Ben Ban, 50 MW

Solar Photovoltaic (PV) Power Facility

Aswan Governorate, Egypt

Environmental Impact Assessment Form B

Volume 2. Environmental Management Plan

Prepared for: Access Egypt Solar One

March 2016

5 Capitals Environmental and Management Consulting
PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Tel: +971 4 343 5955 Fax: +971 4 343 9366

Table Of Contents

List of Tables

List of Acronyms

Abbreviation	Meaning	Definition
CAA	Competent Administrative Authorities	
EBRD	European Bank for Reconstruction and Development	
EEAA	Egypt Environmental Affairs Agency	
EIA	Environmental Impact Assessment	
EMP	Environmental Management Plan	
ESMMP	Environmental and Social Management and Monitoring Plan	
ESIA	Environmental and Social Impact Assessment	
ESSR	Environmental and Social Scoping Report	
E&S	Environmental and Social	
FIT	Feed-in-tariff	
IFC	International Finance Corporation	
IFI	International Finance Institution	
	Mitigation Hierarchy	The mitigation hierarchy comprises measures taken to avoid creating environmental / social impacts from the outset of development activities, and where this is not possible, to implement additional measures that would minimise, mitigate and, as a last resort, offset and/or compensate any potential residual adverse impacts.
NREA	New and Renewable Energy Authority	

Abbreviation	Meaning	Definition
PBF	Priority Biodiversity Feature	Biodiversity that is particularly irreplaceable or vulnerable which include: (i) threatened habitats; (ii) vulnerable species; (iii) significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas or Important Bird Areas); and (iv) ecological structure and functions needed to maintain the viability of priority biodiversity features
PRs	Performance Requirements	
WB	World Bank	
5 Capitals	5 Capitals Environment and Management Consultancy	

1 Introduction

Volume 2 is the project-specific Environmental and Social Management Plan (ESMP), or Environmental Management Plan (EMP) and provides the project-specific environmental and social mitigation measures and monitoring programmes for both construction and operational phases. This Project-specific EMP is a requirement of the Egyptian Government (Annex Five (5) of the Guidelines of Principles and Procedures for Environmental Impact Assessment, Form B). The ESMP is a requirement of the international Lenders as part of their obligations to the Equator Principles and EBRD PRs.

Regarding the dismantling phase, the solar power project is subjected to a 20-25 years FiT. If after these 20 to 25 years dismantling is decided, then the project company would be required to proceed with a preliminary assessment of the environmental and social impact of decommissioning in accordance with applicable national and international environmental regulations, and environmental policies at the time of decommissioning. The DESMP will be reviewed on the basis of this assessment.

1.1 EMP/ESMP Objectives

This EMP/ESMP contains a set of project-specific management tools that include mitigation and monitoring measures to be implemented at different stages (construction, commissioning and operation) to eliminate, offset or reduce adverse environmental impacts to acceptable levels. Elimination, prevention, or enhancement can be achieved by reducing the scale of the activities or introducing mitigation measures, which results in a minimisation of negative impacts, or increase of positive impacts. The main objectives of this EMP/ESMP are:

- Ensuring compliance with regulatory authority stipulations and guidelines which may be national and/or international;
- Ensuring that there is sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts;
- Realizing environmental and social goals and objectives for the project;
- Verifying environmental and social performance through information on impacts as they occur;
- Responding to changes in project execution not considered in the impact assessment process thus far;
- Responding to unforeseen events; and
- Providing feedback for continual improvement in environmental and social performance.

2 Key Regulatory Requirements

The Client and the Contractor will be engaged to conduct their activities in compliance with the applicable E&S standards. The E&S standards related to the development of the Benban project individually, are as follows:

- Egyptian Laws and Regulations including those set out by the Egyptian Environmental Affairs Agency (the **EEAA**), with special attention to the following:
    - The Egyptian Law No. 4/1994 that was amended by law No. 9 of 2009, and its executive amendment no. 338 of 1995 modified by ministerial decrees no. 1741 of 2005, no. 1095 of 2011 and no. 964 of 2015 for the protection and improvement of the environment, and other laws and ordinances that are listed in the SESA and Environmental Specifications;
    - The Egyptian Labor Law No. 12/2003 and other laws and ordinances that are listed in the SESA and Socio-economic Specifications;
- Relevant international conventions and protocols relating to environmental and social issues, as transposed into national legislation;
- EBRD's Environmental and Social Policy and Performance Requirements 2014 and IFC Performance Standards 1-8;
- IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets;
- World Bank Group General EHS Guidelines and EHS Guidelines for Electric Power Transmission and Distribution;
- Stakeholder Engagement: A Good Practice Handbook for Companies doing Business in Emerging Markets;
- EBRD/IFC's Worker Accommodation Guidelines for Construction;
- UN Voluntary Principles on Security and Human Rights; and
- FAO, CSA (2012), Voluntary Guidelines on the Responsible Governance of Tenure.

Applicable Laws and Regulations are further described on Volume 1. Attachments.

3 CESMP Requirements

In order to ensure compliance with E&S legislation, a Construction Environmental and Social Management Plan (CEMP/CESMP) will be developed to manage project-specific E&S risks during the construction phase. The EPC contractor will prepare a CESMP, and all sub-contractors will be obliged to adhere to its procedures. The CESMP will be fully compliant with the requirements outlined in this EMP document for the construction phase. This document includes following and enacting proper management structures and procedures.

