	EPC and Subcontractor	Daily check	As soon as the works start and throughout construction period.
	Implement energy reduction practices in the operation of the vehicles and ensure that exhaust function correctly	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Smoky equipment to be given defect notices until repaired and approved for re-deployment by site supervisor.	EPC and Subcontractor	As needed	As soon as the works start and throughout construction period.
	Modern machinery, with adequate emission control equipment will be used.	EPC and Subcontractor	As applicable	As soon as the works start and throughout construction period.
	Suitable fuels will be used for construction machinery, vessels and vehicles (particularly low sulfur diesel).	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Trained personnel will operate machinery properly and efficiently.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Minimise idling of construction machinery, maximise efficiency of trip times.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Plant maintenance will be carried out off-site in appropriate premises, unless in emergency situations, to contain a spill.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
<b>Volatile Emissions, Odours</b>	Volatile fuels and chemicals will be in sealed containers. On site storage of large quantities of volatile fuels will be avoided, equally prolonged exposure to direct sun and heat will be avoided.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
				Cost should be integrated into the contract.
	Chemical storage areas will be purpose built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Pump out any stagnant waters from excavations.	EPC and Subcontractor	As needed	As soon as the works start and throughout construction period.

**Table 5-2 Air quality mitigation measures – operational phase**

Subject	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Dust and emissions from Solar Power facilities (i.e. Stack Emissions)</b>	Continuous stack emissions monitoring	O&M	Continuous	As soon as the operation start and throughout operation period.
	Ambient air quality monitoring program will be implemented		As required	
	If air quality monitoring reveals exceedences for NO <sub>2</sub> emissions, then NO <sub>2</sub> abatement technology should be considered for the boilers		As Applicable	Cost should be integrated into the operational budget.
	Containers with chemicals and fuels will be adequately stored in secure, covered, bunded areas. Storage quantities will be kept to the minimum needed for uninterrupted operation.		Daily	
	Empty containers will be disposed in dedicated waste storage areas.		Daily	
	Worker training will include material handling, equipment maintenance and good housekeeping practices.		N/A	
	Refer to Construction Phase Mitigation measures for additional recommendations.		N/A	

<b>Volatile emissions</b>	Develop a Leak and fire contingency plan. This is discussed further in Chapter 6. All chemical storage facilities and containers will be appropriately sealed and labelled. (HTF, Wastewater treatment Fluids)	O&M	N/A	As soon as the operation start and throughout operation period.  Cost should be integrated into the operational budget.  Cost of Sealed 205L Plastic Drum: 206USD  Cost of Sealed 205L Steel Drum: 289USD
	Fuels and chemicals will not be stored in direct sun and/or exposed to extreme heat.		N/A	
	Refuelling will be carried out in a controlled manner using appropriate equipment to minimise volatile emissions.		Daily	
<b>Indoor air quality</b>	Building design and construction will ensure adequate ventilation and cooling.		N/A	

## 5.2 Soil Protection

The main soil impact issues associated with the construction and operation activities of the proposed project are identified in Chapters 5 (SESIA Volume 1).

The following table provides the suggested general mitigation measures for the two project phases. Therefore, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the CESMP and OESMP.

**Table 5-3 Soil mitigation measures – construction and operation phases**

Subject	Mitigation measure (construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Soil	Develop and implement: <ul style="list-style-type: none"> <li>• Hazardous Materials Handling Plan;</li> <li>• Hazardous Waste Management Plan.</li> <li>• Waste management Plan Vehicle maintenance Plan</li> </ul>	EPC and Subcontractor. O&M	N/A	As soon as the works start and throughout construction period. Cost should be integrated into the contract. As soon as the operation start and throughout operation period. Cost should be integrated into the operational budget. Cost per Spill kit is 1000DH
	Develop a spill response plan.	EPC and Subcontractor. O&M	N/A	As soon as the works start and throughout construction period.
	Application of soil handling & removal practices (including vegetative cover), application of soil emplacement & storage practices, erosion control & treatment	EPC and Subcontractor. O&M	N/A	As soon as the works start and throughout construction period.
	Store chemicals, hazardous substances and waste only in purpose built areas/structures	EPC and Subcontractor. O&M	N/A	As soon as the works start and throughout construction period.
	Routinely inspect storage areas and all containers for any spills and leaks	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	Routinely inspect all equipment handling hazardous materials for leaks and spills.	EPC and Subcontractor.	Daily	As soon as the operation start and throughout



Subject	Mitigation measure (construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
		O&M		operation period.
	Spill kits will be readily available near refuelling stations, chemical storage areas and any potential spillage area. Back-up supplies will also be ensured.	EPC and Subcontractor. O&M	N/A	As soon as the operation start and throughout operation period.
	All chemicals will be handled in accordance with relevant instructions (MSDS)	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	Reduce quantity of chemicals and fuels on site to minimum practicable levels	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	Only personnel with adequate training will be allowed to handle fuel and chemicals	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	Adequate control measures must be taken to ensure that all servicing, refuelling, storage and waste disposal will be carried out in designated, sealed areas.	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	Ensure all workers are aware of their responsibilities to minimize soil pollution.	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.
	During operation of the plant, care should be taken to limit the land area footprint of the facility	EPC and Subcontractor. O&M	Daily	As soon as the operation start and throughout operation period.

### 5.3 Noise and Vibration

The main impacts from noise and vibration associated with the proposed project are identified in Chapters 8 (SESIA Volume 1).

The following two tables provide the suggested mitigation measures for the construction and operation phase. However, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the OESMP and CESMP.

**Table 5-4 Noise and Vibration mitigation measures – construction phase**

Subject	Mitigation measure (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Noise and vibration	Plan activities with the greatest potential to generate noise during the day.	EPC and Subcontractor	Daily	As soon as the works start and throughout construction period. Cost should be integrated into the contract
	Mufflers will be used on all noisy plant and vehicles. Silencers on generators.		Daily	
	Regularly maintain all plant, machinery and vehicles. Replace any broken parts immediately.		As needed	
	Ensure efficient operation of all plant and vehicles (speed limits should be adhered to).		Daily	
	Switch off the equipment and machineries when not in use i.e. 'no idling'		Daily	
	Provide personnel with hearing protection and advised of its proper use. Ensure adequate provision of PPE.		Daily	
	Monitor noise level at the site boundary to assess noise increase against baseline conditions and to ensure compliance with regulations.		Daily	
	Extremely noisy tasks will be conducted off-site if practicable.		Daily	
	Implement the noise-monitoring program. Ensure contingency plans are in place to deal with noise control if complains are received during		Daily	

	the construction phase.			
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**Table 5-5 Noise and Vibration mitigation measures – operation phase**

Subject	Mitigation measure (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Noise and vibration</b>	Site plant will be contained within insulated buildings with suitable noise controls.	Project Owner and O&M	N/A	As soon as the operation start and throughout operation period.  Cost should be integrated into the design operational budget
	Enclose fans, insulate ventilation pipes and use dampers.		N/A	
	Develop and implement a noise management plan that proposes detailed actions to mitigate against noise impacts.		N/A	
	Use buffers, such as walls and mounds to minimise noise transference.		N/A	
	Office buildings will include insulation against outside noise impacts.		N/A	
	Routinely monitor noise levels at the site boundary and within work spaces for compliance with the relevant standards.		Daily	
	Implement the noise monitoring program and Develop a contingency plan in the event noise complaints are raised.		Daily	
<i>Additional applicable mitigation measures are provided in the construction phase table.</i>				

#### 5.4 Waste Management

The main waste impacts associated with the construction and operation activities of the NOORo II SPC are identified in Chapters 9 (SESIA Volume 1).

The following table provides the suggested general mitigation measures for the two project phases. Therefore, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the CESMP and OESMP.

**Table 5-6 Waste Management mitigation measures – construction and operation phases**

Subject	Mitigation measure (construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Waste Management</b>	Prepare a site-specific Waste Management Plan (WMP). The plan will include training of staff.	EPC and Subcontractor. O&M	N/A	Before commencement of activities
	Materials will be purchased with minimum of packaging waste. "Buy-back" arrangements will be made with key suppliers so that any surplus chemicals or materials can be returned.		N/A	As soon as the works start and throughout construction period.
	Re-use or recycle construction waste such as wood and metal.		Daily	Cost should be integrated into the contract.
	Ensure appropriate disposal of empty containers (Hazardous Waste Management)		Daily	As soon as the operation start and throughout operation period.
	Ensure collection and disposal of putrescible waste		Daily	
	Waste collection and disposal will be carried out by licensed contractors to appropriate facilities.		As needed	Cost should be integrated into the operational budget
	A log will be kept to record the waste streams and volumes/weight of all wastes generated, treated and transported from the facility.		Daily	
	Introduce recycling initiatives. Including allowance in master planning and design phases for additional facilities.		Daily	
	Strictly prohibit littering and waste dumping to land or into waters.		Daily	
	Minimise the time and extent of waste stored on site.			
	Hazardous waste will be segregated from non-hazardous waste at the source. Hazardous wastes will be handled and stored in accordance with the relevant management plans.		Daily	
The design and maintenance of waste containers will conform to		N/A		

Subject	Mitigation measure (construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	local and international standards including their labelling			
	Liquid waste will be stored in tanks designed to international standards and placed in bunds with a capacity equal to 110% of the storage tank.		Daily	
	Flammable waste will be appropriately stored to prevent fire risk.		Daily	
	Auditing will be carried out to ensure that the waste management plan is implemented.		Monthly	

### 5.5 Water Quality, Drainage and Hydrology

Potential impacts on water quality associated with the construction and operation of the NOORo II SPC are identified in Chapters 6 and 10 (SESIA Volume 1).

The following two tables provide the suggested mitigation measures for the construction and operation phase. However, the information provided in the respective impact assessment chapters will also be consulted for the preparation of the CESMP.

