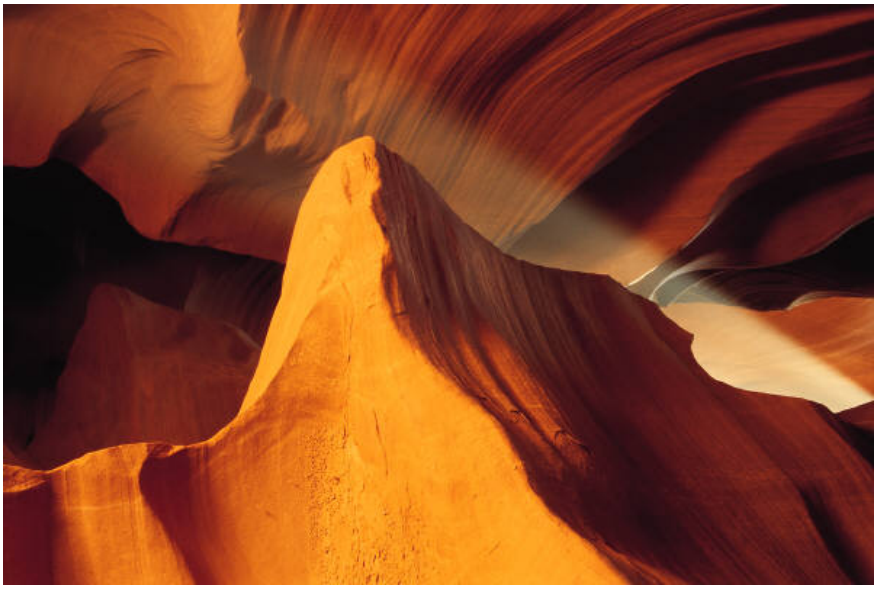
Ouarzazate Solar Power Complex, Phase 1, Morocco

SESIA- Environmental social Management Plant

VOLUME 3



Prepared for:

ACWA Power

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1 INTRODUCTION

This outline Environmental and Social Management Plan has been prepared as part of the SESIA for the Ouarzazate Phase 1 Concentrated Solar Plant 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 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 user 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 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.

It should be noted that, the specific requirements of each IFI cannot reasonably be incorporated into the ESMP, as the IFI's requirements can be contradictory, and may result in confusion. It is common practice for the IFIs to accept a common approach when co-financing projects. Three sets of international environmental standards, which are widely adopted and considered best practice, have been applied to this project and to the ESMP. These are the WB Environmental Safeguard Policies, the IFC standards and guidelines and the Equator Principles.

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 Ouarzazate 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.

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

WB/IFC Standards and Guidelines and Equator Principles (EPs)

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

Principle 4: Action Plan and Management System states the following:

> *"For all Category A and Category B projects located in non-OECD countries, and those located in OECD countries not designated as High-Income, as defined by the World Bank Development Indicators Database, the borrower has prepared an Action Plan (AP) which addresses the relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the*

Assessment. Borrowers will build on, maintain or establish a Social and Environmental Management System that addresses the management of these impacts, risks, and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP".

The Action Plan 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 Action Plan 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 Social and Environmental Management System will incorporate the following elements:

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

In addition, an Environmental and Social Management System that addresses the management of these impacts, risks, and corrective actions is required to comply with applicable laws and regulations, and requirements of the IFC and EHS Guidelines (WB/IFC) as defined in the AP (Equator Principles, Principle 4).

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

'The client will establish and maintain a 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 Objective 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. 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.

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.

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 Ouarzazate 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 Ouarzazate 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; and
- 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.

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) Law Guide'. The guide will be updated annually, by a qualified professional and may be used as an audit protocol.

Further information in this regard is discussed in Chapters 3 and 4 of this SESIA.

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), cultural heritage (e.g. archaeological finds), ecology (e.g. protected fauna/flora), ground/soil quality (contamination issues), noise and vibration, water resources, waste management, 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 Ouarzazate 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 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; 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.

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 2-1 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.

Table 3-1 Roles and Responsibilities – Construction Phase

Role	Environmental Responsibilities
Project Director/ Manager	• Understand the requirements and objectives of the CESMP; • Ensure resources (personnel and financial) are provided to prepare and implement the CESMP; • Overall responsibility for environmental and social performance; • Approve reports of environmental issues and non-conformance to the client in the regular reporting and when any issues arise; • Facilitate proactive communication between all role-players in the interest of effective environmental and social management; • Implement temporary work stoppages where serious environmental or social infringements and noncompliance occur; • Enforce compliance with CESMP and all legal regulations; • Ensure all employees undergo environmental and social training; and • Ensure the CESMP is updated and approves the final updates

Role	Environmental Responsibilities
Environmental /Social Coordinator	• Set up program for regular monitoring; • Follow up community complaints; • Conduct inspections to monitor environmental performance and compliance with the CESMP by contractors; • Check CESMP compliance with legal requirements on regular basis; • Ensure the environmental and social meetings are held on a regular basis; • Communicate and advise PM and subcontractors on environmental and social aspects; • Report, investigate and follow up on incidents (environmental and social); • Establish corrective action plan for any non-compliance including action plan for prevention of such misconduct or incident; • Develop, implement and manage the environmental and social training program

Role	Environmental Responsibilities
Construction Manager and Site Manager	• Responsible for overall environmental performance of the contractor and subcontractors; • Allocate sufficient resources to ensure compliance and effectiveness of CESMP; • Ensure sub-contractors have a copy of the CESMP and are aware of their environmental obligations; • Enforce compliance with CESMP and all legal regulations; • Communicate environmental and social aspects with PM and HSE managers; • Ensure Environmental training is undertaken; • Ensure community complaints are addressed; and • Maintain document registers for training, incidents, waste management and other related environmental reporting requirements.
Site Manager	In addition to the above: • Enforce environmental measures on lower levels; • Ensure compliance with CESMP directly on site; • Communicate environmental and social aspects with Environmental/Social coordinator and lower level management and personnel; • Report all incidents and non-compliance to PM and Environmental/Social coordinator.

