ENVIRONMENTAL IMPACT ASSESSMENT

FOR THE PROPOSED CONSTRUCTION AND OPERATION OF A 313 KWP SOLAR PV PLANT AT THE UNAM MAIN CAMPUS, KHOMAS REGION, NAMIBIA

ENVIRONMENTAL MANAGEMENT PLAN

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1.1 INTRODUCTION

The proposed project is anticipated to have an impact on the socioeconomic and biophysical environment in and around the proposed project area, as was mentioned in the scoping report. This section outlines the Environmental Management Plan (EMP) for the development's potential positive and negative effects.

Enhancing project benefits, reducing or mitigating negative consequences over the course of the project phases, preventing long-term environmental damage, and, whenever possible, preventing negative impacts, are among the objectives of the EMP. The Environmental Management Plan (EMP) outlines environmental roles and responsibilities, potential impacts, as well as mitigation and monitoring strategies to be implemented to control any impacts.

1.2 EMP ADMINISTRATION

To guarantee that the EMP is completely implemented, it is imperative to explicitly define the roles and responsibilities of all stakeholders. To ensure the effective execution of the EMP, the proponent must additionally designate an accountable individual (project manager), as shown below.

Table 1-1: Roles and Responsibilities in EMP Implementation

ROLE	ENVIRONMENTAL RESPONSIBILITIES
UNAM/Alensy Energy Solutions	Responsible to enforce EMP implementation to contractors
Environmental Control Officer	• Implement, review and update the EMP. • Ensure all reporting and monitoring required under EMP is undertaken, documented and distributed as needed • Conduct environmental site training (toolbox talks) and inductions with the support of an environmental consultant. • Conducts environmental audit at work site with the support of environmental consultant. • Close out all non-conformances. • Ensure materials being used on site are environmentally friendly and safe.
The Department of Environmental Affairs	• Approve the EMP and any amendments to the EMP. • Approve reports of environmental issues and non-conformances as issued. • Review and approve environmental reports submitted as part of EMP implementation
Environmental Consultant	• Conduct and monitor actions required by the EMP if required

ROLE	ENVIRONMENTAL RESPONSIBILITIES
	• Conduct environmental site training (toolbox talks) and inductions if assistance is required • Conducts environmental audit at work site • Ensure materials being used on site are environmentally friendly and safe.
Site Technical Team	• Control and monitor actions required by the EMP. • Report all environmental issues to Environmental Control Officer. • Ensure documented procedures are followed and records kept on site. • Ensure any complaints are passed onto the management within 24 hours of receiving the complaint.
Workers	• Follow requirements as directed by site technical. • Report any potential environmental issues to site engineer/project manager, indicating spilt oil, excess waste, excessive dust generation, dirty water running off the site and other possible non-conformances

1.3 EMP Management Actions

The management actions aim to avoid potential impacts where possible. Where impacts cannot be avoided, management actions are outlined in order to minimize the significant impacts.

The tables below outline the specific management actions which need to be undertaken during the construction and operational phase of the development to ensure that the site activities are compliant.

1.4 CONSTRUCTION AND OPERATIONAL PHASE MANAGEMENT ACTIONS

The table below outlines the management actions to be undertaken during the construction and operation phase of the project to ensure compliance with the EMP.