**Table 5-7 Water quality mitigation measures – construction phase**

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Erosion</b>	Adequate drainage systems will be provided to minimize and control infiltration. Sediment traps (i.e. filter fabric) will also be installed.	EPC and Subcontractor	N/A	As soon as the works start and throughout construction period.  Cost should be integrated into the contract
	Road gradient will be minimized (contour and slopes) in order reduce run-off induced erosion and slope stabilisation.		N/A	
	Stockpiles will be located on flat and sealed areas.		N/A	

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Stockpiles will be covered/protected from wind and the height and slope limited, to minimise erosion during rainfall.		Daily	
	Regular inspection of the sedimentation/erosion controls will be regularly conducted.		After rain events	
	Disturbed areas will be stabilised to minimise further erosion.		Daily	
<b>Chemical use and storage</b>	Manage inorganic substances on surface to prevent groundwater contamination		Daily	
	Implement the Waste Management Plan		Daily	
	Quantities of on-site stored fuel and chemicals will be controlled to a minimum, in order to ensure uninterrupted work.		Daily	
	Temporary storage of fuels and chemicals will be in secure bunds. Bunds will have a capacity of 110% of the volume of the container.		N/A	
	Copies of the Material Safety Data Sheets (MSDS) will be kept in the bunded area and at the site office.		Daily	
	All site construction equipment will be daily inspected for leaks.		Daily	
	Vehicle maintenance will not be carried out on site. A spill kit and bucket will be included in each vehicle in the event of a breakdown resulting with leak/spills.		N/A	
	Staff will be trained in the use of the spill kits, and an emergency spill response team will be established.		N/A	
	Chemical handling and refuelling will be conducted over sealed grounds/designated areas, in a controlled by trained personnel.		Daily	
	Construction-phase Emergency Response Plan will be developed and implemented by training and providing the necessary equipment.		N/A	
<b>Wastewater and</b>	Washing of concrete ready-mix trucks will be carried out in designated areas so as to prevent soil and groundwater contamination.		Daily	

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Stormwater</b>	Mixing effluent streams – ground water, vehicle wash water, domestic grey water, sewage effluent etc., is prohibited and shall not be permitted anywhere on-site.		Daily	

**Table 5-8 Water quality mitigation measures – operational phase**

Subject	Mitigation measures (operational phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Wastewater discharge</b>	Conduct regular checking and monitoring of water quality and discharges to/from: <ul style="list-style-type: none"> <li>• Wastewater Treatment Plant;</li> <li>• Cooling water system;</li> <li>• Evaporating Ponds; and</li> <li>• Stormwater system.</li> </ul>	O&M	Weekly	As soon as the operation start and throughout operation period. Cost should be integrated into the design operational budget
	Sludge from treatment systems will be disposed in accordance with World Bank Group Performance Standards (World Bank Safeguard Policies and IFC Performance Standards) and national regulations.		As required	
	Liquid wastes and wastewater (containing hydrocarbons, lubricants, solvents, and descalants) will be appropriately disposed as described in the relevant chapters with regard to water quality and waste management.		As required	
	Maintain stormwater-handling systems and routinely monitor effluents		Daily/Weekly	
<b>Storage and use of chemicals, raw process materials</b>	Design wastewater collection system and location of chemical storage facilities to prevent impacts to water resources.		N/A	
	Storage of chemicals and other hazardous materials will be in adequately designed and securely banded structures.		N/A	
	Liquid storage tanks will be inspected and pressure tested for potential leaks.		As per design specifications	

Subject	Mitigation measures (operational phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
			on	
	<i>Additional applicable mitigation measures are provided in the previous table.</i>			
	All refueling areas will be on impervious surfaces with provision of spill kits.	Project owner and O&M		As soon as the operation start and throughout operation period. Cost should be integrated into the design operational budget. Irrigation system cost 100-150DH per meter
	Maintenance or washing of vehicles, and plant will carried out in dedicated areas with a wastewater drainage system.		N/A	
	Develop and Implement the Emergency Response Plan.		N/A	
<b>Irrigation water (if used)</b>	Install an irrigation system to limit water wastage and avoid run-off of nutrient rich waters to the stormwater system and limit fertiliser application.		N/A	
<b>Water use minimisation</b>	Measures to minimise water use during commissioning, such as recycling shall be implemented by the contractor. These include re-use of the hydrotesting water, until this phase of testing is completed and the water is no longer serviceable. Subsequently, the wastewater will be sent to the evaporation ponds.	EPC and Subcontractor	As required	In time for Hydrotesting to commence and proceed without stoppages.  Cost should be integrated into the contract
	Although it was previously recommended in the FESIA ESMP that dry toilets should be installed, upon review of the minimal functional specifications of the wastewater treatment plant and taking into consideration the health risks of a poorly managed dry toilet, such a recommendation is not considered prudent or feasible. Therefore the SEISA ESMP does not recommend this mitigation measure, as the environmental and health risks of a poorly managed dry toilets far outweighs the insignificant reduction in water use at the CSP.			
	<i>Additional applicable mitigation measures are provided in the previous table.</i>			

## 5.6 Terrestrial Ecology

No fauna or flora species of threatened or rare status were identified within the NOORo Solar Power Project site or in the immediate adjacent areas. However, the adjacent Oueds were identified as valuable habitat for resident and migratory birds, as well as many amphibians, reptiles



and limited mammal species. Therefore in order to minimize any disturbance or degradation to these habitats, the following steps will be implemented to prevent and minimise any harm.

### FLAURA

Mitigation Measure	Construction	Operation
Minimise construction footprint	✓	✓
Maximise site vegetation retention area	✓	✓
Implementation of conservation practices if applicable	✓	✓
Fire prevention	✓	✓
Minimise laydown areas and construction routes on the site and retain existing vegetation wherever possible	✓	
Pesticides will be avoided as much as possible. If they are required, they will be strictly limited and carefully managed	✓	✓
Routinely check the stormwater system and drainage system to ensure that water flows (volume and velocities) are adequate and are not contributing to erosion. Only native vegetation will be planted on site with regards to landscaped areas;	✓	✓
Preservation of vegetation (control of weeds and alien invasive species)	✓	✓

### FAUNA

Mitigation Measure	Construction	Operation
Keep within applicable speed limits	✓	✓
Clear minimum vegetation	✓	✓
Prohibit night driving, except in cases of security and emergencies	✓	✓

Ensure that wastes from sites are cleared and workers are informed of the requirement to not hunt or injure local wildlife such as raptors	✓	✓
Establish procedures for the occasion any species are found on the construction site including procedures for reporting, identification and potential relocation	✓	
Limit open sources of water and monitor animal access		✓
Prevent introduction of foreign species by prohibiting all pets		✓
Remove vegetation from heliostat field to limit foraging activities		✓

### **Biodiversity Conservation, Sustainable Management of Living Natural Resources**

The following actions should be implemented during both construction and operation:

- Minimize land use
- Retain top soil for future habitat restoration
- No introduction of non-native species
- Pollution prevention measures as identified in the relevant environmental sections
- Restore habitat in lands used for lay down area

### **5.7 Socio-Management**

The socio-economic opportunities arising from the project have been identified in chapter 12 of the SESIA. Namely, these include the creation of employment for the local population and skills transfers to the employed workers. The multiplier effect will also generate opportunities for a more dynamic economy within the province.

In order to maximise the socioeconomic benefit, the project will seek to employ local workers where possible and where appropriate will offer training to enhance the development of skills within the local workforce. The number of local population employed in the project will be monitored to assess the effectiveness of the Recruitment Policy that will be developed for the construction and operational phase of the plant.

**Table 5-9 Socio-Management mitigation measures – Construction phase**

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Social Environmental Management</b>	Integrate Social Management Actions from the ESIA into the EPC Project Environmental Health and Safety Plan (EHSP)	EPC and Subcontractors	N/A	Within one month of Financial Close  As soon as the works start and throughout construction period.  Cost should be integrated into the contract
	Subcontractors to integrate requirements of EPC CESMP into their own documents and procedures.	Subcontractors	N/A	
	Undertake sufficient and necessary monitoring measures in accordance with the specifications in the relevant environmental issues discussed in the ESIA	EPC and Subcontractor	As instructed	
	Review procedures, manuals, notice boards, points of contact etc....	EPC and Subcontractor	As need basis	
	Develop public and employee grievance mechanism and communication procedures and notice boards, to provide a means for raising any grievances. All grievances shall be addressed and replied to within an specified time period. A woman will be available to receive complaints or grievances from women if requested.	EPC and Subcontractor	N/A	
	Facilitate access to information by the public; ensure transparency in the Social actions implemented.	EPC and Subcontractor	N/A	
<b>Labour and Work Conditions</b>	Provision of workers accommodation, social and health facilities in line with international good practice	EPC and Subcontractors	N/A	As soon as the works start and, and throughout the construction phase
	A Retrenchment Plan will be prepared by the Contractor for moving from construction to operation and decommissioning.			
	Protect and promote the health of workers, especially by promoting safe and healthy working conditions		N/A	
	Establish and maintain a sound worker-management relationship		N/A	

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Promote the fair treatment, non-discrimination and equal opportunity of workers		Daily	
	Comply with labour laws and ILO core Labour Standards		Daily	
	Provide complaints mechanism for employees and an action plan to address them.		HSE reports	
<b>Community Health, Safety and Security</b>	Prevent or minimize impact on community by implementation of EPC EHSP	EPC and Subcontractors	N/A	Throughout construction period. Integrated into the construction budget.  Cost of Fence is 100-200DH per meter.
	Construct a fence line around project		N/A	
	Prepare Emergency Response Plan		N/A	
	Maintain open communication channels with local communities		daily	
	Provide training and awareness of workers and communities of STDs.		Weekly	
	In the event of high humidity, regular monitoring for Legionella should be implemented and corrective measures adopted to minimise risk to workers or residents.		Monthly reporting	
	Provide construction program schedule to neighbouring population, which informs the work activities, timings and locations, and explains mitigation measures implemented.		Update as needed	
	Ensure that traffic access to the neighbouring villages is never hindered, by providing clearly indicated alternative routes.		Daily	
	Notify community of any disruptions to services with a minimum of 1 week notice.		As needed	