Role	Environmental Responsibilities
Sub Contractor - Foreman	• Implement the requirements of the CESMP; • Allocate the necessary resources to ensure compliance and effectiveness of the CESMP; • Cooperate with the Environmental/Social Coordinate to ensure that site inspections and training are conducted; • Comply with the observations and requirements for corrective actions, which are issued by the inspector; • Report all incidents and non-compliance to Site manager; • Notify the Construction Manager/Site 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; • Maintain a register of incidents and waste management for future audits; • Maintain a register of complaints and correction actions
Construction Workers	• Undergo environmental and social awareness training; • Understand environmental procedures and environmental /social aspects relevant to activities; • In case of any accident or non-compliance report that immediately to foreman.
Visitors	• All visitors must comply with the CESMP, 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 Ouarzazate SPC. The following chapter provides an outline of the environmental management plans, which will be required during the operational life of the proposed project.

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 Ouarzazate Solar Power project, which will be in accordance with the procedures outlined in the Equator Principles and WB/IFC EHS Guidelines.

The purpose of preparing and implementing the OESMP is to eliminate 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 identity 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;

- Establish significant Environmental and Social Aspects;
- 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.

Documentation and communication protocols will also be required to be identified within the OESMP. Communication protocol will include

I. Incident/emergency communication procedure,

II. Internal communications, external communications,

III. 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 – to detail monitoring equipment/methods and schedule;
- 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, only the AfDB requires that costs be estimated, and in this respect 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.

5.1 Air Quality and Emissions

The primary impacts on air quality associated with the construction and operation of the Ouarzazate 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
Dust Generation	Minimise vehicles and plant movements over unsealed roads. Establish paved/tarred access roads in order to minimise dust.	EPC and Subcontractor		As soon as the works start and throughout construction period. Cost should be integrated into the contract
	Vehicle speeds will be restricted to 15Km/h on haul roads and un-surfaced areas of the site.		Daily	
	All vehicle loads will be covered by a tarpaulin and will not be overloaded.			
	Regular wetting down of haul roads by water trucks.		Several times a day	
	Contractor vehicles to access site on newly constructed tarmac road to Phase 1 site to avoid impact on local traffic to Tasselmant			Cost of the road construction is specified in the SDP. Fence cost is 100-200DH per meter.
	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.			
	Any aggregate or dusty material stockpiles will be stored in enclosed structures. Alternatively temporary piles can be covered with impervious sheeting.		Daily	
	Avoid or minimize excavation activities on windy days.			
	Site will be fenced using either fabric or boards.			
	Routinely inspect dust generation and recommend corrective actions.		Daily	
	No burning of wastes will be allowed on site throughout the construction phase.			As soon as the works start and throughout construction period. Cost should be integrated into the contract.
Exhaust Emissions	Modern machinery, with adequate emission control equipment will be used.			
	Suitable fuels will be used for construction machinery, vessels and vehicles (particularly low sulfur diesel).			
	Trained personnel will operate machinery properly and efficiently.			
	Regular maintenance and inspection for all construction plant,			

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	vehicles and vessels (to be documented and checked by site supervisor's representative).			
	Minimise idling of construction machinery, maximise efficiency of trip times.			
	Plant maintenance will be carried out off-site in appropriate premises, unless in emergency situations, to contain a spill.			
	Routinely check equipment for smoky exhausts, and recommend appropriate corrective actions.		Daily	
	Smoky equipment to be given defect notices until repaired and approved for re-deployment by site supervisor.			As soon as the works start and throughout construction period. Cost should be integrated into the contract
Volatile Emissions, Odours	Chemical storage areas will be purposed built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.			
	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.			
	Pump out any stagnant waters from excavations		As needed	

Table 5-2 Air quality mitigation measures – operational phase

Subject	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Dust and emissions from Solar Power facilities (i.e. Stack Emissions)	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.	O&M		As soon as the operation start and throughout operation period. Cost should be integrated into the operational
	Empty containers will be disposed in dedicated waste storage areas.		Daily	
	Worker training will include material handling, equipment maintenance and good housekeeping practices.			

Subject	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Continuous stack emissions monitoring		Daily	budget
	Ambient air quality monitoring program will be implemented in the event of complaints from the community.		**As required**	
	Refer to Construction Phase Mitigation measures for additional recommendations			
Volatile emissions	All chemical storage facilities and containers will be appropriately sealed and labelled. (HTF, Wastewater treatment Fluids)			
	Fuels and chemicals will not be stored in direct sun and/or exposed to extreme heat.	O&M		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
	Refuelling will be carried out in a controlled manner using appropriate equipment to minimise volatile emissions.		Daily	
	Develop a Leak and fire contingency plan. This is discussed further in Chapter 23.			
Indoor air quality	Building design and construction will ensure adequate ventilation and cooling.			

5.2 Soil Protection

The main soil impact issues associated with the construction and operation activities of the proposed project are identified in Chapters 6 (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: • Hazardous Materials Handling Plan; • Hazardous Waste Management Plan.	EPC and Subcontractor. O&M		As soon as the works start and throughout construction period. Cost should be integrated into the contract.
	Develop a spill response plan.			
	Store chemicals, hazardous substances and waste only in purpose built areas/structures			As soon as the operation start and throughout operation period. Cost should be integrated into the operational budget. Cost per Spill kit is 1000DH
	Routinely inspect storage areas and all containers for any spills and leaks		Daily	
	Routinely inspect all equipment handling hazardous materials for leaks and spills.			
	Spill kits will be readily available near refuelling stations, chemical storage areas and any potential spillage area. Back-up supplies will also be ensured.			
	All chemicals will be handled in accordance with relevant instructions (MSDS)			
	Reduce quantity of chemicals and fuels on site to minimum practicable levels			
	Only personnel with adequate training will be allowed to handle fuel and chemicals			
	Adequate control measures must be taken to ensure that all servicing, refuelling, storage and waste disposal will be carried out in designated, sealed areas.		Daily	
	Ensure all workers are aware of their responsibilities to minimize soil pollution.			

