

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Final – February 2023

THE PROPOSED 221 MW SOLAR FARM, NGCANGCANA KAVANGO EAST, NAMIBIA



PROJECT DETAILS

Project Title:	Environmental Impact Assessment Report for the Proposed 221 Megawatts Solar Farm at Ngcangcana, Kavango East Region, Namibia
Proponent Address:	Water and Power Supply Namibia Pty Ltd, PO Box 265, Rundu, Namibia
Contact:	+264 812 775 106 Water and Power Supply Namibia(Pty) Ltd
Contact Person:	Mr. Simon Hewitt
Email:	simonh@wapsafrica.com
Project Location:	Ngcangcana Communal Area, Kavango East, Namibia
Report Status:	Final Environmental Impact Assessment Report
Authors:	Conserver Investment cc Environmental Consultant
Reviewed & Reproduced By:	Michael Matengu IEAP
Submission Date:	February 2023

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DEFINITION OF TERMS

EIA	Environmental Impact Assessment
Environment	the natural and man-made resources, both biotic and abiotic, occurring in the lithosphere and atmosphere, water, soil, minerals and living organisms, whether indigenous or exotic, and the interaction between them.
MW	Mega Watt
Manage	Means to manage with a view to securing its protection, conservation, regulations, rehabilitation, and sustainable use.
Mitigate	Activities designed to compensate for unavoidable environmental damage
Monitor	means to assess continuously the state and trends of developments on any part of the environment as well as the actual or potential impact of any activity on the environment and human health
Natural Resource	the air, soils, minerals and waters of Namibia, mammals, birds, fish, trees, grasses, springs, vleis, sponges, marshes, swamps and public streams.
Deforestation	total removal of trees or any other vegetation from land.
Pollution	any direct or indirect alteration of the physical, thermal, chemical, biological properties of the environment caused by discharge, emission, or deposit of a substance into the environment
Project	means any activity which has or is likely to have an impact on

	the environment
Solar Farm	A solar farm is a large scale electrical generating system comprised of photovoltaic (PV) modules and associated electrical infrastructure.
Sustainable utilization	means the use or exploitation of the environment which guards against extinction, depletion or degradation of any natural resource and permits the replenishment of natural resources by natural means or otherwise.
Waste	includes domestic, commercial or industrial material, whether in liquid, gaseous or solid form, which is discharged, emitted or deposited into the environment in such volume, composition or manner as to cause pollution.

ABBREVIATIONS AND ACRONYMS

BNP	Bwabwata National Park
CLO	Community Liaison Officer
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EPC	Engineering Procurement and Construction
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
I&AP	Interested & Affected Parties
KWh	Kilowatts Hour
KWp	Kilo Watts Peak
METF	Ministry of Environment Tourism and Forestry
MUA	Multiple Use Area
OGEMP	Off Grid Enegrization Master Plan
PV	Photovoltaic
PPP	Public Participation Process
SHE	Safety Health and Environment
STI	Sexually Transmitted Infections
ToR	Terms of Reference

EXECUTIVE SUMMARY

Water and Power Supply Namibia (project proponent) intends to establish a 221 Megawatts, solar energy generating plant in Ngcangcana communal area, Kavango East, Namibia.

Ngcangcana Solar Project site is located approximately 9 km Southeast from Rundu along Cuma-Mbambi highway at Ngcangcana village under Shambyu traditional authority. The proposed and planned Phase 1, 100 MW solar project has the technical analysis to generate approximately 227 000 000 KWh year. The proposed solar site is large enough comprising of 301 hectares. General work is more on the pre work on accessibility from the gravel road to the solar site. The solar power plant has a significant capacity and this power will need to be transferred to a high voltage grid. Water and Power Supply Namibia intends on entering into a Power Purchase Agreement (PPA) with NamPower, the Regional Electricity Distributors (REDS), the Bulk Buyers and the Municipalities to supply clean energy for 25 years. The solar project has an estimated electricity installed capacity as planned by Water and Power Supply Namibia (Pty) Ltd of 100 MWp for Phase 1, with Phase 2 total 121 MWp providing a total of 221 MWp.

A transmission power line will be established to redirect generated power into the national grid which is a few kilometres from generation source, (a separate EIA to be done for the transmission line, with public participation already done).Engagement of Interested and Affected Parties (EAPs) is an integral component of the EIA process. This enables potentially affected people or communities, as well as key stakeholders to air out their views as part of the EIA study. Consultation with the local community is essential to ensure that the impact assessment takes account of issues regarded as priorities by those people living in and around the project area, and affected by the development. A combination of methods was used to solicit views and concerns of the different stakeholders. The methods used include key informant interviews, informal interviews and semi-structured questionnaires. Relevant stakeholders were consulted and these responded through questionnaires and informal interviews.