The key benefits of a CESMP are to:

- Enable the identification of objectives and targets;
- Address the identified E&S impacts and issues identified in the SESA, and provide specific mitigation to avoid, prevent, reduce or compensate other project-specific E&S impacts as per EBRDs mitigation hierarchy;
- Provide a mechanism for monitoring and measuring of performance during construction; and
- Provide a system for the correction of E&S incidents and to identify and correct unforeseen impacts during the construction processes.

The CESMP is required to cover all construction components of the proposed project and will provide detailed specifications for individual activities. The purpose of these is to reduce the severity of impacts of the construction of the project through avoidance, prevention, reduction and rectification. The actions to be set out in the CESMP are intended to act as a guide and tool for anticipating, recording and ameliorating any potential or actual impacts that may arise. In this regard, the CESMP is designed to specify timing and technical aspects of optimising or reducing positive and negative impacts, respectively and will evolve as the 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 section will be used as a basic structure to provide a foundation upon which the EPC Contractor will develop of a final CESMP, when all the necessary details of the construction process are known, subcontractors are appointed, etc. The following sections describe the minimum contents that will be covered on the final CESMP.

3.1 Applicable Legislation, Policy and Environmental /Social Principles

The CESMP will need to include a legislation and policy section detailing the following:

- Specifies the overall policy statement for the project which may include aspects such as E&S induction training for all contractors, subcontractors and staff;
- Specifies the contractor's E&S management procedures (usually included in the company Environmental and Social Management Plan) applicable to the project;
- 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. This will include at least all the legislation included in Chapter 2.

3.2 Requirements and Compliance

The CESMP will be agreed with EEAA, if required, 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 E&S objectives; and
- Procedures for dealing with major environmental and socio-economic 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 generation), cultural heritage (e.g. Grave/Burial sites or any other archaeological artefacts), traffic management, ecology (e.g. Priority Biodiversity Features), ground/soil quality (contamination issues), noise and vibration, water resources, and waste management.

3.3 Site Description and Existing Conditions

The CESMP will be required to include the following:

- Location of Benban 50MW PV Project, including a site map, showing construction site boundaries. This information is included in Volume 1, but if any updates are made before the start of construction, these should be specified;
- Position of the project in relation to any sensitive receptors identified in the SESA and Volume 1; and

- Access roads to the site, specifying the preferred access, as selected by the contractor.

The CESMP will refer to the SESA baseline studies, but it is not necessary to replicate all the baseline information collected for the SESA.

3.4 Description of the Construction Works

The CESMP will provide a detailed programme of the construction activities of the project and will include, as a minimum:

- Proposed dates and sequences of the planned works with relation to the E&S issues outlined within this report in order to minimise disturbances to the sensitive receptors;
- Details of proposed normal working hours and intended start up and close down times. This will take into consideration the SESA mitigation (e.g. no nigh time work near the workers accommodation);
- List of activities and equipment;
- 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, including the mitigation to avoid spills and contamination;
- Vehicle access routes/points;
- Methods of the delivery/removal of materials/wastes and equipment;
- Details of proposed site offices; and
- Location of storage facilities for pipe sections, tools, equipment, chemicals etc.

Volume 1 has discussed the machinery that is expected to be used during construction and the construction techniques at a project-specific level. The final CESMP will provide details on the final selected construction equipment, and the final construction techniques.

3.5 Identifying E&S Issues

A summary of the relevant E&S risks and potential impacts will be prepared based on the findings of the SESA, on a project-specific level.

Any additional risks resulting from the contractors/subcontractors selected methods of working, changes in site conditions, changes in program, and changes in design will also be included in this section, after they are subject to an appropriate risk assessment.

3.6 Mitigation Measures

This CESMP will include mitigation measures for the identified potential environmental and social risk arising during the construction phase, including commissioning.

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

3.7 Monitoring, Recording, Inspection and Auditing Program

Inspections of work areas will 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, which will involve all the subcontractors. Regular audits 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 focusing on a continuous improvement approach.

3.8 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 and workers complaints. The EPC will be responsible for the review and update of the CESMP, its procedures and its implementation on site. If any new machinery or activity is introduced on site, the existing CESMP will be updated accordingly.

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 project site boundary will need the provision of contact numbers on sign boards easily viewable in order for the local community to be able to contact the Project team.

The following minimum procedures shall be implemented:

- All grievances will be registered and reviewed;
- Determine a mechanism to redress the grievance and identify the party responsible for accomplishing the task and will issue the instruction to complete the action;
- Review the adequacy of the action and approve the completion of the action, and
- All steps of the process will be registered and relevant environmental issues will be updated accordingly (i.e. monitoring, training, material supplies, budgeting, staffing…etc.).

3.10 E&S 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 E&S awareness and training program prior to commencing work, which will include:

- Induction training for general E&S awareness and the content of the CESMP;
- Site induction training that will highlight the specific E&S 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, actions to be undertaken in case any archaeological remain is unearthed, etc.;
- Dealing with and handling hazardous and non-hazardous wastes;
- The importance of waste avoidance, reusing, and recycling and associated procedures;
- Training on the emergency preparedness plan;
- Training on incident notification, investigation and reporting; and
- Induction training for construction site visitors.