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.			
	Regularly maintain all plant, machinery and vehicles. Replace any broken parts immediately.			
	Ensure efficient operation of all plant and vehicles.			
	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.			
	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 the construction phase.		Daily	

Table 5-5 Noise and Vibration mitigation measures – operational phase

Subject	Mitigation measure (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Noise and vibration	Site plant will be contained within insulated buildings with suitable noise controls.	Project Owner and O&M		As soon as the operation start and throughout operation period. Cost should be integrated into
	Enclose fans, insulate ventilation pipes and use dampers.			
	Develop and implement a noise management plan that proposes detailed actions to mitigate against noise impacts.			
	Use buffers, such as walls and mounds to minimise noise transference.			

Subject	Mitigation measure (operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Office buildings will include insulation against outside noise impacts.			the design operational budget
	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	

Additional applicable mitigation measures are provided in the construction phase table.

5.4 Waste Management

The main waste impacts associated with the construction and operation activities of the Ouarzazate 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
Waste Management	Prepare a site-specific Waste Management Plan (WMP).	EPC and Subcontractor. O&M		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.			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
	Re-use or recycle construction waste such as wood and metal.		Daily	
	Ensure appropriate disposal of empty containers (Hazardous Waste Management)			
	Ensure collection and disposal of putrescible waste			
	Waste collection and disposal will be carried out by licensed contractors to appropriate facilities.			
	A log will be kept to record the waste streams and volumes/weight of all wastes generated, treated and transported from the facility.			
	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.			
	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.			
	The design and maintenance of waste containers will conform to local and international standards.			
	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.			
	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 Ouarzazate SPC are identified in Chapters 10 and 11 (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
Erosion	Adequate drainage systems will be provided to minimize and control infiltration. Sediment traps (i.e. filter fabric) will also be installed.	EPC and Subcontractor		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.			
	Stockpiles will be located on flat and sealed areas.			
	Stockpiles will be covered and the height and slope limited, to minimise erosion during rainfall.			
	Regular inspection of the sedimentation/erosion controls will be regularly conducted.		After rain events	
	Disturbed areas will be stabilised to minimise further erosion.			
Chemical use and storage	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.			
	Copies of the Material Safety Data Sheets (MSDS) will be kept in the bunded area and at the site office.			
	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.			
	Staff will be trained in the use of the spill kits, and an emergency spill response team will be established.			
	Chemical handling and refuelling will be conducted over sealed grounds/designated areas, in a controlled by trained personnel.		Daily	

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Construction-phase Emergency Response Plan will be developed and implemented by training and providing the necessary equipment.			
Wastewater and Stormwater	Washing of concrete ready-mix tucks will be carried out in designated areas so as to prevent soil and groundwater contamination.		Daily	
	Mixing effluent streams – ground water, vehicle wash water, domestic grey water, sewage effluent etc., is prohibited and shall not be permitted anywhere on-site.			

Table 5-8 Water quality mitigation measures – operational phase

Subject	Mitigation measures (operational phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Wastewater discharge	Conduct regular checking and monitoring of water quality and discharges from: • Wastewater Treatment Plant; • Cooling water system; • Evaporating Ponds; and • Stormwater system.	O&M	Weakly	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 IFC/WB and national regulations.			
	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.			
	Maintain stormwater-handling systems and routinely monitor effluents		Daily/Weekly	
Storage and use of chemicals, raw process materials	Design wastewater collection system and location of chemical storage facilities to prevent impacts to water resources.			
	Storage of chemicals and other hazardous materials will be in adequately designed and securely bunded structures.			
	Liquid storage tanks will be inspected and pressure tested for potential leaks.		As per design specification	
	Additional applicable mitigation measures are provided in the previous table and chapters 22.5 and 22.6			
	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
	Maintenance or washing of vehicles, and plant will carried			

Subject	Mitigation measures (operational phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	out in dedicated areas with a wastewater drainage system.			operation period. Cost should be integrated into the design operational budget. Irrigation system cost 100-150DH per meter
	Develop and Implement the Emergency Response Plan.			
Irrigation water (if used)	Install an irrigation system to limit water wastage and avoid run-off of nutrient rich waters to the stormwater system and limit fertiliser application.			
Water use minimisation	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.			

Additional applicable mitigation measures are provided in the previous table.

5.6 Terrestrial Ecology

No fauna or flora species of threatened or rare status were identified within the Ouarzazate Solar Power Project site or in the immediate adjacent areas. However, the adjacent Wadis 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.

- 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.
- Ensure that wastes from sites are cleared and workers are informed of the requirement to not hunt or injure local wildlife such as raptors;
- Only native vegetation will be planted on site with regards to landscaped areas; and
- Establish procedures for the occasion any species are found on the construction site including procedures for reporting, identification and potential relocation.