Table 1-2: Construction and Operation EMP

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
Noise pollution	Noise will be generated through: • Construction of drainage services and water reticulation systems. • Construction of buildings • Moving vehicles. • Installation of PV panels stands	• The health of working personnel could be disturbed e.g., noise hearing loss. • Community residents could be disturbed by the noise. • General annoyance • Driving away of local animal species near the project site	Environmental	Construction phase	• Environmental Control Officer • Site Manger	• A construction interval will be established, used and adhered to. • Workers will be issued earplugs to protect them from excessive noise. • Public will be notified through printed timetable stating planned operational activities. • Construction activities will be conducted during daytime.	**Construction & Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						• Site notices will be erected on, around the site-notifying visitors, and nearby residents of different hazards on site. • No go areas marked as sensitive environments, especially for birds needs to be avoided during construction and operation.	
Dust Generation	Dust will accumulate because of the land preparation, onsite movements of vehicles and machines, wind	• Can lead to respiratory illnesses especially to those working in the area. • General air pollution. • Nuisance to nearby residents	Environmental	Construction phase	• Environmental Control Officer • Project Manger	• Dust suppression will be done through watering dust sources surfaces. • Transmission pole sites can be wet drilled and minimise dust generation.	**Construction & Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	blowing on loose material during construction and tipping.	• The process can also drive away wild animals within the project area surroundings				• Watering down dusty surfaces, • Ensure that protective equipment such as respirators are distributed to employees and ensure their use. • Site notices to be erected on and around the site to inform visitors and surrounding residents.	
Loss of Biodiversity	• Vegetative plants on site will be removed • Habitat destruction for	• The clearing of vegetation will result in the breaking of the ecosystem processes in the area.	Environmental	Construction phase	• Environmental Control Officer • Site Manager	• All the major trees will be preserved, and the layout plan will fit into the environment without affecting the trees.	**Construction**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	both ground dwelling species and tree dwelling species. • Soil disturbance on and around the site.	• Loss of aesthetic value of the proposed project area. • The few small animals still habiting the place such as small rodents and birds will be forced away. • The ecosystem food chain on and around the area will be broken.				• Ground disturbance will only be limited to the boundary area to avoid affecting a large area. • Upon completion of construction activities more vegetation will be planted on and around the site to restore the site into a status that is environmentally friendly. • When necessary, a permit must be obtained from the Directorate of Forestry before removing a major	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						tree species (In this respect, a permit is not necessary to be obtained for land clearance for MAWF) • Any identified protected species must not be removed, and they must be clearly marked, and such areas fenced off. • Utilise existing tracks and roads where possible. • During vegetation clearing avoid killing and/or hunting of animals.	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
Avian Impacts	Avifauna electrocution or hitting on electrical infrastructure	• High fatalities of avifauna in the project environment • Birds may affect electrical infrastructure to nesting construction on power line.	Environmental Infrastructure	Project lifetime	Environmental Control Officer	• Use aircraft warning spheres across deep valleys in forested areas • Investigate the implementation of warning spheres in areas where pilots have recommended them. • Bird diverters will be installed on the electrical infrastructure in the event that the infrastructure is reconductored, or if the static wire or aviation markers are replaced.	**Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						• BDs will be spaced between the aerial marker balls to increase visibility of the shield wire. • If available, light emitting BDs will be installed to improve low light visibility	
Greenhouse gas emissions	Green House Gasses (GHGs) emissions will be produced from the following activities: • Fuels combustion for transport (construction vehicles and equipment)	• Global climate change • Air pollution	Environmental	Project lifetime	• Environmental Control Officer • Project Manager • Department of Environmental Affairs.	• Adopt the use of ethanol blended fuels wherever necessary. • Design an operation system that cuts on fuel consumption. • Use of solar energy system during construction for lighting and other minor energy needs.	**Construction & Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	• Ground excavation releases phosphorus found underground and releases particulate matter into the atmosphere.						
Waste Generation	Construction and operations are associated with a lot of raw material and activities that results in pollution	• Chemical pollution from oil spills resulting from the handling of various machineries used during the construction phase • Construction rubble, empty packaging containers/bags and materials remnants.	Environmental	Project lifetime	• Environmental Control Officer • Project Manger	• Ensure that all waste from construction activities is stored and contained in designated containers and transported to either Oshikuku or Outapi Townships waste disposal site.	**Construction & Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
		• Construction workers can also pollute the surrounding environs if they are not provided with adequate toilet facilities and a waste management system for domestic waste.				• Bulky waste such as building rubbles must be collected and disposed of for landfilling. • Hazardous waste storage bin will be on site and an independent hazardous waste transporting company will be contracted to collected hazardous waste storage bin whenever it is full. • Visual inspections monitoring • All waste will be managed by proponent and the	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						developer will ensure that domestic waste handling facilities such as labelled dustbins will be available. • Waste separation will be provided for to allow for recycling of recyclable materials i.e. glass, hazardous waste, paper, bio-degradable waste.	