E&S induction and training can be incorporated with a safety-training programme, which is also required for all employees working on the project site.

3.11 Roles and Responsibilities

The CESMP will need to detail the organizational management structure encompassing all staff responsible for environmental work.

4 OESMP Requirements

The Environmental and Social Management Plan for the Operational Phase (Operational Environmental and Social Management Plan or OEMP/OESMP) will serve as a general tool for managing all E&S aspects related to the activities and operations at the PV Plant. The following chapter provides an outline of the E&S management plans, which will be required during the operational life at a project-specific level for Benban 50MWPV.

The OESMP establishes mechanisms for the identification and implementation of E&S protection, mitigation, monitoring and institutional measures that will be taken during the occupation phase of the proposed 50MW PV Project.

The purpose of preparing and implementing the OESMP is to eliminate the potential adverse E&S impacts associated with the occupation of the proposed project that have been identified within the SESA/Volume 1 Form B and then mitigating them or, at the least, offsetting them to acceptable levels.

The OESMP also needs 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 final OESMP, to be developed prior to project handover date (i.e. prior to the end of construction and start of operation), 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 national and international applicable E&S guidelines, regulations/the legislative context;
- Include the mitigation actions included in the SESA/Project specific Form B;
- Establish operational E&S Objectives;
- Establish significant E&S Aspects;
- Develop and implement relevant procedures;
- Develop a programme of continuous E&S improvement;
- Clearly specify roles and responsibilities; and

- Highlight the procedures to be considered in the event of an environmental/social monitoring trigger level being breached or an unforeseen impact arising.

An outline of the sections of the OESMP is provided below

4.1 Applicable Legislation, Policy and Environmental /Social Principles

The OESMP will need to include a section that:

- Specifies the overall policy statement for the project;
- Specifies the O&M E&S management procedures (usually included in the company E&S Management Plan) applicable to the project; and
- Identifies the applicable national and international legislative requirements, guidelines and standards such as legislation in relation to pollution control, Priority Biodiversity Features, wastewater management, employment and social rights issues.

To ensure compliance with applicable laws and standards the OESMP will consider at least all applicable laws, regulations and standards including, at least, all the E&S regulations included in the relevant chapter of this SESA/Form B and in Chapter 2 of this report, and it will be updated as necessary.

4.2 Requirements and Compliance

The OESMP will be submitted to EEAA and to the IFIs, and will include the relevant mitigation measures outlined in the SESA and the requirements set out in the approval permit. It will therefore include:

- Procedures for mitigating the identified significant impacts and to identify, assess and mitigate unexpected impacts that may occur;
- Procedures for monitoring operation against the national and international standards and with regard to the project E&S objectives; and
- Procedures for dealing with major pollution incidents that could unexpectedly occur during the operational phase (including the reporting to the relevant authorities).

4.3 Site Description and Existing Conditions

The OESMP will be required to include the following:

- Location of the Project showing the final layout. This information is included in Volume 1 Form B, but if any updates are made before the start of operations, these should be specified;

- Position of the project in relation to any sensitive receptors identified in the SESA/Form B and new sensitive receptors if required; and
- Access roads to the site and hierarchy of accesses.

4.4 Description of the Operations

The OESMP will detail activities of the project-specific PV Plant and will include, as a minimum:

- List of required equipment and site services such as water supply, sanitation, solid waste facilities, power supply, etc.;
- List of operational and maintenance activities;
- Details of the storage facilities required, e.g. coolants and oils for the transformers, etc. and describe the method for storing these substances, as per the mitigation measures outlined below;
- Vehicle access routes/points;
- Methods of the delivery/removal of materials/wastes and equipment; and

4.5 Identifying the E&S Issues

A summary of the relevant E&S risks and potential impacts will be prepared by the O&M for the OESMP based on the findings of the SESA and project specific Form B.

Any additional risks resulting from the construction phase or from any new activities envisaged by the O&M will also be included in this section.

4.6 Mitigation Measures

This OESMP will include mitigation measures for the identified potential environmental and social risk arising during the operational phase.

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during the operational phase of the project. The monitoring and auditing activities will also be designed to evaluate the project's compliance against environmental and social regulatory requirements.

4.7 Monitoring, Recording, Inspection and Auditing Program

Inspections will be conducted to identify any issues or non-compliance with the OESMP and to monitor the daily work practices. A monthly inspection checklist will be prepared, which will involve all the subcontractors. Regular audits will take place in order to ensure the following:

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

The outcomes of the audit will also need to be documented including the recommendations and corrective actions focusing on a continuous improvement approach.

4.8 Document Control and Review

All documents relevant to the OESMP will be controlled onsite. The controlled documents include the OESMP report, procedures, audit reports, incident reports, records, and community and workers complaints. The O&M will be responsible for the review and update of the OESMP, its procedures and its implementation on site. If any new machinery or activity is introduced on site, the existing OESMP will be updated accordingly.

4.9 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 project site boundary will need the provision of contact numbers on sign boards easily viewable in order for the local community to be able to contact the Project team.