5.7 Socio-Economic

The socio-economic opportunities arising from the project have been identified in the assessment described in chapter 13. 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-Economic mitigation measures – Construction phase

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Social Environmental Management	Integrate Social Management Actions from the ESIA into the EPC Project Environmental Health and Safety Plan (EHSP)	EPC and Subcontractors	Review procedures, manuals, notice boards, points of contact etc…. as need basis	Within one month of Financial Close
	Subcontractors to integrate requirements of EPC CESMP into their own documents and procedures.	Subcontractors		Within one month of Financial Close
	Undertake sufficient and necessary monitoring measures in accordance with the specifications in the relevant environmental issues discussed in the ESIA	EPC and Subcontractor		As soon as the works start and throughout construction period. Cost should be integrated into the contract
	Develop public and employee communication procedures and notice boards, to provide a means for raising any grievances.			
	Facilitate access to information by the public; ensure transparency in the Social actions implemented.			
Labour and Work	Protect and promote the health of workers, especially by promoting safe and healthy working conditions	EPC and Subcontractors		As soon as the works start and, and

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Conditions	Establish and maintain a sound worker-management relationship			throughout the construction phase
	Promote the fair treatment, non-discrimination and equal opportunity of workers			
	Comply with labour laws			
	Implement the actions and recommendations of MASEN's Socio Economic Impact Study to help boost local employment, knowledge development, economic trade and participation.			
	Provide complaints mechanism for employees and an action plan to address them.		HSE reports	
Community Health, Safety and Security	Prevent or minimize impact on community by implementation of EPC EHSP	EPC and Subcontractors		Throughout construction period. Integrated into the construction budget. Cost of Fence is 100-200DH per meter.
	Construct a fence line around project			
	Prepare Emergency Response Plan			
	Maintain open communication channels with local communities			
	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			
	Notify community of any disruptions to services with a minimum of 1 week notice.			

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Land Acquisition, Involuntary Resettlement	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.	Not applicable	Not applicable	Not applicable
	A new access road to Tasselmante Douar is being built.	MASEN Subcontractor		On going

The project site is situated on community land covering about 3,500 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.

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 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 identity and address any complaints. **Verbatim Source**: ESIA Executive Summary. AfDB Ourazazate Solar power Station, P-MA-DC0-003.

Biodiversity Conservation, Sustainable Management of Living Natural Resources	*The site is located far from any protected natural or tourist areas.*			
	Minimize land use	EPC and Subcontractors		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			

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
	Restore habitat of land used for lay down area			
Cultural Heritage	Upon discovering of cultural and or archaeological assets during site excavation, immediately stop work and notify the relevant authorities	EPC and Subcontractors	Daily monitoring	During excavation phase of the project
Information Disclosure and Stakeholder Engagement	Preparation of SEP, and updating SEP as necessary	Project Owner		At early planning stage throughout the construction period.

A detailed Socio Economic Impact Study was launched by MASEN and completed in the last quarter of 2011. This study, was based on a participatory approach, and provided a detailed socio-economic profile of the project area and identified opportunities as well as economic development and social impacts before and after the construction and commissioning of the solar power station. The study has helped to determine actions that should accompany the project in order to boost local development. The study should be provided to the EPC for integration of identified measures into the social action plan. **Verbatim Source**: ESIA Executive Summary. AfDB Ourazazate Solar power Station, P-MA-DC0-003

Table 5-10 Socio-Economic mitigation measures – Operation phase

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Social Environmental Management	Integrate Social Management Actions from the ESIA into the Project Environmental Health and Safety Plan (EHSP)	Project Owner		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.			
	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		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 basis	Cost estimated in the Socio-Economic

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
				Action Plan
	Improve infrastructures so as to improve the lives of the nearby villagers	O&M		
	Prioritize employment and subcontracting at the local level			
	Create a tourist site within the solar complex	Project Owner and O&M		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
Labour and Work Conditions	Prepare Human Resource Policy	O&M		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.			
	Provide grievance mechanism.			
	Implement the actions and recommendations of MASEN's Socio Economic Impact Study to help boost local employment, knowledge development, economic trade and participation.			
Community Health, Safety and Security	Prevent or minimize impact on community by implementation of O&M EHSP.	O&M		Throughout operation phase
	Prepare Emergency Response Plan.			
	Maintain open communication channels with local communities.			

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
Land Acquisition, Involuntary Resettlement	Pastoral activities will be organised in the spaces located between the solar collectors.	O&M		Throughout operation phase
Biodiversity Conservation, Sustainable Management of Living natural Resources	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			
Information Disclosure and Stakeholder Engagement	Updating SEP as necessary	Project Owner		Throughout the operation period.

The amount gained from the sale of the land of the Ait Oukrour 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

Issue	Mitigation measures (Operation phase)	Parties responsible	Monitoring	Implementation Schedule/Cost
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 identity 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 14 (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
Off-site Traffic	Schedule major material supply for off-peak hour traffic.	EPC and Subcontractor. O&M		As soon as the works start and throughout construction period. Cost should be integrated into the contract.
	Encourage car pooling by site workers.			
	Designate parking/staging areas. Provide adequate parking stations for the estimated numbers of visitors to the site (workers and suppliers).			
	MASEN and the Consortium may engage in discussions with the public transport authority to increase public transport to the site.			
	Allow for easy access to public transport routes from the site.			As soon as the operation start and throughout operation period. Cost should be integrated into the operational budget
	Clearly identify truck routes and entry points for heavy vehicles entering the site.			
	Site operations will be monitored to ascertain that congestion is minimised outside the site, and to minimise traffic impacts on local roads networks, particularly through the city of Ouarzazate.		Daily	
	If congestion is observed, consider monitoring traffic numbers at entry/exit point			
On-Site Traffic	Develop a Traffic Management Plan (operation).			
	Clearly post site entry / exit signs. Use 24hr security and document all vehicles entering/exiting the site.			
	Clearly post on-site speed limits, recommended 5Km/hr during construction and 10Km/hr during operation.			

5.9 Archaeology and Cultural Heritage

No archeologically significant or cultural heritage sights have been identified within the Ouarzazate SPC or in the immediate adjacent areas. However, in the event that any artefacts are unearthed during the excavation works, the following steps will be implemented to prevent and minimise any further damage to the site.

Potential heritage items or relics can include:

  - Evidence of historical occupation (such as aged building remains), pottery, flint 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.
- The possible or confirmed existence of heritage objects or places, and any suspected 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 and vibration, resulting from vehicles and equipment.