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Land Acquisition, Involuntary Resettlement</b>	<p>The land is currently used as grazing with very little pasture. No displacement of communities has been assessed. The site is located far from the main settlement areas.</p> <p><b>Please refer to the LAP on MASEN website.</b></p> <p>The LAP refers to the Land Acquisition Plan that has been conducted by MASEN and that describes the whole process of acquisition of the 3000 ha hosting all Ouarzazate phases (including NOOR II site) conducted in accordance with the national requirements and laws.</p> <p>The LAP has been conducted in accordance with national law and international requirements (including compliance with OP 4.12, as the LAP has been approved and published by the World Bank</p>	MASEN	MASEN	MASEN
<p>The project site is situated on community land covering about 3,000 ha, which belonged to the Ait Oukrour Toundout ethnic group. The land purchase procedures have already been carried out by MASEN. The Ait Oukrour Toundout community and its supervisory council gave their approval on 14 January and 20 May 2010, respectively, on transfer of the land to MASEN in accordance with statutory terms of sale and for the price set by the review commission.</p> <p>Purchase of the land was finalized on 18 October 2010 through a negotiated contract. The price for the land was paid by MASEN on 18 November 2010. The amount was deposited in a special account on behalf of the Ait Oukrour Toundout collectivity at the Ministry of the Interior, and this amount is managed by the Department for Rural Affairs.</p> <p>The community supervisory council has decided on how proceeds from the land sale will be used for the benefit of the Ait Oukrour Toundout community. The funds are currently used to for socio-economic activities in the project area, in consultation with the local population and other stakeholders. The acquisition of the land was conducted in a voluntary context with the voluntary consent of the local population. MASEN initiated an information and consultation process with stakeholders to identify and address any complaints.</p> <p>The acquisition have been conducted on a voluntary basis with the concerned community, not causing any displacement of economic activities nor population (and therefore not leading to any resettlement of population), and not causing any loss of income source.</p> <p>Over the last four to five decades that land has become so eroded that it cannot sustain any serious livestock activities: it has become a desert land</p>				

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
The LAP has been conducted in accordance with national law and international requirements (including compliance with OP 4.12, as the LAP has been approved and published by the World Bank).				
<b>Biodiversity Conservation, Sustainable Management of Living Natural Resources</b>	<i>The site is located far from any protected natural or tourist areas.</i>			
	Minimize land use	EPC and Subcontractors	N/A	Throughout construction phase.
	Retain top soil for future habitat restoration			
	No introduction of non-native species			
	Pollution prevention measures as identified in the relevant environmental sections			
Restore habitat of land used for lay down area				
<b>Cultural Heritage</b>	Upon discovering of cultural and or archaeological assets during site excavation, immediately stop work and notify the relevant authorities.  i.e. Implement the procedure of a chance find	EPC and Subcontractors	Daily monitoring	During excavation phase of the project
<b>Information Disclosure and Stakeholder Engagement</b>	Preparation of SEP, and updating SEP as necessary.  Implement grievance mechanism Procedure	Project Owner	N/A	At early planning stage throughout the construction period.

**Table 5-10 Socio-Management mitigation measures – Operation phase**

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
<b>Social Environmental Management</b>	Integrate Social Management Actions from the ESIA into the Project Environmental Health and Safety Plan (EHSP). Ensure that the grievance redress mechanism is incorporated	Project Owner	N/A	Within one month of Financial Close.  Cost integrated in the project development budget
	Establish and manage an OESMP, which has to be consistent with actions identified in the ESIA. Ensure that social management actions are integrated into the OESMP	O&M	Review procedures, manuals, notice boards, points of contact etc....on an as need basis. Minimum bi-yearly	OESMP to be established prior to initial operation of the plant. Cost integrated in the operational budget
	Undertake sufficient and necessary monitoring measures to check against compliance with environmental limits in accordance with the specifications in the relevant environmental issues discussed in the ESIA.			Throughout operation period. Cost integrated in the operational budget.
	Develop public and employee communication procedures and notice boards, to provide a means for raising any grievances.  Open dialogue about male and female employment opportunities			
	Facilitate access to the information by the public; ensure transparency in the Social actions implemented.			
	Initiatives aimed at economic development and the socio-cultural enhancement of communities will be proposed by the socio-economic study and the socio-economic action plan which is being finalised by MASEN.	O&M	N/A	Cost integrated in the operational budget.
	Create an employment committee within the province to study the best way for encouraging local employment	Project Owner	Review on a quarterly	Cost estimated in the Socio-Economic Action

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
			basis	Plan
	Improve infrastructures so as to improve the lives of the nearby villagers	O&M	N/A	
	Prioritize employment and subcontracting at the local level			
	Create a tourist site within the solar complex	Project Owner and O&M	N/A	Cost integrated in the operation budget
	MASEN will develop a strategy for the management of relationships with stakeholders and communication in support of the project. The strategy should serve to ensure the acceptability of the project and encourage cooperation between local stakeholders	Project Owner	Review on a quarterly basis	Cost budgeted in the Social Strategy
<b>Labour and Work Conditions</b>	Prepare Human Resource Policy	O&M	N/A	Within three months of commencing operation
	Protect and promote the health of workers, especially by promoting safe and healthy working conditions.			Throughout the operation phase
	Establish and maintain a sound worker-management relationship			
	Promote the fair treatment, non-discrimination and equal opportunity of workers.			
	Comply with labour laws and ILO Core Labour Standards			
	Provide grievance mechanism.			
	Capitalize on the outputs and recommendations of MASEN's Socio Economic Impact Study to help boost local employment, knowledge development, economic trade and participation.			
<b>Community Health, Safety and Security</b>	Prevent or minimize impact on community by implementation of O&M EHSP.	O&M	N/A	Throughout operation phase
	Prepare Emergency Response Plan.			



Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Maintain open communication channels with local communities.			
<b>Land Acquisition, Involuntary Resettlement</b>	Pastoral activities will be organised in the spaces located between the solar collectors.	O&M	N/A	Throughout operation phase
<b>Biodiversity Conservation, Sustainable Management of Living natural Resources</b>	No introduction of non-native species.	O&M	Bi-yearly monitoring of ecological environment for the first 3 years. Reduced to yearly for the next 5 years.	Throughout operation phase. Cost integrated in operational budget
Pollution prevention measures as identified in the relevant environmental sections.				
Restore Habitat and wadis in the surrounding areas				
<b>Information Disclosure and Stakeholder Engagement</b>	Updating SEP as necessary	Project Owner	N/A	Throughout the operation period.

The amount gained from the sale of the land of the Ait Oukroun Toundout collectivity served to finance development projects for the same collectivity. Following a process which was started by the technical service agencies of the province from November 2009 to September 2011, the local population was provided with an opportunity to express their needs in the form of projects. Numerous projects were identified, in three primary areas:

- (i) Basic amenities projects;
- (ii) Economic projects; and

(iii) Socio-educational projects.

Some of the projects will be financed through the amount which was paid to acquire the land and some of the projects will be financed by MASEN based on the findings from the socio-economic study. In general, all of these projects will contribute positively to the local development program for the project zone of influence. **Verbatim Source:** ESIA Executive Summary. AfDB Ourazazate Solar power Station, P-MA-DC0-003

Purchase of the land was finalised on 18 October 2010 through a negotiated contract. The price for the land was paid by MASEN on 18 November 2010. The amount was deposited in a special account on behalf of the Ait Oukrour Toundout collectivity at the Ministry of the Interior, and this amount is managed by the Directorate for Rural Affairs.

The community supervisory council will decide on how proceeds from the land sale will be used for the benefit of the Ait Oukrour Toundout community. Some of the funds will be used for socio-economic activities in the project area, in consultation with the local population and other stakeholders.

The acquisition of the land was conducted in a voluntary context with the voluntary consent of the local population. MASEN initiated an information and consultation process with stakeholders to identify and address any complaints.

**Verbatim Source:** ESIA Executive Summary. AfDB Ourazazate Solar power Station, P-MA-DC0-003

There exists a positive perception about the project by the local population with respect to employment, economic activity, and the reputation of the town.

## 5.8 Traffic and Transport

Potential traffic and transport impacts and recommended mitigation measures have been discussed in Chapter 13 (SESIA Volume 1). The following tables provide general mitigations actions for the construction and operational phases. In the event that alternative traffic management practices are needed, the following options will be considered:

- Increasing public transport services;

- Revising the timing and frequency of deliveries; and
- Providing alternative parking.

**Table 5-11 Traffic mitigation measures – construction and operation phase**

Issues	Mitigation Measure (Construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost	
<b>Off-site Traffic</b>	Schedule major material supply for off-peak hour traffic.	EPC and Subcontractor. O&M	N/A	As soon as the works start and throughout construction period.	
	Encourage car pooling by site workers.		N/A		
	Designate parking/staging areas. Provide adequate parking stations for the estimated numbers of visitors to the site (workers and suppliers).		N/A		Cost should be integrated into the contract.
	MASEN and the Consortium may engage in discussions with the public transport authority to increase public transport to the site.		N/A	N/A	As soon as the operation start and throughout operation period.
	Allow for easy access to public transport routes from the site.		N/A	N/A	Cost should be integrated into the operational budget
	Clearly identify truck routes and entry points for heavy vehicles entering the site.		N/A	N/A	
	Site operations will be monitored to ascertain that congestion is minimised on local roads networks, particularly through the city of Ouarzazate.		Daily		
	If congestion is observed, consider monitoring traffic numbers at entry/exit point		As needed		
	Ensure adequate training of drivers		N/A		
<b>On-Site Traffic</b>	Develop a Traffic Management Plan (operation).	N/A			
	Clearly post site entry / exit signs. Use 24hr security and document all vehicles entering/exiting the site.	N/A			
	Clearly post on-site speed limits, recommended 5Km/hr during construction and 10Km/hr during operation.	N/A			

## 5.9 Archaeology and Cultural Heritage

No archeologically significant or cultural heritage sights have been identified within SPC or in the immediate adjacent areas. However, in the unlikely event of any art found/uncovered, the construction work would be ceased immediately and the Culture, via the "Institut National des Sciences de L'Archéologie et du Patrimoine" be contacted by the contractor the Site Manager. The INSAP will take charge of archaeological investigations.