The following minimum procedures shall be implemented:

- All grievances will be registered and reviewed;
- Determine a mechanism to redress the grievance and identify the party responsible for accomplishing the task and will issue the instruction to complete the action;
- Review the adequacy of the action and approve the completion of the action, and
- All steps of the process will be registered and relevant environmental issues will be updated accordingly (i.e. monitoring, training, material supplies, budgeting, staffing…etc.).

4.10 E&S Training and Awareness Program

This section will include the training and awareness programmes considered relevant for all the workers onsite or specific personnel. This will include:

- Induction training for general environmental awareness and the content of the OESMP;
- Site induction training that will highlight the specific E&S requirements and activities being undertaken at the site including hours of operation for specific activities, mitigation measures, spill control measures, sensitive receptors (migratory birds, Luxor-Aswan Highway users, etc), traffic access, site entrance and exits etc.;
- Dealing with and handling hazardous and non-hazardous wastes, for the staff that handle these;
- The importance of waste avoidance, reusing, and recycling and associated procedures;
- Training on the emergency preparedness plan, if relevant;
- Training on incident notification, investigation and reporting; and
- Induction training for site visitors.

E&S induction and training can be incorporated with a safety training programme, which is also be required for all employees working on the project site.

4.11 Roles and Responsibilities

The OESMP will need to detail the organizational management structure encompassing all staff responsible for environmental work.

5 Environmental and Social Impacts

Main project-specific impacts generated on the environmental and social elements at the Benban 50MW PV project are described on Chapter 6, Volume 1. Environmental Impact Assessment Form B, Attachments. A brief summary of the impacts generated at a project specific level is provided below:

Table 5-1: Summary of Impacts

Elements	Phase	Impact
Soil and Geology	CN	Potential soil contamination due to accidental interactions with hazardous substances including spillage or leakage of hazardous material, inadequate waste management and cross contamination of soil.
	OP	Soil contamination only expected due to an inadequate handling of storing or transferring fuels, vehicle oils, or clear agents during maintenance activities.
Hydrology and Hydrogeology	CN	Groundwater located more than 150m deep. No wastewater discharges to any waterbody are expected.
	OP	No impacts on the hydrological/hydrogeological systems are expected.
Ecology and Biodiversity	CN	Impacts mainly limited to hunting, fauna entering the project area, vehicles running animals over, and the introduction of invasive species
	OP	Impacts on birds expected due to collision with the PV panels.
Air Quality	CN	Impacts expected due to increased dust, gaseous and particulate emissions and emissions of VOCs.
	OP	Impacts expected in the form of dust and gaseous and particulate emissions generated by vehicular emissions
Water Quality	CN	Impacts expected due to an improper management of domestic water generation and storm water runoff events
	OP	
Waste and Hazardous waste	CN	Impacts could arise if waste and/or hazardous waste are managed improperly
	OP	
Noise and Vibration	CN	Noise levels likely to be affected by work activities during construction phase, mainly due to site preparation, civil works, construction and installation, drainage and road paving.
	OP	Noise impacts expected during operational phase, mainly generated by vehicles movement and maintenance works
Economic Status	CN	Positive and negative impacts likely during construction phase, due to employment creation, dissemination of skills, purchase of goods and materials from the local and global economy and cumulative impacts to the local residents.

Elements	Phase	Impact
	OP	Likely lack of available local experts for the PV Plant operation phase will lead to import qualified workers and a reduction in the benefit to the local economy.
Social Status	CN	Impacts expected on vulnerable communities due to the installation of the workers accommodation at the Project site. Impacts on workers if an adequate HR Policy and Workers Accommodation Plan are not yet put in place.
	OP	Impacts could be expected due to the importation of qualified workers during operational phase.
Traffic and Transportation	CN	Impacts expected due to an increased traffic and transportation levels at Luxor-Aswan Highway. Congestion, increased journey times and higher accident risks, or higher fear of accidents
	OP	No significant impacts expected.
Topography and Landscape	CN	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery
	OP	Visual impacts (reflectivity of the solar collector arrays of parabolic trough and thin-film PV facilities, depending on the time of day, viewer location, and viewer movement) to Luxor-Aswan Highway, which is located approximately 1km to the east of Benban 50MW PV Project.
Cultural Heritage and Archeology	CN	No specific cultural or archaeological features identified at the proposed 50MW PV site. Potential unknown buried artifacts to be disturbed or unearthed during earthworks.
	OP	No excavation processes expected during maintenance works

Note 1: CN: Construction Phase, OP: Operational Phase. Note 2: The location of the workers accommodation is not known at this stage.

6 E&S Management Plan

6.1 Impact Mitigation

The mitigation measures will include:

- All the mitigation measures outlined in the mitigation chapter of the SESA applicable to the construction phase.
- Project-specific mitigation measures recommended for other E&S impacts identified at a project level;
- If any additional risks result from the contractors/subcontractors selected methods of working, changes in site conditions, changes in program, and changes in design are

identified, mitigation measures will be designed to eliminate or reduce the impacts following a mitigation hierarchy.

6.1.1 Bio-physical Environment

6.1.1.1 Soil and Geology

The following table provides the project-specific mitigation measures for the two project phases.