Hydrocarbons release into the environment	There will be no storage of oils and fuel on site, however there is risk of spillage of hydrocarbons	• Washing away of contaminated soils by rains into nearby rivers • Pollution of soil and affecting small living	Environmental	Project lifetime	• Environmental Control Officer • Project Manager	• Implement a maintenance programme to ensure all vehicles, machinery and equipment are and	**Construction & Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	from vehicles and machinery operations, maintenance through leakages and spillages which may result in environmental contamination	organisms habituating the soil • Result in possible groundwater pollution. • Possible fire risk on and around the site			• Department of Environmental Affairs.	remain in proper working order • Vehicle maintenance should be conducted in designated areas only, preferably off-site. • If maintenance is to be conducted on site, these areas should be designed to contain spillages i.e. maintenance site must be bunded and paved and the use of chemicals must be controlled. • Spillages contaminants are to be removed from	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						site by a specialist waste removal contractor such as rent a drum. • Waste oil, fuels and other chemicals from drip trays on stationery vehicles and machinery will be disposed of as hazardous waste at a licensed facility by a specialist hazardous waste handler. • Oil residue will be treated with oil absorbent material such as Drizit or bioremediation and removed to an	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						approved waste disposal site • Spill kits will be easily accessible and workers will be trained in the use thereof. • Staff and contractors will be trained in the handling and storage of oils, fuels, chemicals and other hazardous substances • No bins containing organic solvents such as paint and thinners shall be cleaned on site, unless containers for	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						liquid waste disposal are provided on site.	
Safety and Health risks	Construction related Safety and Health hazards	• Injuries to workers such as Occupational dermatitis, slips and fall of humans and objects, musculoskeletal disorders, etc.	Health and safety	Construction phase	HSE Officer	• Equip workers with Personal Protective Equipment (PPE), provide trainings on how to effectively use the PPE. • Provide platforms for briefings and meetings about possible safety and health hazards in the workplace. • Provide site signs warning and informing about different hazards on site.	**Construction**
	Electrical hazards	Fatalities and fires	Health and safety	Project lifetime	HSE Officer	• Employees should be trained on	**Construction and Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						electrical safety before working on site. • Safety representative with training on electrical hazards emergency management should be station on site always. • Safety signs during construction and operation should be put on-site, no-go areas should be labelled, PPE specifications should be clear to maintenance personnel.	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
Population Influx	The project will bring in skilled and unskilled workforce into the area.	• There is potential for cultural systems conflict between locals and new people in the area • Potential for rife prostitution and spread of HIV/AIDS and other STDs	Socio-economic	Project lifetime	• Environmental Control Officer • Project Manger	• Train and brief employees to respect local cultures and leaders, • Engage on massive sexual health training and awareness and providing contraceptives such as condoms, as well as provide means counselling for those that are affected by HIV/AIDS and other STDs	**Construction and Operation**
Land use change	The existing environment will drastically change from a	• The area will no longer be suitable for agriculture.	• Social • Terrestrial environment	Project lifetime	• Environmental Control Officer • Project Manger	• The development should blend into the existing area	**Construction and operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	dormant piece of land to a PV plant.	• Sudden change in landscape appearances may be unfavourable to the conservatives.				through designing and colour coding. • Green designing will bring life to the site and blend with surrounding areas.	
Resources consumption	The construction industry can be resource intensive, i.e. water resources.	The project can result in a strain on available water resources, however also generating clean energy/electricity.	Socio-economic	Project lifetime	• Environmental Control Officer • Project Manger	Water saving should be ensured by the site manager i.e. repairing leakages, opening taps only when water is required and recycling of water on site.	**Construction and operation**
Movement of vehicles within the site and along main road	Traffic and road safety	• Road Accidents • Damage to roads	• Safety • Socio-economic	Project lifetime	• Environmental Control Officer • Project Manger	• Traffic signs and symbols should be used at all necessary points along the roads. • Schedule construction work to allow for the	**Construction and operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						movement of material and heavy equipment. • Arrange for parking and storage of material onsite where feasible. • Schedule vehicle movement to minimize disruption to traffic flow along the main and access roads. • Make provision for handling peak traffic flows. • Identify traffic hazards and mitigate them • All drivers should be competent and with	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						defensive driving certificates. • Make use of road worthy vehicles. • Ensure that all traffic safety measures are put in place. • Raise safety awareness in the communities • Carry periodic road maintenance work.	
Infrastructure (e.g. roads, powerlines, etc) that run close to the project site	Disruption of socio-economic activities of the surrounding local land users	• Failure in service provision e.g. electrical power supply failure; • Encroachment into infrastructure (e.g. road, powerlines) servitudes	Socio-economic	Project lifetime	• Environmental Control Officer • Project Manger	• Consultation with relevant authorities and departments for best possible actions to take. • Do not extend operations to areas close to the infrastructure until	**Construction and operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						everyone affected is involved. • Mapping of all infrastructure and establishment of appropriate servitudes • Do a risk assessment for the site and manage the risks	
Flooding and Storm Water	• The area may be prone to flooding	• Property damage, • Loss of agricultural crop/produce • Injury/death of animals • Human injury/loss of life	Environmental	Project lifetime	• Site Engineer • ECO	• Standard storm water drainage will be part of the water reticulation designs indicating the storm water deposit areas. • During construction all access tracks and the compound area will be	**Construction and operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						constructed using permeable granular materials. • Vehicular movements will be restricted to the access tracks and designated areas where possible to avoid or limit soil compaction, which could have a detrimental impact on infiltration rates. • The ground conditions are sandy hence the use of vehicles on-site is unlikely to create muddy conditions, which may in-turn	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						increase suspended solids levels in surface water run-off. • All run-off is likely to dissipate naturally to ground, however standard storm drains are going to be installed around the project area to avoid water flowing into nearby properties. • During operation the following design features will reduce the risks from surface water run-off from solar panels by	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						• promoting dispersion and infiltration: • The gap between panels will be sufficient (typically 20 mm) to allow drainage to ground rather than onto adjacent panels. • The ground surface around and between the frames will be maintained as grass to ensure that bare soil areas are minimised. • The vegetated gap between rows of frames will be of greater width than	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						that of each row of solar panels. • Groundcover vegetation will be maintained in good condition in those areas receiving runoff from solar panels. • The surface gradient is generally less than 10% across the site and therefore run-off is expected to remain dispersed and unlikely to form channels. • Broad grass strips around the edge of the array will also act to impede	