In addition, the following steps will be implemented to prevent and minimise damage to the site.

- The possible or confirmed existence of heritage objects or places, and any heritage discoveries, will be communicated to all staff including machinery operators.
- When work is conducted near identified heritage items, the items will be clearly marked with temporary flagging or fencing prior to the commencement of works.
- When work is conducted near identified heritage items, an exclusion zone will be created around the items to prevent damage by excavation, vehicle movement, or vibration, resulting from vehicles and equipment.

Potential heritage items or relics can include:

- Evidence of historical occupation (such as aged building remains), pottery, and other tools;
- Evidence of early industrial heritage;
- Articles of religious heritage value; and
- Items or places of importance to the ethnic groups and tribes.

## 5.10 Consultation Process

For this project, the public consultation process had already been undertaken in accordance with the procedures outlined for the FESIA preparation. These meetings included:

- First Public Consultation to introduce the project concept. November 3rd 2011.
- Meeting with the CNEIE to discuss the framework of the ESIA. December 10th 2011.
- Public Enquiry for the FESIA was held in September 2011.
- A presentation of the ESIA framework and environmental acceptability was held with the CNEIE. February 22nd 2012.
- Second Public Consultation to provide an update of the ESIA framework was held in March 2012.
- MASEN provided a presentation of the results of the FESIA on April 24th 2012.

- Public Consultation to introduce the specific environmental impact assessment for NOORo I, November 2012
- Presentation of the revised ESIA framework, June 2014

However, in order to meet the IFI's requirements, additional and project specific public consultation was carried out by Phénixa on February 3rd 2015.

The detailed report of the community consultation meeting is provided in Appendix 1.

The public consultation meeting was advertised through the publication of an advert in French and Arabic national newspapers and the invitation of identified stakeholders in the province of Ouarzazate. The meeting was led by representatives of Phenixa, ACWA Power and MASEN. Local Arabic and Berbere were spoken during the meeting and 76 people attended.

An initial presentation was undertaken to outline the main elements of the NOORo II solar complex, to summarise the environmental baseline on the study area (physical, biological and human), to outline the positive and negative impacts identified, explain the preliminary assessment undertaken and specify the mitigation measures that were being considered.

The stakeholders present at the meeting consisted of the following:

- 19% of participants were local inhabitants of the Ghassate commune,
- 32% represented different government/administrative bodies such as the Délégation du commerce et de l'industrie, la direction provincial des eaux et forets, l'agence national de promotion de l'emploi et des compétences, la délégation du ministère du tourisme..etc) and
- 12% represented research offices and local private companies,
- 35% were represented by associations.

Considering that extensive consultations had already been undertaken during the FESIA, the attendance to the meeting was considered very positive.

Regarding the content of the points raised in the meeting, 70% were direct questions and 30% were proposals or comments. The following is a summary of the perspectives and concerns of the stakeholders:

- Consumption of water during the operation phases
- Solar flux/rays from the tower on neighbouring communities
- Employment, and
- Concerns about the role of the project in the development of the local population.

The meeting was considered to fulfil its aims, for the following reasons:

- It allowed for precise information to be provided about water use.

- It confirmed that the concerns raised by the population (employment of local people, water use, employment) were in line with the mitigation measures being proposed (e.g. minimal water use, zero wastewater discharges, water treatment for reuse onsite, inclusion of provisions in the CESMP / ESMP to promote the employment of the local population and the provision of training).

In addition to the community consultation that was held at the project inception phase and for the various phases of the SPC development, continued and Longterm community consultation will be implemented through a Communication Plan, which will aim to ensure that throughout the project lifecycle, both employees, external stakeholders and vulnerable groups are able to obtain the information and support they seek.

A complaints register will be established and used for documenting all community and worker complaints.

The EPC must address all complaints, and responses will be prepared within an adequate time frame. If the complaint is serious, corrective measures will be taken immediately. All corrective actions will also be documented in the register, and any changes in work methods, resulting from the complaints, will be updated in the CESMP revisions.

Finally, provision of consultation will be explored as a pro-active measure, if grievances are expected due to the construction or operation activities of the Solar Power Complex.

## **6 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 soil contamination, groundwater and water pollution. Spills of hazardous materials may include:

- Gasoline;
- Diesel;
- Adhesives;
- Hydraulic oil;
- Lubricating oil and grease;
- Cleaning solvents;

- Paint and paint thinners; and
- Concrete from release agents.

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 construction site. Key personnel will know and understand their responsibilities as well as coordinate their response actions with their subordinates.

This plan serve 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.

### **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. Mechanical loading shovels, excavators and dump trucks may also available for sand distribution and clean up. Storage containers for contaminated materials and earth will be banded, 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.

## 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 cleanup 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.

## 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 surrounded by the kit 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;
- All contaminated materials are to be handled as hazardous waste. The contaminated material shall be collected and appropriately stored. A 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 banded 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 providers.

## Chemical Spill Response Options

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

- Only attempt containment and cleanup operations of spilt substances when it can be performed safely;



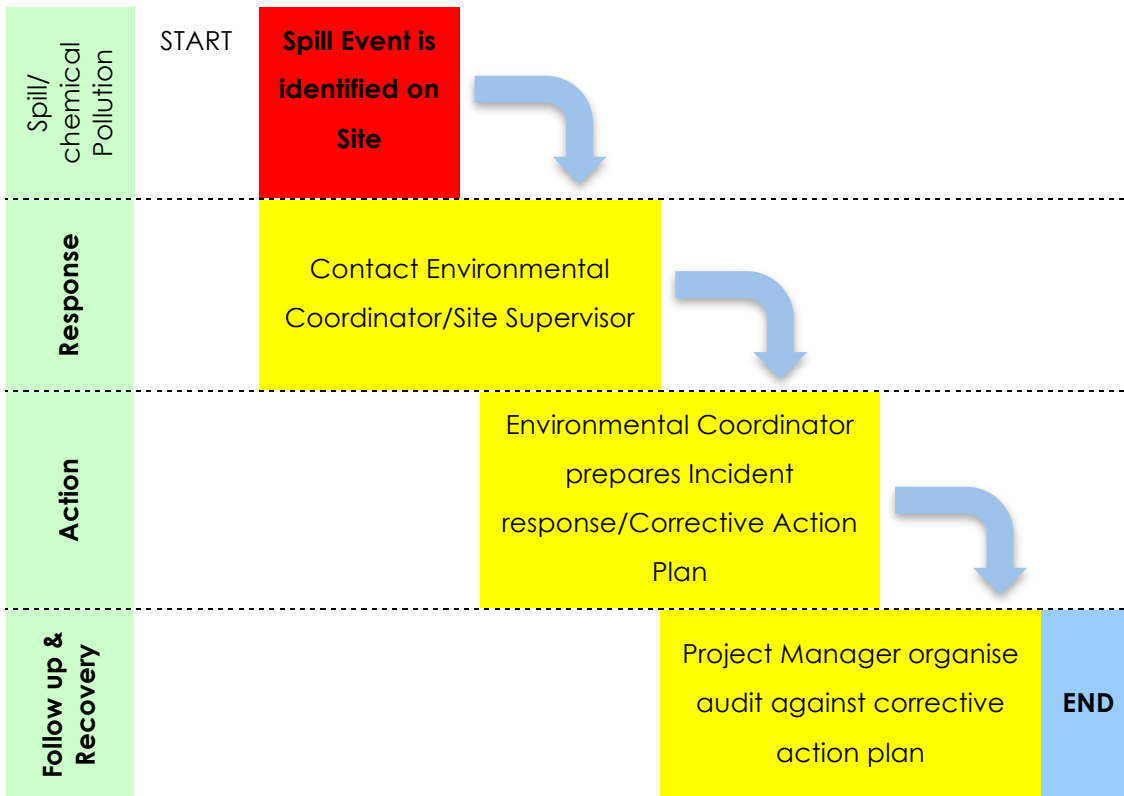
- If spilled material is flammable, eliminate sources of ignition near spill area;
- Liquid spills – If the spill is liquid its path will be blocked or diverted and then soaked up using an absorbent material such as sand;
- Gaseous spills/leaks – A gaseous leak must be stopped at the source as soon as 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
- 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 banded 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 providers.

### **Reporting**

Any person involved in construction works 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 6-1 Incident Response**



## 7 ENVIRONMENTAL MONITORING PLAN

The objective of an environmental monitoring plan is to establish the baseline indicators to assess the overall performance and effectiveness of the environmental management programs. A monitoring program has the underlying objective of ensuring that the intended environmental mitigations are realised and that minimal deterioration occurs to the environmental parameters. The environmental monitoring program will aid management in redefining the environmental program 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 Environmental Monitoring Plan are:

- To evaluate the performance of mitigation measures proposed in the ESMP;
- To evaluate the adequacy of Environmental 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 meet the requirements of the existing environmental regulatory guidelines and community obligations.

The detailed monitoring plan strategy will be determined in consultation with the AGCE- MTA regulator and the lending banks, and will enable the NOORo II SPC to comply with regulatory requirements for monitoring during the operational phase and in order to monitor environmental aspects during the construction stage. The IFC/WB EHS Guidelines for Thermal Power Plants (2008) identifies the typical air emission 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 contractor and approved by the regulator. At the operational phase the monitoring plan will be prepared by the project operator 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.

Additional guidance on applicable sampling and analytical methods for emissions and effluents that will be considered is provided in the IFC's General EHS Guidelines (2007) or revised version if available.