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 2010.
- Meeting with the CNEIE to discuss the framework of the ESIA. December 10th 2010.
- Public Enquiry for the FESIA was held in September 2011.
- A presentation of the ESIA framework and environmental acceptability was given to the CNEIE. February 22nd 2012.
- Second Public Consultation to provide an update of the ESIA framework. March 6th 2012.
- MASEN provided a presentation of the results of the FESIA on April 24th 2012.

However, in order to meet the EFI's requirements, additional and project specific public consultation was carried out by Phénixa on November 2nd 2012.

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 two national newspapers and the invitation of identified stakeholders in the province of Ouarzazate. The meeting was lead by representatives of Phenixa, ACWA Power and MASEN. Arabic and French were spoken during the meeting and 40 people attended.

An initial presentation was undertaken to outline the main elements of the first phase of the Ouarzazate 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:

- 40% of participants were local stakeholders (politicians, inhabitants of the Ghassate commune, cultural associations, etc.)
- 32.5% represented different government bodies such as the Délégation de Energies et Mines, Délégation de l'ABHSM (Agence du Bassin Hydraulique de

Souss Massa), Haut commissariat aux Eaux et Forets, Agence urbaine de Ouarzazate, Délégation du Ministère de la Santé..etc) and

- 27.5% were representing local private companies.

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, 53% were direct questions and 47% were proposals or comments. The following is a summary of the perspectives and concerns of the stakeholders:

- 34.5% points raised issues related to health, particularly concerns about air emissions and waste water,
- 17% of the comments were about water use,
- 24.5% referred to the protection of the local environment in relation to the fauna and cultural environment and
- 24% raised concerns about social and economic issues, in particular the delayed compensation for land acquisition and the use of local labour in the project.

The following table summarises the most commonly raised questions and concerns raised, and the mechanism proposed/addressed in the design of the project:

Question/Concerns	Project's Design
What is the destination of the water used in the plant? What is the quality? Will the water be reused by the population or for irrigation?	The used water of the plant will be treated in accordance with Moroccan wastewater treatment standards. The treated water will be recycled for use by the plant. This helps to minimise overall use of the water resource in the region.
Is the industrial water (washing mirrors, cooling, other) harmful to the natural environment? What is the destination of these waters?	The water will be treated within specialised chemical waste treatment facilities. The untreated wastewater never comes into contact with the environment, as the system is a closed/contained drainage system from the

	wastewater generating facilities to the treatment plant. Any remaining treated water, that is not recycled to the plant, is evaporated in specifically designed ponds (they are sealed, therefore no leaching can occur).
What is the impact of the project on historic and cultural heritage?	MASEN has developed a voluntary action plan to mitigate against any perceived social issues. A specific socio-economic study has been carried out to identify the mechanism and activities that can be implemented using the funds from the land acquisition plan to realise these remedial actions. A tourist centre will be built within the CSP.
N10 national road, has increasingly heavy traffic, and the quality of the road is deteriorating.	MASEN is shouldering the cost of the upgrade of a new road to Tasselmant.
What are the actual measures taken to avoid disruption of traffic through the N10?	Construction traffic will be monitored for density, frequency and speed. Schedules and timing of deliveries will be organised around the least busy times of day. Any changes in the route will be notified to the public via notice boards/publications in a timely manner with alternative routes given and sign posted.
The amount of water used for the operation of the project, will it not be at the expense of local needs in the region (irrigation, drinking water and industrial, etc.)	The water use during construction represents 0.03% of the average contribution to the Mansour Ed Dahbi Reservoir. The water use during operation represents 0.41% of the average yearly contribution to the Mansour Ed Dahbi Reservoir in the wet

	years, and 2.57% of the lowest recorded yearly contribution to the reservoir. Water will be treated and recycled at the plant, further minimising the reliance on the Dam's supply.
Measures to mitigate adverse impacts on flora and fauna should be developed.	The lay down areas and construction measures have been clearly defined, and mechanisms to avoid and limit impacts are clearly outlined in the SESIA. Preserving the seed bank, replanting of native species and remediation in kind are some of the many mechanisms that will be implemented.

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

- It allowed for scientific information to be provided regarding the expected extent of impacts on air quality and wastewater.
- It allowed for precise information to be provided about water use.
- It confirmed that the concerns raised by the population (employment of local people, air pollution, wastewater discharges) were in line with the mitigation measures being proposed (e.g. 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).

The amount of issues raised and the time that it took to reply to them made the meeting to last over an hour and a half over the expected time. This time allowed for a proper discussion and addressing of the concerns raised.

Several issues were raised on the meeting that lay beyond the aim of this SESIA. These included questions to MASEN regarding delays in compensation for land acquisition from the Provincial Government, issues about the implementation of mitigation measures agreed for the FESIA, such as the calendar for the execution of a road to some villages in the areas that lie beyond the study area, or the preparation of a framework for

collaboration between MASEN and the Ministry of Health to improve healthcare infrastructure in some areas of the province.

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 form 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 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 bunded, located in the waste storage area, and labelled and treated as hazardous waste. All equipment will be stored in a safe location on site in close proximity to the storage and waste areas. This material is to be used to contain and clean up pollution/spills, care will be taken to dispose of any absorbent materials properly. The Supervisor and Environment Coordinator will keep stocks well maintained and replenished.

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 bunded location to prevent leakage will the barrels suffer corrosion.