Table 6-1 Soil and Geology mitigation measures – construction and operation phases

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
Soil Contamination	Develop and implement: Hazardous Materials Handling Plan and Hazardous Waste Management Plan.	Project Site	Contractor and Subcontractor.	Previous to the commencement of activities
	Develop a Emergency and Response Plan			
	Store chemicals, hazardous substances and waste only in purpose built areas / structures. Chemical storage areas will be impermeable and bunded.	Project Site		Construction and Operation
	Routinely inspect storage areas and all containers for any spills and leaks	Project Site		
	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			
	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, refueling, storage and waste disposal will be carried out in designated, sealed areas.			
	Ensure all workers are aware of their responsibilities to avoid soil contamination.	Project site		

Impact/	Mitigation measure	Location	Parties responsible	Implementation Schedule
Erosion	Adequate drainage systems will be provided to minimize and control infiltration.	Project Site	Contractor and Subcontractor	Construction
	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.			
	Regular inspection of the sedimentation/erosion controls will be conducted.			
	Disturbed areas will be stabilised to minimise further erosion.			

6.1.1.2 Hydrology and Hydrogeology

Table 6-2: Hydrology and Hydrogeology - Construction and Operational phase

Impact/ Source	Mitigation measures (construction phase)	Location	Parties responsible	Implementation Schedule
Hydrological Systems	No solid waste, wastewater or hazardous waste will be deployed at any hydrological system (waterbody, natural or man-made drainage, etc.) within the site or on the nearby areas. The contractors will make sure that employees are aware of this measure (e.g. training methods)	Project Site and nearby systems	EPC Contractor and O&M	Construction and Operation
	The laydown areas of the site and workers accommodation will be located away from any hydrological systems in order to reduce any degradation and contamination.	Project Site & Worker Camp	EPC Contractor	Construction

6.1.1.3 Ecology and Biodiversity

Table 6-3 Ecology Mitigation Measures – Construction and Operational phase

Impact/ Source	Mitigation measures (construction phase)	Location	Parties responsible	Implementation Schedule

Impact/ Source	Mitigation measures (construction phase)	Location	Parties responsible	Implementation Schedule
Degradation of the terrestrial ecosystem by earthworks and laydown areas	All construction vehicles adhere to clearly defined transportation routes. Transport routes should be identified and training provided to emphasise the need to adhere to the designated routes in order to protect any existing vegetation and reduce encroachment on adjacent land, and reduce dust across the site.	Project Site	Contractor and Subcontractors	Construction
Pest	Since human settlement attracts pests and also has a large impact on birds, consideration should be given to developing a plan to manage pests identified on the site attracted by the waste facilities and kitchens.	Project Site & work camp	Contractor and Subcontractors	Construction and Operation
Loss of Seed bank and degradation of terrestrial ecosystem	Landscaping on site (if any) should incorporate indigenous xerophytic plant species to minimise irrigation requirements and the need for fertilisers/pesticides.	Project Site & work camp	Contractor	Project design and throughout the landscape contact
	Transport routes on site and training will emphasise that vehicles and workers should keep to the designated routes in order to prevent unnecessary land encroachment, thus protecting the natural resources and reducing dust emissions;		Contractor and Subcontractors	Construction and Operation
	Appropriate storage of hazardous materials, should be designed in accordance with the National Legislation and International Best Practice Guidelines, preventing any major spillages on the site.			

Impact/ Source	Mitigation measures (construction phase)	Location	Parties responsible	Implementation Schedule
Direct Mortality of fauna	Hunting, and trade will be strictly forbidden and penalized on site. Signals will be established onsite.	Project Site & work camp	Contractor and Subcontractors	Construction and Operation
	Bird Mortality Monitoring Plans to be developed		O&M	Previous to Operation
Herbicide Pesticide Use	An integrated pest management scheme will be developed before using pesticides	Project Site & work camp	Contractor and Subcontractors	Project design and throughout the landscape contact

6.1.1.4 Air Quality

The following table provides the suggested project-specific mitigation measures.

Table 6-4 Air quality mitigation measures – Construction phase

Issue	Mitigation measures	Location	Parties responsible	Implementation Schedule
Dust Generation	Minimise vehicles and plant movements over unpaved roads. Establish paved/tarred access roads in order to minimise dust.	Project Site	Contractor and Subcontractor	As soon as the works start and throughout construction period.
	Vehicle speeds will be restricted to 15Km/h on haul roads and un-surfaced areas of the site.			
	All vehicle loads will be covered by a tarpaulin and will not be overloaded.			
	Regular wetting down of haul roads by water trucks.			
	Contractor vehicles to access site on newly constructed tarmac road to avoid impact on local traffic			

Issue	Mitigation measures	Location	Parties responsible	Implementation Schedule
	Any aggregate or dusty material stockpiles will be stored in enclosed structures. Alternatively temporary piles can be covered with impervious sheeting.			
	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.			
	No burning of wastes will be allowed on site throughout the construction phase.			
Exhaust Emissions	Modern machinery, with adequate emission control equipment will be used.	Project Site	Contractor and Subcontractor	As soon as the works start and throughout construction period.
	Suitable fuels will be used for construction machinery, vessels and vehicles (particularly low sulfur diesel).			
	Trained personnel will operate machinery properly and efficiently.			
	Regular maintenance and inspection for all construction plant, 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.	Off-site		
	Routinely check equipment for smoky exhausts, and recommend appropriate corrective actions.	Project Site		
	Smoky equipment to be given defect notices until repaired and approved for re-deployment by site supervisor.			
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.	Project Site	Contractor and Subcontractor	As soon as the works start and throughout

Issue	Mitigation measures	Location	Parties responsible	Implementation Schedule
	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.			construction period.
	Pump out any stagnant waters from excavations			

Air quality mitigation measures – Operation phase

The proposed project will not generate significant emissions to air. Therefore, no mitigation measures are required from the project in order to ensure compliance with National and International Ambient air quality standards.