The following parameters, at a minimum, will be regularly monitored during both construction and operational phases. Procedures for undertaking this monitoring must be incorporated within the monitoring plan:

- Noise;
- Soil;
- Wastewater discharges (continuous monitoring);
- Gaseous emissions (continuous monitoring);
- Ambient air quality;
- Stack emission testing (for PM, SO<sub>2</sub>, NO<sub>x</sub> on annual basis);
- Waste streams generated;
- Recruitment of local population; and
- Public complaints.

A general monitoring plan for the proposed Solar Power 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 lower IFC EHS limits, regulatory maximum allowable limits and the collected baseline data 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 Environmental Monitoring Program register.

Based on the mitigation recommendations in the SESIA, the following environmental 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 7-1 Construction and Operational Phase Monitoring Activities**

Subject to monitor	Construction	Operation
Wastewater and stormwater discharge	✓	✓
Treated process water at treatment facility		✓
Ambient Air Quality	✓	✓
Air quality monitoring at point sources		✓
Workplace noise and vibration	✓	✓
Traffic movements on/off-site	✓	
Waste Management	✓	✓
Recruitment of local population	✓	✓
Complaints regarding environmental issues from all sensitive receptors	✓	✓

## 7.1 Monitoring Program for Construction Phase

### Compliance Monitoring

The construction phase compliance monitoring will be carried out on a regular basis, using various techniques and at different intervals. This will ensure that all activities are carried out in compliance with existing local and international standards and according to the proposed CESMP. Recommended construction phase monitoring activities are described below.

### Air Quality

#### *Workplace dust/ Exhaust Air Quality*

Monitoring of construction related dust will be carried out using air filters, for the measurement of PM10 and PM2.5.

Exhaust will be monitored if visual checks reveal smoky or malodorous fumes, this is particularly applicable to fixed site plant and specialised equipment.

Internal air quality will be monitored if activities are occurring in confined spaces.

#### *Ambient Air Quality*

At the boundaries of the construction site, air filters or dust collectors will be installed to monitor PM10. Monitoring will be daily during significant dust generating activities or during periods of high winds (>20Knots), otherwise weekly.

Under both monitoring activities, the monitoring locations will be determined at the onset of construction activities, and the air quality analysis results will be assessed against the relevant air quality objectives.

#### **Noise and Vibration**

Workplace noise levels will be monitored weekly, following the same methods used for carrying out the baseline noise survey. The noise levels will be assessed according to construction guidelines for construction noise, taking into consideration the proximity of any sensitive receptors, time of day and location of the activity.

Vibration monitoring will be carried out in areas likely to be affected, and near sensitive receptors.

#### **Water Quality**

##### *Wastewater discharges and wastewater quality*

General construction techniques for handling wastewater is to collect it in evaporation ponds, re-use the water in soil and groundwater compaction/settling techniques, or disposal of the water off site following treatment. Monitoring is therefore required for wastewater discharges.

Monitoring will be carried out in accordance with the relevant water discharge and re-use requirements.

As a minimum wastewater discharges will be monitored for:

- In Situ parameters: Total dissolved solids, Total Suspended Sediments, Dissolved oxygen, Electrical Conductivity, Temperature and pH.
- Analytical parameters: BOD<sub>5</sub>, COD, Heavy metals, nutrients, oils and grease.

#### **Waste Management**

Waste management practices will be monitored on a monthly basis to ensure the proper implementation of the measures proposed in the ESMP and compliance with relevant standards. A log on waste management will be maintained to record information on waste reuse, recycling and disposal to demonstrate achieved levels of waste minimisation. The waste log will include the following information:

- Bi-weekly quantities and types of waste taken off site, the approved handler, and where the waste was disposed;
- Estimates of the quantities and types of waste recycled, reused, or recovered;
- List of persons that approved waste removal;
- Indication if waste disposal has met intended construction phase recycling, recovery or reuse targets.

### **Monitoring of Ecological Status**

Any ecological impacts occurring during site clearance, land preparation, cut and fill activities need to be monitored and recorded. Further, impacts on Wadi flora and fauna species present close to the site need to be monitored and recorded during construction.

### **Recruitment policy**

In order to maximise the socioeconomic benefit, the project will seek to employ local workers where possible and where appropriate will offer training to enhance the development of skills within the local workforce. The number of local population employed in the project need to be monitored to assess the effectiveness of the Recruitment Policy that will be developed for the construction and operational phase of the plant. The recruitment of women and dis-advanced groups (e.g. disabled) will be encouraged. Specific jobs that can be targeted for these groups will be identified.

### **Complaints**

A point of contact and their details will be published at the entrance of the project site, in order receive complaints regarding any environmental grievances resulting from the construction activities. All complaints will be registered in the ESMP, including follow up results actions.

#### **Emergency Monitoring**

Emergency monitoring will be conducted following any incident to check whether appropriate measures have been taken to minimise environmental impacts. The Environmental coordinator will carry out the monitoring and, if required invite a regulatory authority representative to cooperate.

## **7.2 Monitoring Program for Operation Phase**

The monitoring program during the operation phase provides a means of validation of the implementation and effectiveness of the mitigation measures incorporated in the NOORo II Solar Power project and developed during the SESIA process, while allowing residual impacts to be predicted. This information can be used to refine the existing mitigation and, if necessary, aid in the development of additional mitigation measures.

## **Compliance Monitoring**

Compliance monitoring will be conducted through regular environmental inspections, audits, control feed-back mechanisms, document control, and reviews to check if activities and operations are in compliance with proposed Moroccan / IFC standards or indicators proposed in this SESIA.

It is recommended that Independent environmental / social auditing reports be public.

Environmental compliance monitoring will be carried out on several different levels, namely:

- Trained technicians and/or environmental consultants will carry out the continuous and/or field and laboratory monitoring of physical measurements (e.g. air, water, noise);
- In some cases compliance monitoring will be carried out under the supervision of foremen, who will be specially trained in environmental procedures relevant to their fiduciary operation. An example of this is monitoring of waste generation, handling and disposal; and
- Environmental coordinator will conduct daily inspections, spot checks, and overall compliance reviews (inspection of the monitored data verse standards and other indicators) on a regular periodic basis.

If any non-compliance is found during any of control mechanisms, the adequate correction measures will be taken. Each non-compliance will be followed-up by an investigation which will be carried out to identify sources and/or reasons for non-compliance. Based on follow up investigation results, adequate prevention measures will be implemented to ensure that non compliance will not reoccur.

## **Residual Monitoring**

In order to check the implementation and effectiveness of the mitigation measures it is necessary to monitor specific environmental parameters that have been identified and assessed in the SESIA.

It is recommended that the following items at a minimum will be regularly monitored.

- Noise;
- Soil condition;
- Wastewater discharges, wastewater quality (continuous monitoring);
- Gaseous emissions (continuous monitoring);
- Ambient air quality;
- Stack emission testing (for PM10, PM2.5, SO2, NOx and on annual basis);
- Waste deposit; and
- Public complaints.

Frequency, locations and parameters will be determined in consultation with the regulator and the lending banks, to enable the NOORo II Solar Power project to comply with regulatory requirements for monitoring during the operational phase. A detailed monitoring programme will be prepared and incorporated in the OESMP by the O & M Company.

Once the approval is given by the regulator an attachment of conditions for approval is included which specifies how, when and what should be monitored and reported.

## **Water Quality**

### *Wastewater Discharge*

All wastewater discharges to the evaporation ponds will be monitored on a continuous basis, prior to discharge or re-use. The main wastewater streams that will be produced at the site are from cooling tower, reverse osmosis, boiler blowdown, oily water, HTF system, tempering water, and sanitary.

Wastewater quality will be analysed on a continuous basis using on-line analysers. As a minimum the parameters that will be measured include: DO, Temperature, Salinity, EC, TDS, TSS, Turbidity and pH.

Grab samples will also be collected and analysed for the following minimum parameters: Oil and grease, nutrients, residual chlorine, BOD<sub>5</sub>, COD, heavy metals (Cadmium, chromium, copper, lead and nickel) and cross referenced against Moroccan wastewater quality objectives.

It is recommended that sampling be carried out daily during the start up/commissioning phase, until it can be demonstrated that all parameters are within acceptable wastewater discharge quality objectives.

Automatic sampling will continue during normal operations, however analysis need only be conducted on a weekly basis. The frequency may eventually be reduced if the longterm compliance with wastewater discharge objectives is demonstrated.

## **Noise and Vibration**

Operational noise levels at the boundary of the project will be monitored monthly. The noise levels will be assessed according to operational guidelines, taking into consideration the proximity of any sensitive receptors, time of day and location of the activity.

Workplace noise levels will be monitored weekly. The monitoring methodology and interpretation of the levels will take into consideration the level of workers' activities in the workplace and relevant exposure guidelines.



### **Traffic and Transport**

If significant congestion is experienced, then a traffic monitoring plan will be implemented. A specialist traffic consultant will determine the locations, frequencies and reporting requirements.

### **Waste Management**

Waste management practices will be monitored on a monthly basis to ensure the proper implementation of the measures proposed in the ESMP and compliance with relevant standards. A log on waste management will be maintained to record information on waste reuse, recycling and disposal to demonstrate achieved levels of waste minimisation. The waste log will include the following information:

- Bi-weekly quantities and types of waste taken off site, the approved handler, and where the waste was disposed;
- Estimates of the quantities and types of waste recycled, reused, or recovered;
- List of persons that approved waste removal;
- Indication if waste disposal has met intended construction phase recycling, recovery or reuse targets.

### **Social issues and Complaints**

A point of contact and their details will be published at the entrance of the project site, in order receive complaints regarding any environmental grievances resulting from the operational activities. All complaints will be registered in the ESMP, including follow up results actions.

### **Emergency Monitoring**

Emergency monitoring will be conducted following any incident to check whether appropriate measures have been taken to minimise environmental impacts. The Environmental coordinator will carry out the monitoring and, if required invite an environmental regulatory representative to cooperate.