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
						drainage of surface water to field margins.	
Positive Impacts							
Employment creation	The development provides an opportunity of outsourcing work	Improves disposable income to those employed and their immediate families.	Socio-economic	Project lifetime	Project Manger	Work with local leadership (councillor) on acquiring non-skilled labour from the residents.	**Construction and operation**
Business linkages	Raw materials acquiring and contracting companies provide an opportunity for businesses.	• Local suppliers will be presented with an opportunity to empower their businesses. • Construction workers can be provided with accommodation, food and services from the local community	Socio-economic	Project lifetime	Project Manger	The proponent will outsource most of its materials and services from nearby townships and towns.	**Construction and operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
		increasing business activities.					
Infrastructure development	The development presents a unique opportunity for infrastructure development	• Existing roads will be upgraded which will benefit the local community. • Development of the facilities will also pave way for future developers to grow interests in the area and result in ripple effects and quick growing of the area.	Socio-economic	Project lifetime	Project manager	Development such as road upgrading will not only be limited up until the project site, but it will be extended to service other the connecting roads when there is need.	**Construction and operation**
Climate smart energy	The project is towards clean energy production and is highly beneficial to the country	Alternative clean energy generation	• Socio-economic • Environmental	Operation phase	Project manager	It is recommended that the project once it takes off, a second phase development be implemented in order to expand operations.	**Operation**

Impact	Description	Effects	Class	Time frame	Responsibility	Action	Phase
	and the continent at large.						