With regards to the impacts from the existing emissions of vehicles on adjacent roads and highways, the following design options are recommended for integration in the final Master plan:

- Encourage the use of public transport or alternative forms of transport. Discussions should be undertaken in order to explore the opportunities to expand the bus service into the proposed development;
- Reduce the number of vehicle trips outside the project by ensuring that all basic services and amenities are located within the development; and
- Ensure that the design of internal road network controls speeds, and the placement of public amenities promotes the use of alternative transport means.

6.1.1.5 Water and Groundwater Quality

The following two tables provide the mitigation measures for project.

Table 6-5 Water and Groundwater quality mitigation measures – construction and operational phase

Impact/ Source	Mitigation measures	Location	Parties responsible	Implementation Schedule
Domestic Wastewater	Chemical toilets will be available on site and septic tanks will be installed at the workers accommodation and administration buildings. The number of septic tanks will be proportional to the increased of workers on site. These will also be regularly emptied by a licensed waste contractor and transported to an approved sanitary waste facility off site.	Project Site & worker camp	EPC Contractor	Construction
	The EPC contractor will keep records of the disposal events in order to give an indication of required frequency of removal and for auditing purposes. If possible, meters will be installed on the tanks to monitor the volumes and prevent overflows.			
	The septic tanks will be above ground where possible, though if buried, will be placed in secure areas, away from general vehicle traffic, in order to prevent any damage to the tanks.			
	The EPC contractor will develop procedures for the demobilisation of the septic tanks once site construction has ended to ensure that appropriate procedures/methods will be employed and no contamination to the site area will occur during the demobilisation period.			
Wastewater Management	On all accounts, the spillage and runoff of oils, greases and other toxic liquid waste from the machinery fleet outside this waterproofed area will be avoided. Site inspections will be carried out regularly by the contractor who will ensure that all wastewater generated is properly managed, and no leakages or spill over occur.	Specific Areas for wastewater within the Project Site	Contractor and Subcontractors	Construction
	The sanitary wastewater from the workers at the plant will be treated at a licensed Sewage Treatment Plant (STP).			
	In the event of a spill or overflow, immediate action should be taken in accordance with spill containment procedures.			

Impact/ Source	Mitigation measures	Location	Parties responsible	Implementation Schedule
	Mixing effluent streams – domestic grey water, sewage effluent etc., is prohibited and shall not be permitted anywhere on-site.	Project Site	Contractors	Before commencement of Construction Construction
	Quantities of on-site stored fuel and chemicals will be controlled to a minimum, in order to ensure uninterrupted work.		Contractor and Subcontractor, O&M	Construction and Operation
	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/operation equipment will be daily inspected for leaks.			
	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.			
Water Consumption	Effort will be made in training employees including all sub-contractors at the site to minimise water consumption and ensure an understanding of wastewater issues.	Project Site	O&M and EPC	Construction and Operation

6.1.1.6 Waste and Hazardous Waste

The following table provides the mitigation measures for the project.

Table 6-6 Utilities Management mitigation measures – construction and operational phases

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
Waste and Hazardous Waste Generation	Prepare a site-specific Waste Management Plan (WMP).	Project Site	Contractor and Subcontractors, O&M	Before commencement of Construction and Operational phase
	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.			Construction and Operation
	Re-use or recycle construction waste such as wood and metal.			
	Ensure appropriate disposal of empty containers (Hazardous Waste Management)			
	Ensure collection and disposal of putrescible waste is fenced in order to avoid any rodents, and other pest vectors			
	Only licensed contractors will carry out waste collection and disposal.			
	A log will be kept to record the waste streams and volumes/weight of all wastes generated, treated and transported from the facility.			
	Introduce reuse and recycling initiatives. Including allowance in master planning and design phases for additional facilities.			
	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.			

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
	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.			
	Flammable waste will be appropriately stored to prevent fire risk.			
	Auditing will be carried out to ensure that the Waste Management Plan is properly implemented.			

6.1.1.7 Noise and Vibration

The following two tables provide the mitigation measures for the construction phase.

Table 6-7 Noise and Vibration mitigation measures – construction phase

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
Generation of Noise and vibration	Plan activities with the greatest potential to generate noise during the day.	Project Site	Contractor and Subcontractor	As soon as the works start and throughout construction period.
	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'			
	Provide personnel with hearing protection and advised of its proper use.			
	Extremely noisy tasks will be conducted off-site if practicable.	Off-site		
	Monitor noise level at the site boundary to assess noise increase against baseline conditions and to ensure compliance with regulations.	Project site		

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
	Ensure that noisy tasks are NOT undertaken near the Workers Accommodation during night-time.	Onsite		

Noise mitigation measures – Operation phase

The proposed project will not generate significant noise, is not subject to any significant levels of noise and no sensitive receptors are located onsite or the nearby. Therefore no mitigation measures are required from the project.