## **7.3 Monitoring Plan Template**

The following table is a very basic template design to help develop a more detailed procedure and reporting format. The government authorities will also provide the outline of the format and content of a monitoring plan that will be used for regulatory reporting purposes. In order to simplify the process, it is best to therefore adopt the regulatory authorities monitoring report template, in order to avoid duplication of works. Furthermore, the regulatory authority will provide further input to the content and methodology as is fitting to the project needs and phases of construction and operation.

**Table 7-2 Basic Monitoring Template**

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
<b>Preparation/ Conception</b>						
FESIA monitoring (as specified in the FESIA)	SPC site and study area	Refer to the FESIA report	2010-2011	Establish baseline entire SPC and assess strategic impacts	Not available	MASEN/ Phenixa/ Burgeaup
SESIA monitoring- Air Quality - SO <sub>2</sub> , NO <sub>2</sub> , VOCs	As specified in Figure 7-1 of vol.1 of the SESIA	Diffusion tubes detailed description section 7.3 vol 1	TBD	Establish baseline NOORo II CSP plant	Paid	5Capitals
SESIA monitoring- Air Quality - Dust	As specified in Figure 7-2 of vol.1 of the SESIA	PM <sub>2.5</sub> PM <sub>10</sub> Monitoring Stations Detailed description section 7.3 vol 1	TBD	Establish baseline NOORo II CSP plant	Paid	5Capitals
SESIA monitoring- Noise	As specified in Figure 8-1 of vol.1 of the SESIA	Noise meter – detailed description section 8.3 vol 1	TBD	Establish baseline NOORo II CSP plant	Paid	5Capitals
SESIA monitoring- Soil-	As specified in Figure 5-1 of vol.1 of the SESIA	Soil samples – detailed description section 5.3 vol 1	May 2014	Establish baseline NOORo II CSP plant	Paid	5Capitals
FESIA / LAP / SDP community consultation	Input community concerns about the SPC. Gather information about social	Described FESIA / lap / SPD	2010-2012	Incorporate community concerns for the design of the SPC	Not available	MASEN / Phenixa / Burgeaup

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
	impacts.					
SESIA community consultation	As specified in the public consultation section of the SESIA	As specified in the public consultation section of the SESIA	TBD	Incorporate community concerns for the design on the NOORo II CSP plant	Paid	5Capitals
<b>Construction</b>						
Air quality - PM <sub>10</sub> PM <sub>2.5</sub>	Site boundary	Air filters or dust collectors (follow testing equipment specifications for use)	Weekly. Daily when dust generating activities are undertaken or wind >20 knots	Possible dust creating by vehicles and earthworks	To be determined by the EPC	EPC
Air Quality - Exhausts	Vehicle / equipment exhausts	Visual inspection of the smoke (follow testing equipment specifications for use)	Daily	If there is visible dark smoke, the equipment will be sent for maintenance or replaced	Not applicable	EPC/ Subcontractors
Noise	Site boundary and sensitive receptors	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly	Construction activities increase noise levels (nuisance, disturb fauna, work hazard)	To be covered by the EPC ( indicative cost noise meter 2000-5000 MD)	EPC
Vibration	Sensitive receptors	Vibration meter recording for 24hrs (follow testing equipment)	Weekly, for a full day (24h period)	Construction activities can create vibration (damage)	To be covered by the EPC (indicative cost noisemeter 2500-6000 MD)	EPC

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
		specifications for use)		property, disturb fauna...)		
Wastewater –In situ parameters – Temperature, pH, Conductivity, TDS, Dissolved Oxygen	Discharge from wastewater treatment	In-situ standard methodology (follow testing equipment specifications for use)	Continuous	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be covered by the EPC(indicative cost multiparameter continuous sonde 25,000 – 70,000 MD)	EPC
Wastewater –Ex situ parameters – TSS, BOD <sub>5</sub> , COD, Nutrients, Oil/Grease	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be agreed between the EPC and an accredited laboratory	EPC
Wastewater –Ex situ parameters – Heavy Metals (Cadmium, chromium, copper, lead and nickel)	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be agreed between the EPC and an accredited laboratory	EPC
Waste management	-	Waste log	Every time that waste is taken off site or recycle onsite	Monitor compliance with waste recycling targets and off site disposal by approved subcontractors	To be agreed between the EPC / subcontractors and approved waste management contractors	EPC / subcontractors
Ecological status	Chaabas and Oueds	Count of fauna species, monitoring	Monthly	Monitor ecology around the site	To be covered by the EPC.	EPC

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
	surrounding the site	flora				
Social Development Plan (SDP)	In the area of the project	MASEN has prepared a SDP describing (i) the benefits that will accrue to local communities in the area of the project through the use of the proceeds of the compensation paid pursuant the provisions of the LAP for the land acquisition necessary for the project and (ii) other voluntary actions planned to be implemented by MASEN and/or any other stakeholders.	May 2013	To follow the compensation of communities for the sale of land through the implementation of local social development measures financed with the land sale proceedings	To be assessed	MASEN and any other Stakeholder
Recruitment policy	Not applicable	Ratio local to immigrant labour	Every time there is recruitment	Provide employment for local population, minimize impact immigrant labour	To be covered by the EPC.	EPC

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
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	To be covered by the EPC.	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
<b>Operation</b>						
Air quality – Stack emissions - PM <sub>10</sub> , PM <sub>2.5</sub> SO <sub>2</sub> , NO <sub>x</sub>	Stack	Collection and analysis of samples taken on the stack following up to date EPA method	Monthly	Even though combustion emissions will be infrequent, harmful air pollutants need to be monitored.	To be determined by the O&M (can be undertaken in-house, subcontracted, etc...)	O&M
Air Quality – Fugitive Emissions (VOC)	Connection points and linkages	Following up to date EPA method	Monthly	To ensure materials and equipment and maintained and optimal plant efficiency	To be determined by the O&M (can be undertaken in-house, subcontracted, etc...)	O&M
Noise	Site boundary, sensitive receptors, near noisy equipment	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly	Construction activities increase noise levels (nuisance, disturb fauna, work hazard)	To be covered by the O&M (indicative cost noise meter 2000-5000 MD)	O&M

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
Vibration	Sensitive receptors	Vibration meter recording for 24hrs (follow testing equipment specifications for use)	Weekly, for a full day (24h period)	Construction activities can create vibration (damage property, disturb fauna...)	To be covered by the O&M (indicative cost noisemeter 2500-6000 MD)	O&M
Visual	At the sensitive receptors (Road N10)	Visual assessment of light reflection and glint blinding the drivers	Weekly	Road safety, avoid visual interference	To be covered by the O&M	O&M
Lighting	Boundaries of the site	Visual assessment of directional lighting	Quarterly	Prevent light pollution to the undeveloped areas and the road	To be covered by the O&M	O&M
Mirror Malfunction	All mirrors	Visual assessment of mirror alignments	Daily	Ensure efficiency of the plant operations, identification of malfunctions	To be covered by the O&M	O&M
Wastewater –In situ parameters – Temperature, pH, Conductivity, TDS, DO	Discharge from wastewater treatment	In-situ standard methodology (follow testing equipment specifications for use)	Continuous	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be covered by the O&M (indicative cost multiparameter continuous sonde 25,000 – 70,000 MD)	O&M
Wastewater –Ex situ parameters – BOD <sub>5</sub> , COD, TSS, Nutrients, Oil and	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Determine treated wastewater suitability for reuse or discharge to	To be agreed between the O&M and an accredited laboratory	O&M

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
Grease				evaporation ponds		
Wastewater –Ex situ parameters – Heavy Metals (Cadmium, chromium, copper, lead and nickel)	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be agreed between the O&M and an accredited laboratory	O&M
Waste management	-	Waste log	Every time that waste is taken off site or recycle onsite	Monitor compliance with waste recycling targets and off site disposal by approved subcontractors	To be agreed between the O&M / subcontractors and approved waste management contractors	O&M / subcontractors
Ecological status	Chaabas and Oueds surrounding the site	Count of fauna species, monitoring flora	Monthly	Monitor ecology around the site	To be covered by the O&M	O&M
Recruitment policy	Not applicable	Ratio local to immigrant labour	Every time there is recruitment	Provide employment for local population, minimize impact immigrant labour	To be covered by the O&M .	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	To be covered by the O&M .	O&M



<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (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
<b>Supervision (during the construction and operation phases)</b>						
Independent Environmental Audits – Documentation	-	The auditors will review the environmental documentation kept at the plant, check the adequate implementation of the environmental procedures established in the ESMP (CEMP/OEMP) and the application of the mitigation and monitoring measures stated in the SESIA, including the monitoring results	Quarterly	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP. The audit reports are sent to the lenders.	To be agreed with independent environmental experts	EPC (construction) O&M (operation)

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
Independent Environmental Audits — Site inspection	-	The auditors will visit the plant, to ensure that the environmental procedures are being adequately applied.	Quarterly	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP. The audit reports are sent to the lenders.	To be agreed with independent environmental experts	EPC (construction) O&M (operation)
Independent Environmental Audits — Monitoring	-	The auditors will take their own samples and measurements of the monitoring elements outlined above for the construction and operational phases, if considered necessary to confirm the validity of the results provided by the EPC/O&M.	Quarterly	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP. The audit reports are sent to the lenders.	To be agreed with independent environmental experts	EPC (construction) O&M (operation)
<b>Decommissioning</b>						
Air quality - PM <sub>10</sub> PM <sub>2.5</sub>	Site boundary	Air filters or dust collectors (follow testing equipment)	Weekly. Daily when dust generating activities are	Possible dust creating by vehicles and earthworks	To be determined by the Decommissioning Contractor	Decommissioning Contractor/ Subcontractor