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

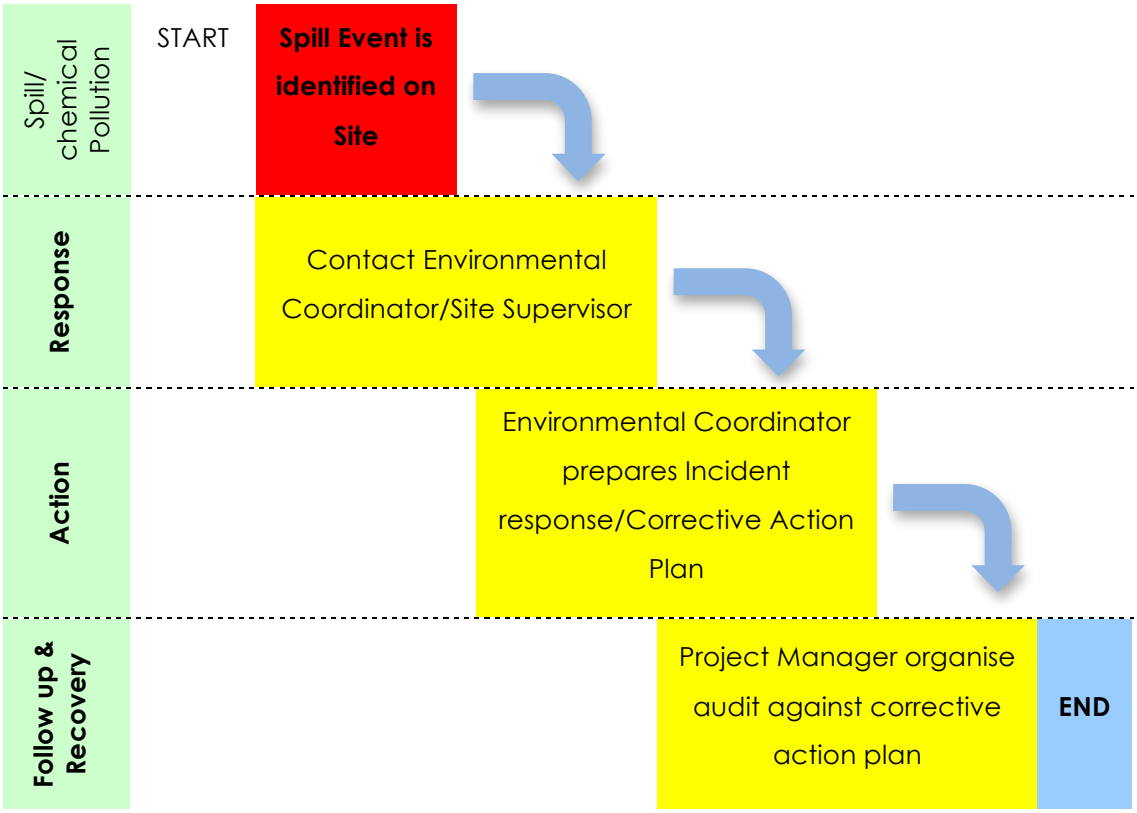
- Barrels will be placed on plastic or wooden pallets in the temporary double plastic lined bund and not directly on the plastic; and
- Conventional metal barrels will not be used, however if there are no alternatives the materials may be stored in them providing they are covered with plastic sheet tightly fastened to prevent Aeolian distribution and again are stored in an appropriately bunded location to prevent leakage will the barrels suffer corrosion.

All contaminated materials that cannot be collected and disposed are to be cleaned in-situ. This cleaning is to be undertaken by an approved service 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 Ouarzazate 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. These guidelines/requirements will be considered while preparing a project-specific monitoring plan.

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).

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, SO2, NOx 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.

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 (cooling system)		✓
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 form 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 PM_{10}.

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 PM_{10}. 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_5, 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.

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 Ouarzazate 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.

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 PM_{10}, SO_2, 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 Ouarzazate 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.

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_5, 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

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
Preparation/ Conception							
	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_2, NO_2, VOCs	As specified in Figure 8-1 of vol.1 of the SESIA	Diffusion tubes detailed description section 8.3 vol 1	November 2012	Establish baseline phase 1 CSP plant	Paid	5Capitals
	SESIA monitoring- Air Quality - Dust	As specified in Figure 8-2 of vol.1 of the SESIA	PM_{10} Monitoring Stations Detailed description section 8.3 vol 1	November 2012	Establish baseline phase 1 CSP plant	Paid	5Capitals
	SESIA monitoring- Noise	As specified in Figure 9-1 of vol.1 of the SESIA	Noise meter – detailed description section 9.3 vol 1	November 2012	Establish baseline phase 1 CSP plant	Paid	5Capitals
	SESIA monitoring- Soil-	As specified in Figure 6-1 of vol.1 of the SESIA	Soil samples – detailed description section 6.3 vol 1	November 2012	Establish baseline phase 1 CSP plant	Paid	5Capitals
	FESIA / LAP / SDP community consultation	Input community concerns	Described FESIA / lap / SPD	2010-2012	Incorporate community concerns for the	Not available	MASEN / Phenixa / Burgeaup

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
		about the SPC. Gather information about social impacts.			design f the SPC		
	SESIA community consultation	As specified in the public consultation section of the SESIA	As specified in the public consultation section of the SESIA	November 2012	Incorporate community concerns for the design on the phase 1 CSP plant	Paid	5Capitals
Construction							
	Air quality - PM_{10}	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	Standard noise monitoring methodology, as	Weekly	Construction activities increase noise	To be covered by the EPC (indicative cost	EPC

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
		receptors	described in the baseline monitoring survey.		levels (nuisance, disturb fauna, work hazard)	noise meter 2000-5000 MD)	
	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 EPC (indicative cost noisemeter 2500-6000 MD)	EPC
	Wastewater –In situ parameters - Temperature	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 continuos sonde 25,000 – 70,000 MD)	EPC
	Wastewater –In situ parameters - pH	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 continuos sonde 25,000 – 70,000 MD)	EPC
	Wastewater –In situ parameters - TSS	Discharge from wastewater	In-situ standard methodology (follow testing	Continuous	Determine treated wastewater	To be covered by the EPC (indicative cost	EPC

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
		treatment	equipment specifications for use)		suitability for reuse or discharge to evaporation ponds	multiparameter continuos sonde 25,000 – 70,000 MD)	
	Wastewater –In situ parameters - TDS	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 continuos sonde 25,000 – 70,000 MD)	EPC
	Wastewater –Ex situ analysis– 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 continuos sonde 25,000 – 70,000 MD)	EPC
	Wastewater –In situ analysis– 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	To be covered by the EPC (indicative cost multiparameter continuos sonde 25,000 – 70,000 MD)	EPC