6.1.1.8 Topography and Landscape

The nearest visual receptor is located approximately 1km to the East of the proposed PV Plant (Luxor-Aswan Highway). The nearest inhabited area was identified more than 12km to the proposed Benban Project.

Table 6-8 Topography and Landscape – construction and operation phases

Impact/ Source	Mitigation measure	Location	Parties responsible	Implementation Schedule
Visual Impact	Only use flood lighting during construction if absolutely necessary. Do not use flood lighting during the operational phase unless required for security reasons.	Project Site	Project Company	Previous to Operational Phase

Table 6-9 Traffic mitigation measures – Construction and Operation phase

Issues	Mitigation Measure (Construction and Operation phase)	Location	Parties responsible	Implementation Schedule
Traffic Generation	Schedule major deliveries for off-peak hour traffic.	Off-site	Contractor and Subcontractor.	As soon as the works start and throughout construction period. Project lifecycle
	Encourage car pooling for workers at construction phase			
	Designate parking/staging areas. Provide adequate parking stations for the estimated numbers of visitors to the site (workers and suppliers).			
	Clearly identify truck routes and entry points for heavy vehicles entering the site.			

Issues	Mitigation Measure (Construction and Operation phase)	Location	Parties responsible	Implementation Schedule
	Develop a Traffic Management Plan	Project Site		
	Clearly post site entry / exit signs. Use 24hr security and document all vehicles entering/exiting the site.			
	Clearly post on-site speed limits, recommended 15Km/h on haul roads and un-surfaced areas of the site, and 20km/h on paved roads.			

6.1.1.9 Archaeology and Cultural Heritage

No archeologically significant or cultural heritage sights have been identified within the project site or in the immediate adjacent areas. 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.

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. 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. An experienced archaeologist will then examine the findings and will determine if the Competent Authorities need to be notified.

6.1.2 Socio-Economic Environment

6.1.2.1 Social and Economic

In order to maximise the socio-economic 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.

Table 6-10 Socioeconomic mitigation measures – Construction and Operational phase

Issue	Mitigation Measures	Location	Parties responsible	Implementation Schedule
Employees and Work Conditions	Establish and maintain HR Policy, which covers the following: Child labor and forced labor; Non-discrimination and equal opportunities and Workers' Organizations	N/A	Contractor and Subcontractor	Prior to the designation of the contractors and throughout the construction/operational period
	Prepare an employee handbook outlining employee rights conferred by national laws on labor and employment and benefits offered by the Company			Prior to the designation of the contractors
	Provide complaints mechanism for employees and an action plan to address them.			Prior to the designation of the contractors
	Introduce in tenders and contracts a requirement to hire a percentage or a fixed number of local workers			Prior to the designation of the contractors and throughout the construction/operational period
	Protect and promote the health of employees, especially by promoting safe and healthy working conditions			
	Establish and maintain a sound worker-management relationship			
ers Acc omm odati	Design workers accommodation facilities aligned with the principles detailed on the following Best Practice Guidelines:	Workers Accommodation	EPC Contractor	Construction
Local Community	Maintain open communication channels with local communities	Local communities	Subcontractors	Construction and Operational Phase
	A point of contact and their details will be published at the entrance of the project site, in order receive complaints regarding any environmental or social grievances resulting from the construction activities.			

6.1.2.2 Traffic and Transport

The following tables provide mitigation 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.

6.2 Environmental and Social Monitoring Plan

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during both construction and operational phase. The monitoring activities will also be designed to evaluate the project's compliance against E&S guidelines.

6.2.1 Inspections and Audits

Daily inspections of work areas by the EPC/O&M Supervisor and weekly inspections as a minimum by the E&S Coordinator will be conducted to identify any issues or non-compliance with the CESMP/OESMP and to monitor the daily work practices.

A weekly inspection checklist will be prepared in a discussion involving all the subcontractors. All the mitigation measures will be checked in the weekly inspection checklist.

The main subcontractors will be required to prepare their own checklist with the mitigation measures relevant to their work.

External audits will also need to be undertaken quarterly during construction period and annually during operational phase by an external, independent auditor, as required by the EBRD PRs. This audit will take place at least twice during the construction period, in order to ensure the following:

- Compliance with all standards and regulatory requirements and the CESMP/OESMP;
- Auditing the contractor and subcontractor activities for non-conformances;
- Checking monitoring records, inspection checklists, grievance records and other relevant documentation; and
- Consulting with the Local Communities representatives regarding the implementation of the social mitigation and their perception of the project; and
- Identifying the requirements for corrective actions.

6.2.2 E&S Monitoring

The objective of an E&S Monitoring Plan is to establish the baseline indicators to assess the overall performance and effectiveness of the E&S management programs. A monitoring program has the underlying objective of ensuring that the intended mitigation measures are realised and that minimal deterioration occurs to the environmental and socio-economic parameters. The E&S Monitoring Plan will aid management in redefining the E&S 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 E&S Monitoring Plan are:

- To evaluate the performance of mitigation measures proposed in the CESMP/OESMP;
- To evaluate the adequacy of the E&S Assessment;
- To suggest on-going improvements in the management plan based on the monitoring and to devise fresh monitoring on the basis of the improved CESMP/OESMP;
- To enhance E&S quality through proper implementation of new suggested mitigation measures; and
- To meet the requirements of the existing E&S regulatory guidelines.