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
		specifications for use)	undertaken or wind >20 knots			
Air Quality - Exhausts	Vehicle / equipment exhausts	Visual inspection of the smoke (follow testing equipment specifications for use)	Daily	If there is visible dark smoke, the equipment will be sent for maintenance or replaced	Not applicable	Decommissioning Contractor/ Subcontractor
Noise	Site boundary and sensitive receptors	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly	Demolition activities increase noise levels (nuisance, disturb fauna, work hazard)	To be covered by the Decommissioning Contractor (indicative cost noise meter 2000-5000 MD)	Decommissioning Contractor/ Subcontractor
Vibration	Sensitive receptors	Vibration meter recording for 24hrs (follow testing equipment specifications for use)	Weekly, for a full day (24h period)	Demolition activities can create vibration (damage property, disturb fauna...)	To be covered by the Decommissioning Contractor (indicative cost noisemeter 2500-6000 MD)	Decommissioning Contractor/ Subcontractor
Soil	Multiple locations across the site, in accordance with land use and likelihood of contamination	Core sample collection from surface up to 1.5m depths	At end of decommissioning period / before handover of site	To verify that the site is being handed over without any contamination issues	To be agreed between the Decommissioning Contractor and an accredited laboratory	Decommissioning Contractor/ Subcontractor

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
Groundwater	Groundwater wells that are still in use in the nearest village.	One sample per well	At end of decommissioning period / before handover of site	To verify that the site is being handed over without any contamination issues	To be agreed between the Decommissioning Contractor and an accredited laboratory	Decommissioning Contractor/ Subcontractor
Wastewater –In situ parameters – Temperature, pH, Conductivity, TDS, DO	Discharge from wastewater treatment	In-situ standard methodology (follow testing equipment specifications for use)	Continuous	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be covered by the Decommissioning Contractor (indicative cost multiparameter continuous sonde 25,000 – 70,000 MD)	Decommissioning Contractor/ Subcontractor
Wastewater –Ex situ parameters – BOD <sub>5</sub> , COD, TSS, Heavy Metals, Nutrients, Oil and Grease	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Determine treated wastewater suitability for reuse or discharge to evaporation ponds	To be agreed between the Decommissioning Contractor and an accredited laboratory	Decommissioning Contractor/ Subcontractor
Waste management	-	Waste log	Every time that waste is taken off site or recycle onsite	Monitor compliance with waste recycling targets and off site disposal by approved	To be agreed between the Decommissioning Contractor / subcontractors and approved	Decommissioning Contractor/ Subcontractor

<b>MONITORING PLAN</b>						
<b>What</b> (Is the parameter to be monitored?)	<b>Where</b> (Is the parameter to be monitored?)	<b>How</b> (Is the parameter to be monitored?)	<b>When</b> (Define the frequency / or continuous?)	<b>Why</b> (Is the parameter being monitored?)	<b>Cost</b> (if not included in project budget)	<b>Who</b> (Is responsible for monitoring?)
				subcontractors	waste management contractors	
Ecological status	Chaabas and Oueds around the site	Count of fauna species, monitoring flora	Monthly	Monitor ecology around the site	To be covered by Decommissioning Contractor.	Decommissioning Contractor/ Subcontractor
Labour Law Monitoring	In the area of the project	Mechanisms for end of service benefits according to Moroccan labour law.	Continuous	To ensure that employees receive severance pay or re-employment according to Moroccan law	To be assessed	EPC/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	To be covered by the Decommissioning Contractor.	Decommissioning Contractor/ Subcontractor
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 Decommissioning Contractor.	Decommissioning Contractor/ Subcontractor

## 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 NOORo II SPC.

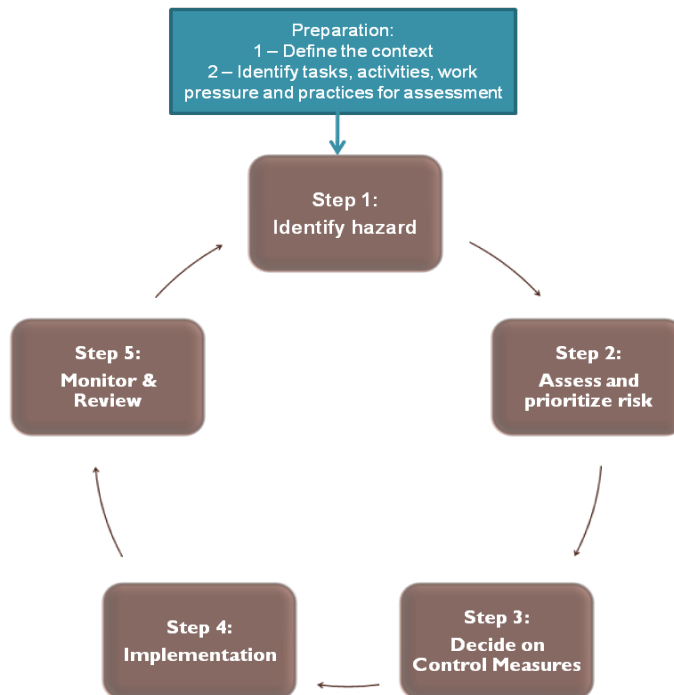
The risk assessment addresses the impacts to the environment that could occur as a result of mishaps or failures during the construction and operation phases of the project. These could be failure of equipment or material or processes. Examples of mishaps are;

- 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.

**Figure 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 8-1 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)
<b>Atmosphere/Waste/Other</b>	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 of 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.
<b>Human health and safety</b>	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 8-2 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 8-3 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.

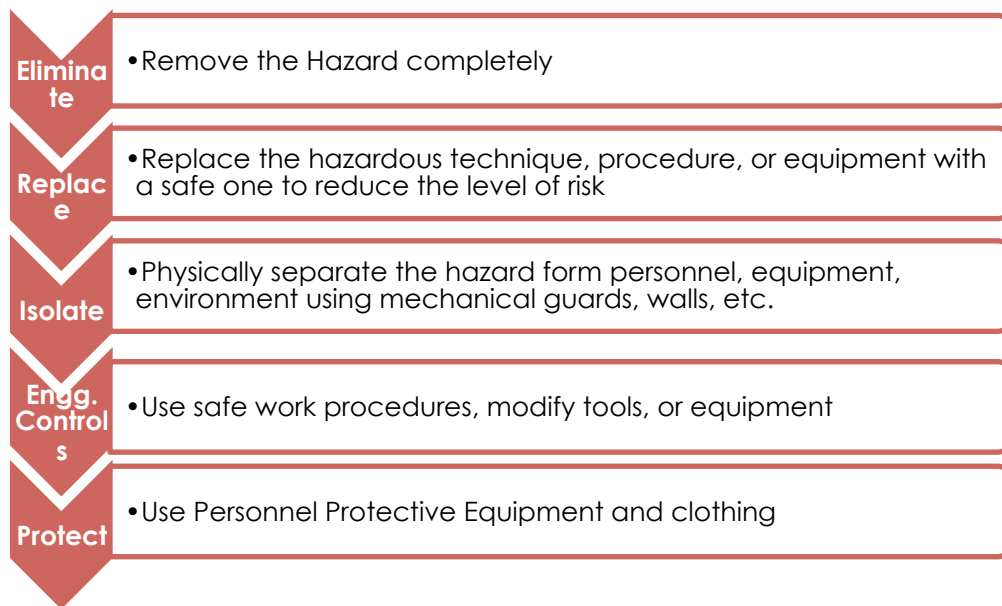
**Table 8-4 Hazard Controlling Measures**

Control	Use	Description and example
Preventive measures	To reduce the likelihood of hazards or to prevent or avoid the release of a hazards	a. 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).

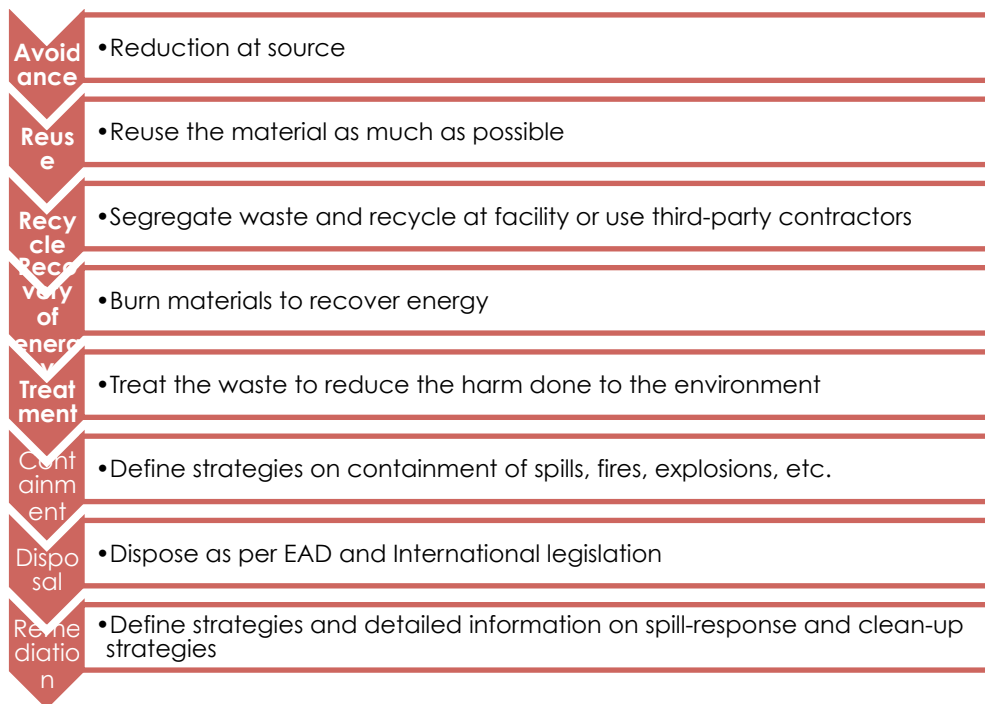
Control	Use	Description and example
Improvement measures	To reduce or limit the consequences arising from a hazardous event or effect	<p><b>Active systems:</b></p> <p>b. Intended to detect and abate incidents, for example, gas, fire and smoke alarms, shutdowns, deluge</p> <p><b>Passive systems:</b></p> <p>c. Intended to guarantee the primary functions, for example, fire and blast walls, isolation, separation, protective devices, drain systems</p> <p><b>Operational (non physical) systems:</b></p> <p>d. Intended for emergency management, for example contingency plans, procedures, training, drills</p>
Recovery Measures	Includes top events	<p>All technical, operational and organizational measures which can –</p> <p>e. Reduce the likelihood that the first hazardous event or 'top event' will develop into further consequences.</p> <p>f. Provide life saving capabilities will the 'top event' develop further.</p>

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 8-5 Hazard and Safety Hierarchy of Controlling Hazards**



**Table 8-6 Environmental hierarchy of Controlling Hazards**



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 measures.