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
					ponds		
	Wastewater –In situ analysis– 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 continuos sonde 25,000 – 70,000 MD)	EPC
	Wastewater –Ex situ parameters – BOD_5	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 – COD	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,	Discharge from wastewater	Ex-situ analysis of samples following a certified	Monthly	Determine treated wastewater	To be agreed between the EPC and an	EPC

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
	chromium, copper, lead and nickel)	treatment	laboratory methodology		suitability for reuse or discharge to evaporation ponds	accredited laboratory	
	Wastewater –Ex situ parameters – Nutrients	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 – 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 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	EPC / subcontractors

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
						contractors	
	Ecological status	Wadies and canyons surrounding the site	Count of fauna species, monitoring flora	Monthly	Monitor ecology around the site	To be covered by the EPC.	EPC
	Social Development Plan (SDP)	In the area of the project	Masen will prepare 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	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

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
			stakeholders.				
	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
	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
Operation							
	Air quality – Stack emissions - PM_{10}	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 – Stack emissions - SO_2	Stack	Collection and analysis of samples taken on the stack following up to	Monthly	Even though combustion emissions will be infrequent, harmful air	To be determined by the O&M (can be undertaken in-house,	O&M

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
			date EPA method		pollutants need to be monitored	subcontracted, etc…)	
	Air quality – Stack emissions - NO_x	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
	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

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
	Wastewater –In situ parameters - Temperature	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 continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –In situ parameters - pH	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 continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –In situ parameters - TSS	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 continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –In situ parameters - TDS	Discharge from wastewater treatment	In-situ standard methodology (follow testing equipment	Continuous	Determine treated wastewater suitability for	To be covered by the O&M (indicative cost multiparameter	O&M

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
			specifications for use)		reuse or discharge to evaporation ponds	continuos sonde 25,000 – 70,000 MD)	
	Wastewater –Ex situ analysis– Residual Chlorine	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 continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –Ex situ analysis– 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 O&M (indicative cost multiparameter continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –In situ analysis– 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 O&M (indicative cost multiparameter continuos sonde 25,000 – 70,000 MD)	O&M

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
	Wastewater –In situ analysis– 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 O&M (indicative cost multiparameter continuos sonde 25,000 – 70,000 MD)	O&M
	Wastewater –Ex situ parameters – BOD_5	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
	Wastewater –Ex situ parameters – COD	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
	Wastewater –Ex situ parameters – Heavy Metals (Cadmium, chromium, copper,	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory	Monthly	Determine treated wastewater suitability for	To be agreed between the O&M and an accredited	O&M

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
	lead and nickel)		methodology		reuse or discharge to evaporation ponds	laboratory	
	Wastewater –Ex situ parameters – Nutrients	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
	Wastewater –Ex situ parameters – 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 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

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
	Ecological status	Wadies and canyons 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
	Emergency monitoring	Not applicable	Register emergencies and follow-up-remediation	Every time there is an emergency	Register emergencies and follow-up-remediation	To be covered by the O&M .	O&M
Supervision (during the construction and operation phases)							
	Independent Environmental Audits – Documentation	-	The auditors will review the environmental documentation kept at the plant, checking the adequate implementation of	Quarterly	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the	To be agreed with independent environmental experts	EPC (construction) O&M (operation)

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
			the environmental procedures establish in the ESMP (CEMP/OEMP) and the application of the mitigation and monitoring measures stated in the SESIA, including the monitoring results		ESMP. The audit reports are sent to the lenders.		
	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	Quarterly	Independent environmental audits provide assurance of	To be agreed with independent environmental	EPC (construction) O&M (operation)

MONITORING PLAN							
Phase	**What** (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Why** (Is the parameter being monitored?)	**Cost** (if not included in project budget)	**Who** (Is responsible for monitoring?)
			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.		compliance with the measures included in the SESIA and the ESMP. The audit reports are sent to the lenders.	experts	

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 Ouarzazate SPC.

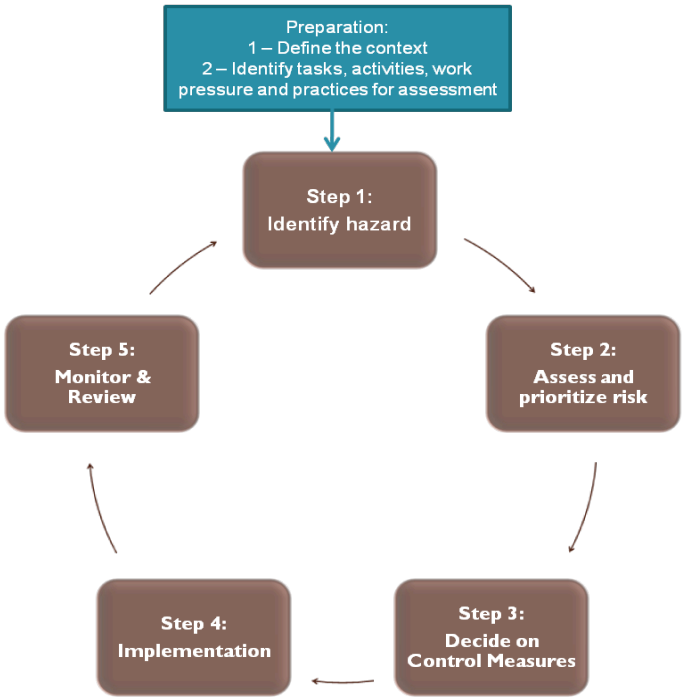
The risk assessment addresses the impacts to the environment that could occur as a result of mishaps or failures during the construction and operation phases of the project. These could be failure of equipment or material or processes. Examples of mishaps are;

- 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 below defines the process for EPC and O&M 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)
Atmosphere/ Waste/Other	Temporary nuisance from noise, dust, odour, other air emissions, greenhouse gases, vibration, visual impact. Results in the generation of significant quantities of non-hazardous wastes.	Minor environmental impact due to contained release of pollutant (including odour, noise and dust) fire 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.