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:

- Biophysical Environment
    - Air Quality (including Workplace dust/ Exhaust Air Quality);
    - Ecology and Biodiversity (bird mortality during operational phase only);
    - Wastewater Generation;
    - Waste and Hazardous Waste; and
    - Noise and Vibration;
- Socio-economic Environment
    - Grievance Mechanism;
    - Work Conditions; and
    - Traffic.

A general monitoring plan for the construction phase is included below, to be incorporated by the contractor in the final CESMP/OESMP.

All monitoring results will be recorded in the site E&S Monitoring Program register.

Based on the mitigation recommendations in the SESA, at least 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 will be provided in the final CESMP/OESMP by the sub-contractor.

Table 6-11: E&S Parameters to be monitored - Construction

Environmental Aspect	Monitoring Location	Methodology / Parameters	Frequency	Responsibility
Air Quality	Site and access road and workers accommodation	Monitoring of construction related dust will be carried out visually, and by using air filters for the measurement of PM (if required). Vehicle exhausts will be monitored visually. If visual checks reveal smoky or malodorous fumes, this is particularly applicable to fixed site plant and specialized equipment.	Monitoring will be **Daily** during significant dust generating activities (for dust monitoring) or during periods of high winds (>20Knots), otherwise **Monthly**	EPC
Ecology and Biodiversity	Onsite	Any ecological impacts occurring during site clearance, land preparation, cut and fill activities need to be monitored and recorded. Trenches will be covered at night and inspected on a daily basis to avoid direct mortality of fauna.	**Daily**	EPC
Wastewater	Onsite and workers accommodation	Wastewater will be tankered and transported and managed offsite. No wastewater will be discharge in the project site or boundaries.	**N/A**	-
Waste and Hazardous Waste Management	Onsite and workers accommodation	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: (1) 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. (2) Site construction equipment will be inspected	**(1) Biweekly** **(2) Daily**	EPC Contractor / subcontractors

Environmental Aspect	Monitoring Location	Methodology / Parameters	Frequency	Responsibility
		for leaks.		
Noise	Site boundary and workers accommodation	The noise levels will be monitored according to guidelines for construction noise, taking into consideration the proximity of any sensitive receptors (workers accommodation), time of day and location of the activity.	**Biweekly** and during noisy activities near sensitive receptors	EPC
Grievance Mechanism	Onsite	All complaints will be registered in the CESMP, including follow up results actions.	**Monthly**	EPC
Work Conditions	Onsite	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 phase of the project.	**Monthly**	EPC
Traffic Management	Onsite and Aswan-Luxor Highway	A Traffic-Monitoring plan will be implemented, traffic will be monitored in order to make sure that mitigation measures are followed	**Monthly**	EPC

Table 6-12: E&S Parameters to be monitored - Operation

Environmental Aspect	Monitoring Location	Methodology / Parameters	Frequency	Responsibility
Ecology and Biodiversity	Onsite	A Bird Monitoring Plan will be designed and developed in consultation with the regulator in order to determine bird mortality due to the installation of the PV panels. Mortality will be monitored on a monthly basis. A detailed Monitoring Programme will be designed and incorporated in the OESMP.	**Monthly**	O&M
Wastewater Discharge and	Onsite	Wastewater will be tinkered and transported and managed offsite. No wastewater will be	**N/A**	O&M

Environmental Aspect	Monitoring Location	Methodology / Parameters	Frequency	Responsibility
quality		discharge in the project site or boundaries.		
Waste and Hazardous Waste Management	Onsite	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: Qantities 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.	**Monthly**	O&M
	Onsite	Containers and storage areas will be inspected for leaks	**Daily**	O&M
Grievance Mechanism	Onsite	All complaints will be registered in the OESMP, including follow up results actions.	**Quarterly**	O&M
Work Conditions	Onsite	The number of local population employed in the project need to be monitored to assess the effectiveness of the Recruitment Policy.	**Biannually**	O&M
Traffic Management	Onsite and Aswan-Luxor Highway	A Traffic-Monitoring plan will be implemented, traffic will be monitored in order to make sure that mitigation measures are follower	**Quarterly**	O&M

7 References

EBRD Guidance Note 1 (2011) Gender. Good Practice Note;

EBRD Guidance Note 2 (2012). Grievance Mechanism. Good Practice Note;

EBRD Guidance Note. Non-discrimination and equal opportunities. Good Practice Note;

EBRD and IFC (2009). Workers' accommodation: processes and standards. Good Practice Guidance.

FAO (2012). Voluntary Guidelines on the Governance of Tenure.

Glasson, J. (1994) 'Life after the Decision: The Importance of Monitoring in EIA', Built Environment, 20 (4): 309-320

World Bank (2009) Global Invasive Species Programme;

IFC (2007). Environmental, Health, and Safety General Guidelines. Good Practice Note;

IFC (2007). Stakeholder Engagement. A Good Practice Handbook for Companies doing Business in emerging Markets; and

UN Voluntary Principles on Security and Human Rights;