**ANNEX I**  
**APPLICABLE STANDARDS**

**TABLE A Ambient Air Quality Standards ( $\mu\text{g}/\text{m}^3$  unless otherwise specified)**

Parameter	IFC EHS General GLs/WHO GLs		Moroccan		
	24 hour	Annual	1 hour	24 hour	Annual
PM10	150 (Interim target 1)	70 (Interim target 1)	-	90.4 50%centile	-
	100 (Interim target 2)	50 (Interim target 2)			
	75 (Interim target 3)	30 (Interim target 3)			
	50 (guideline)	20 (guideline)			
PM2.5	75 (Interim target 1)	35 (Interim target 1)	-	-	-
	50 (Interim target 2)	25 (Interim target 2)			
	37.5 (Interim target 3)	15 (Interim target 3)			
	25 (guideline)	10 (guideline)			
Nitrogen Dioxide	200 (1 hour)	40	98 200%centile	-	50 health 30 vegetation
Sulphur Dioxide	125 (Interim target 1)	500 (10 minute guideline)	-	99.2 125%centile	20 (ecosystem)
	50 (Interim target 2)				
	20 (guideline)				
	150 (Interim target 1)				
Ozone	100 (8 hour daily maximum guideline)	-	110 for 8hr	65 vegetation	-
Carbon Monoxide	-	-	10mg/m <sup>3</sup> for 8hr	-	-
Cadmium	-	-	-	-	5ng/m <sup>3</sup> Health
Benzene (C <sub>6</sub> H <sub>6</sub> )	-	-	-	-	10 Health
Pb	-	-	-	-	1 Health

**TABLE B Moroccan and IFC Maximum Permissible Emission Rates for Boilers**

Pollutant	Units	Moroccan	IFC Boilers thermal power plants (One Hour Average)		IFC Small Combustion Facilities Emissions Guidelines
			NDA <sup>1</sup>	DA <sup>2</sup>	
Particulate Matter Total	mg/Nm <sup>3</sup>	5mg/m <sup>3</sup> for an emission rate of 25g/hr	50	30	50 - 150
Nox (as NO <sub>2</sub> )	mg/Nm <sup>3</sup>	500mg/m <sup>3</sup> at emission rate of 5000g/h	400	200	460
Sox (as SO <sub>2</sub> )	mg/Nm <sup>3</sup>	500mg/m <sup>3</sup> at emission rate of 5000g/h	900-1,500	400	2000
HCl	mg/Nm <sup>3</sup>	1mg/m <sup>3</sup> at emission rate of 5g/h			

1 NDA is non degraded airshed (i.e. NOORo II Project Site)

2 DA is degraded airshed (this does not apply to NOORo II)



**TABLE C Water Standards for irrigation**

PARAMETERS	UNITS	VALUE	SPECIFICATIONS
<b>Biological Parameter</b>			
Faecal Coliform	ml	1000/100	100ml for agricultural products eaten raw
Salmonella		Absence	in 5 litres
Vibrio cholera		Absence	in 450ml
<b>Parasitological Parameter</b>			
Pathogenic parasites		Absence	
Parasite cysts		Absence	
Larvae of Ankylostomides		Absence	
Fluococercaries of Schistosoma haematobium		Absence	
<b>Toxic Parameters</b>			
Mercury	mg/l	0.001	
Cadmium	mg/l	0.01	
Arsenic	mg/l	0.1	
Total Chromium	mg/l	1	
Lead	mg/l	5	
Copper	mg/l	2	
Zinc	mg/l	2	
Selenium	mg/l	0.02	
Fluorine	mg/l	1	
Cyanides	mg/l	1	
Phenols	mg/l	3	
Aluminium	mg/l	5	
Beryllium	mg/l	0.1	
Cobalt	mg/l	0.5	
Iron	mg/l	5	
Lithium	mg/l	2.5	
Manganese	mg/l	0.2	
Molybdenum	mg/l	0.01	
Nickel	mg/l	2	
Vanadium	mg/l	0.1	
<b>Physical and Chemical properties</b>			
<b>Salinity</b>			
Total salinity	mg/l	7680	
Electrical conductivity	mS/cm	12	at 25°C
<b>Infiltration</b>			
- Sodium Absorption Ratio 0-3	EC	< 0.2	
- Sodium Absorption Ratio 3-6		< 0.3	
- Sodium Absorption Ratio 6-12		< 0.5	
- Sodium Absorption Ratio 12-20		< 1.3	
- Sodium Absorption Ratio 20-40		< 3	
<b>Toxic Ions (affecting sensitive agricultural product receptors)</b>			
<b>Sodium</b>			
- Surface Irrigation	mg/l	69	
- Overhead irrigation	mg/l	9	
<b>Chloride</b>			
- Surface Irrigation	mg/l	350	
- Overhead irrigation	mg/l	15	
Boron	mg/l	3	
<b>Effect drivers (affecting sensitive agricultural product receptors)</b>			

Temperature	°C	35	Temperature
pH		6.5 to 8.4	pH
Suspended solids			Suspended solids
- Gravitational Irrigation	mg/l	200	- Gravitational Irrigation
- Localised overhead irrigation	mg/l	100	- Localised overhead irrigation
Nitrate (N-NO <sub>3</sub> -)	mg/l	30	Nitrate (N-NO <sub>3</sub> -)
Bicarbonate (HCO <sub>3</sub> ) [overhead irrigation]	mg/l	518	Bicarbonate (HCO <sub>3</sub> ) [overhead irrigation]
Sulphates (SO <sub>4</sub> <sup>2-</sup> )	mg/l	250	Sulphates (SO <sub>4</sub> <sup>2-</sup> )

**TABLE D Drinking Water Standards**

PARAMETER	UNITS	A1-G	A1-I	A2-G	A2-I	A3-G	A3-I
<b>Toxic Substances</b>							
Arsenic	μ g/l	-	50	-	50	-	100
Cadmium	μ g/l	1	5	1	5	-	5
Chromium (total)	μ g/l	-	50	-	50	-	50
Cyanides	μ g/l	-	50	-	50	-	50
Lead	μ g/l	-	50	-	50	-	50
Mercury	μ g/l	-	1	-	1	-	1
Nickel	μ g/l	-	50	-	50	-	50
Selenium	μ g/l	-	10	-	10	-	10
Pesticides, per substance	μ g/l	-	0.1	-	0.1	-	0.1
Pesticides, total	μ g/l	-	0.5	-	0.5	-	0.5
HPA	μ g/l	-	0.2	-	0.2	-	0.2
<b>Undesirable Substances</b>							
Boron	mg/l	-	1	-	1	-	1
Ammonia	mg/l	0.05	0.5	1	1.5	2	4
TKN	mg/l	1	-	2	-	3	-
Nitrates	mg/l	-	5	-	50	-	50
Phosphorous	mg/l	0.4	-	0.7	-	0.7	-
Barium	mg/l	-	1	-	1	-	1
Copper	mg/l	-	1	-	2	-	2
Zinc	mg/l	-	50	-	5	-	5
Manganese	mg/l	-	0.1	0.1	0.1	1	-
Dissolved iron	mg/l	-	0.3	1	2	1	3
Fluorides	mg/l	0.7	1.5	0.7	1.5	0.7	1.5
Dissolved hydrocarbons	mg/l	-	0.05	-	0.2	0.5	1
Phenols	mg/l	-	0.01	-	0.05	-	0.1
Anionic detergents	mg/l	-	0.5	-	0.5	-	0.5
<b>Physical-chemical Parameters</b>							
Temperature	°C	20	30	20	30	20	30
pH		6.5-8.5	-	6.5-9.2	-	6.5-9.2	-
Conductivity at 20° C	μ S/cm	1300	2700	1300	2700	1300	2700

Chlorides	mg/l	300	750	300	750	300	750
Sulfates	mg/l	200	-	200	-	200	-
Suspended materials	mg/l	50	-	1000	-	2000	-
Dissolved Oxygen	mg/l	7 (90%)	-	5 (70%)	-	3 (50%)	-
BOD5	mg/l	3	-	7	-	10	-
COD	mg/l	-	-	25	-	40	-
Oxydability	mg/l	2	-	5	-	10	-

Category A1: Water requiring a simple physical treatment and disinfection, including filtration, to be drunk.

Category A2: Water requiring normal physical and chemical processing and disinfection, including pre-chlorination, coagulation, flocculation, sedimentation, filtration and disinfection (final chlorination), to be drunk.

Category A3: Waters requiring physical treatment, chemical pushed refining and including disinfection by chlorination, coagulation, flocculation, sedimentation, filtration, adsorption and disinfection (ozone, final chlorination), to be drunk.

Within each category, there are two columns:  
 Column G (guideline values): correspond to the recommended values that surface water to be used for the production of drinking water will satisfy to be classified into one of three categories.  
 Column I (mandatory values): values that are shown are the requirements that any surface water used for the production drinking water must meet to be classified in one of three categories.

**TABLE E Domestic Discharge Standards**

PARAMETERS	UNITS	VALUE
BOD5	O <sub>2</sub> /l	120
COD	O <sub>2</sub> /l	250
Suspended Materials	mg/l	150

**TABLE F Indicative Values for treated Sanitary Sewage Discharge**

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPNb / 100 ml	400a

Notes:  
 a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.  
 b MPN = Most Probable Number