Human health and safety	Minor injuries, which may require self-administered first-aid. Injured personnel can continue to perform normal duties.	Injuries requiring on-site treatment by medical practitioner. Personnel unable to continue to perform normal duties	Serious injuries requiring off-site treatment by a medical practitioner or immediate evacuation to hospital. Potential long term or permanent disabling effects.	Single fatality	Multiple fatalities

Table 8-2 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).
Improvement measures	To reduce or limit the consequences arising from a hazardous event or effect	**Active systems:** **b.** Intended to detect and abate incidents, for example, gas, fire and smoke alarms, shutdowns, deluge **Passive systems:** c. Intended to guarantee the primary functions, for example, fire and blast walls, isolation, separation, protective devices, drain systems **Operational (non physical) systems:** d. Intended for emergency management, for example contingency plans, procedures, training, drills
Recovery Measures	Includes top events	All technical, operational and organizational measures which can – e. Reduce the likelihood that the first hazardous event or 'top event' will develop into further consequences. f. Provide life saving capabilities will the 'top event' develop further.

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

Table 8-5 Hazard and Safety Hierarchy of Controlling Hazards

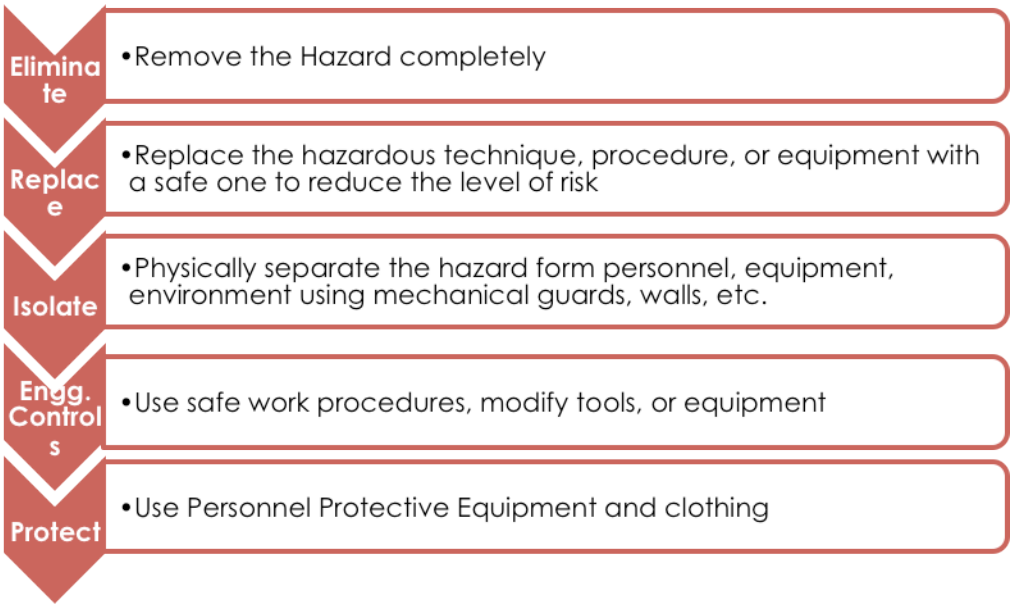
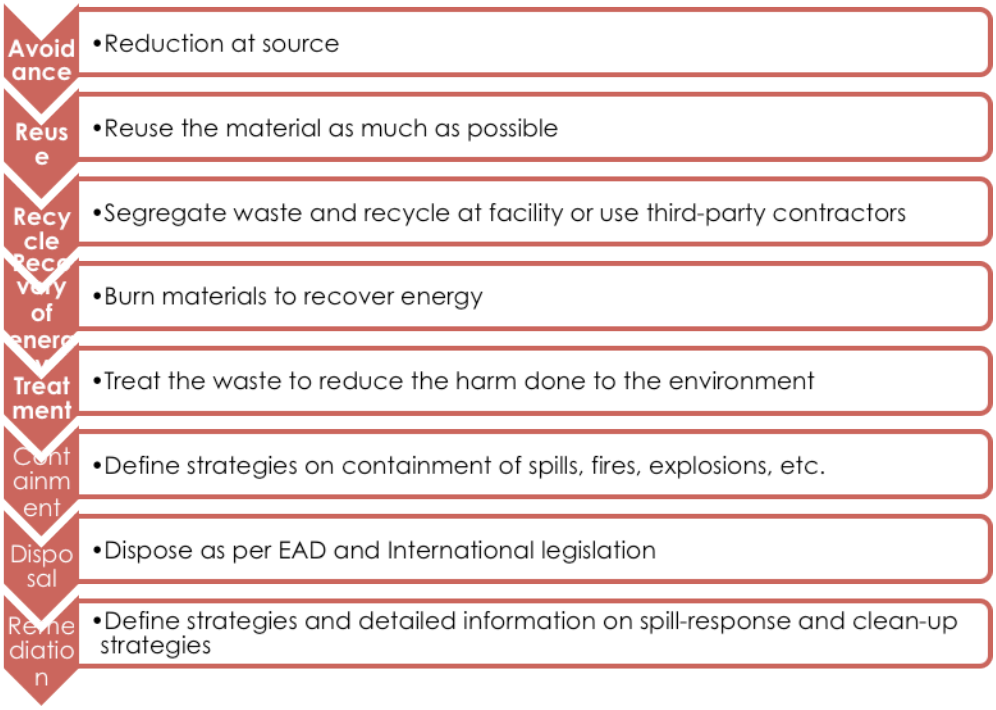


Table 8-6 Environmental hierarchy of Controlling Hazards



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.