1.5 ENVIRONMENTAL MONITORING PLAN

Monitoring is very important for identifying the success of mitigation measures formulated for the significant impacts identified. Monitoring of activities will identify impacts that have not been foreseen and give enough time to analyse the situation and formulate measures to minimise impacts. Survey records and results must be maintained for these monitoring and inspections, highlighting any problems and the measures taken to address it.

Prior to site preparation and construction activities, the main contractor should present an environmental monitoring plan (including, *inter alia*, location of construction camp and toilet facilities, location of material storage areas, solid waste management plan, dust control measures, activity schedule, etc.) for review and approval by the DEA, the environmental control officer and the project manager. The developer should present a landscape plan and the trees/vegetation earmarked for protection should be flagged and hoarded by the contractor.

The entity selected to carry out environmental monitoring of the construction works should then prepare an environmental monitoring programme based on the above, the requirements of the EIA, and conditions of the development permit. The major elements of the environmental impact monitoring programme to be implemented during the all the project phases of the project are as follows:

- Site clearance to ensure that trees marked for protection are left untouched and that large areas of soil are not left exposed and uncovered for extended periods of time.
- Site drainage and surface runoff, especially during and shortly after major rainfall events, to ensure there is no flooding, ponding and runoff of surface water Compliance of construction works with site management and landscape plans.
- Ensure transportation of earth materials is done by covered trucks and from approved sites.
- The contractor must immediately and completely clean up spills of materials in public areas.
- Solid waste disposal practices to ensure appropriate on-site management and final disposal at approved dump.
- Electrical safety training and signage is highly recommended and important for this development, thus high priority should be placed on electrical safety.
- **An ECO should be contracted to conduct quarterly reports before the triennial renewal period.**

2 CONCLUSION AND RECOMMENDATIONS

The Environmental Impact Assessment process for the proposed construction and operation of a 313 kWp Solar PV Plant at the UNAM Main Campus, Khomas Region, Namibia was conducted in accordance with the Environmental Management Act 2007 and EMA Regulation 2012. Further consideration was given to relevant legislation throughout the entire process to ensure a successful assessment process.

Impacts likely to occur during project phases (construction and operation) were assessed depicting a positive outlook despite limited details of the magnitude of the proposed development. Based on the assessment, the overall project is less damaging to the environment demonstrating climate change mitigation, improved economic development, high job creation opportunities and community development. Impacts with negative effects were also identified and summarized in a form of environmental management plan to ensure sustainable implementation.

The site has access to services such as water infrastructure and roads for accessibility. It is important that the proponent observe and maintain accountability to both socio-economic and environmental sensitive activities from the project, such that the project is harmonized with policy, regulations, administrative frameworks and social interface with the public as proposed in the environmental management plan. Failure to observe these measures will significantly affect the local environment and lead to non-compliance. Therefore, implementation environmental protection measures should be executed in consultation with the key stakeholders.

JBIC cc hereby recommends that MET: DEA grant the environmental clearance certificate for the 313 kWp Solar PV Plant at the UNAM Main Campus, Khomas Region, Namibia, under the condition of full implementation of the project's EMP.

3 REFERENCES

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APPENDICES

Appendix A: Public Consultation Documents

1. Background Information Document
2. Newspaper Adverts
3. Site Notice
4. Meeting Attendance Register
5. Meeting Presentation
6. Questionnaires

Appendix B: Site Information

1. Appointment Letter
2. Locality Map

Appendix C: Any other relevant documentation

Appendix D: Consultancy Team resumes