An Environmental Management Plan (EMP) describes the processes that will be followed to maximize compliance and minimize harm to the environment. This plan also helps an

organization map its progress toward achieving continual improvements. Each project is unique and, as a result, so is Environmental Management Plan. In the context of this EIA report, the Environmental Management Plan (EMP) is limited to the mitigation and management of negative impacts rated as moderate, high and extreme during impact assessment. The project will have an impact on the environment but with proper management and monitoring plans the impacts can be mitigated. The anticipated positive impacts which will contribute towards alleviating poverty in Kavango East far outweigh the anticipated negative impacts. The national development plan and renewable energy policy targets the sourcing of 70% of Namibia's energy from renewable energy sources by 2030, therefore, the photovoltaic panels (PV) project should be implemented while the proponent should take into cognisance all recommended mitigation measures at all stages of project life cycle. With the above and taking into consideration the environment as the number one client, I am confident that once the Environmental Clearance certificate is issued, mitigation measures will be strictly enforced through all the phases of the development.

Impacts during construction phase: Key environmental issues that may be affected during the construction phase include, Habitat destruction and fragmentation caused by clearance of vegetation, increased soil erosion and sedimentation, soil compaction and increased risk of sediment transport and erosion, displacement of priority avian species from important habitats, creation of direct and indirect employment opportunities, economic multiplier effects from the use of local goods and services, Impacts on daily living and movement patterns.

Impacts during the operational phase: Key environmental issues that may be affected during the operation phase include, habitat destruction caused by clearance of vegetation, displacement of priority avian species from important habitats, collision of avifauna when flying into power line infrastructure, electrocution of avifauna when perched on the power line infrastructure, visual impacts on observers travelling along the roads and residents at homesteads in close proximity to the power line structures, creation of employment opportunities and skills development, Development of non-polluting, renewable energy infrastructure, contribution to Local Economic Development and social upliftment.

Impacts during the decommissioning phase; Key environmental issues that may be affected during the decommissioning phase include, habitat destruction caused by clearance of vegetation, Impact on the characteristics of the watercourse.

Cumulative impact

Cumulative impact assessment has indicated that all cumulative impacts will be of a medium or low significance, with no impacts expected to be of a high and unacceptable significance. The potential most significant cumulative impacts relate to:

Cumulative effects during construction phase; Habitat loss (including avian habitats) owing to clearing of vegetation, displacement of priority avian species, Impacts of employment opportunities, business opportunities and skills development, Impact with large-scale in-migration of people.

Cumulative effects during the operational phase; Collisions when flying into power line infrastructure, electrocutions of avifauna when perched on power line infrastructure,, Visual impacts related power line.

Cumulative effects during the decommissioning phase; Generation of waste

1. INTRODUCTION

1.1. LEGAL MANDATE AND PURPOSE OF THE REPORT

The Environmental Management Act 7 of 2007 identifies listed activities (in terms of section 27) which are likely to have an impact on the environment. These activities may not be undertaken without obtaining an Environmental Clearance Certificate (ECC) from the relevant competent authority. Sufficient information is required by the competent authority to make an informed decision and the project is therefore subject to an environmental assessment process which can be either a Basic Assessment Process or a full Scoping and Environmental Impact Assessment process.

The EMA Regulations No. 4878, Annexure 1 (a) and (b) outline the activities that may be undertaken without Environmental Clearance Certificate (ECC). The following listed activities with special reference to the proposed development is triggered:

Table 1.1: Listed activities

Relevant notice:	Activity No (s)	Description of each listed activity as per the project description:
No 29 (of 2012)	Activity 1(a) Activity 1(b)	<ul style="list-style-type: none">• <i>Generation of Electricity</i>• The transmission and supply of electricity

The Environmental Management Act 7 of 2007 is the principal defender to the environment aiming to:

Promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the

Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.

Section 56 of the Environmental Management Act, 2007 (Act No.7 of 2007), the Minister has made the protocols for Environmental Impact Assessment as set out in the Schedule of Government Notice No. 30 (2012). These protocols necessitate that all developments/projects that have a detrimental effect on the environment must be accompanied by an EIA Under section 27 of the Environmental Management Act, 2007 (Act No. 7 of 2007), and after following the consultative process referred to in section 44 of that Act, the Minister lists in the Annexure to the above-mentioned Schedule, activities that may not be undertaken without an environmental clearance certificate. In both the Environmental Management Act and its guidelines, all activities that may not be undertaken without an environmental clearance are listed.

The fruits of sustainable development are conducted by a comprehensive statutory framework which was used in this section. All the relevant legal instruments and prescribed procedures have been acknowledged.

1.2. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Table 1.2. EAP Details

Contact Person:	Conserver Investment Environmental Consultant
Postal Address:	P.O. Box 2499,Rundu
Tel:	0814087482
	0817637974
Email:	hausiku2007@yahoo.co.uk
	tnyungu@gmail.com

1.3. DETAILS OF SPECIALISTS

Table 1.3. Specialist Details

Contact Person:	Conserver Investment Environmental Consultant
	Tatiya Investment Environmental Consultant
	Michael Matengu (IEAP)
Postal Address:	P.O.Box 2499,Rundu
Tel:	0814087482
	0817637974
Email:	hausiku2007@yahoo.co.uk
	tnyungu@gmail.com
	matengu.myck@yahoo.com

1.4. STATUS OF THE EIA PROCESS

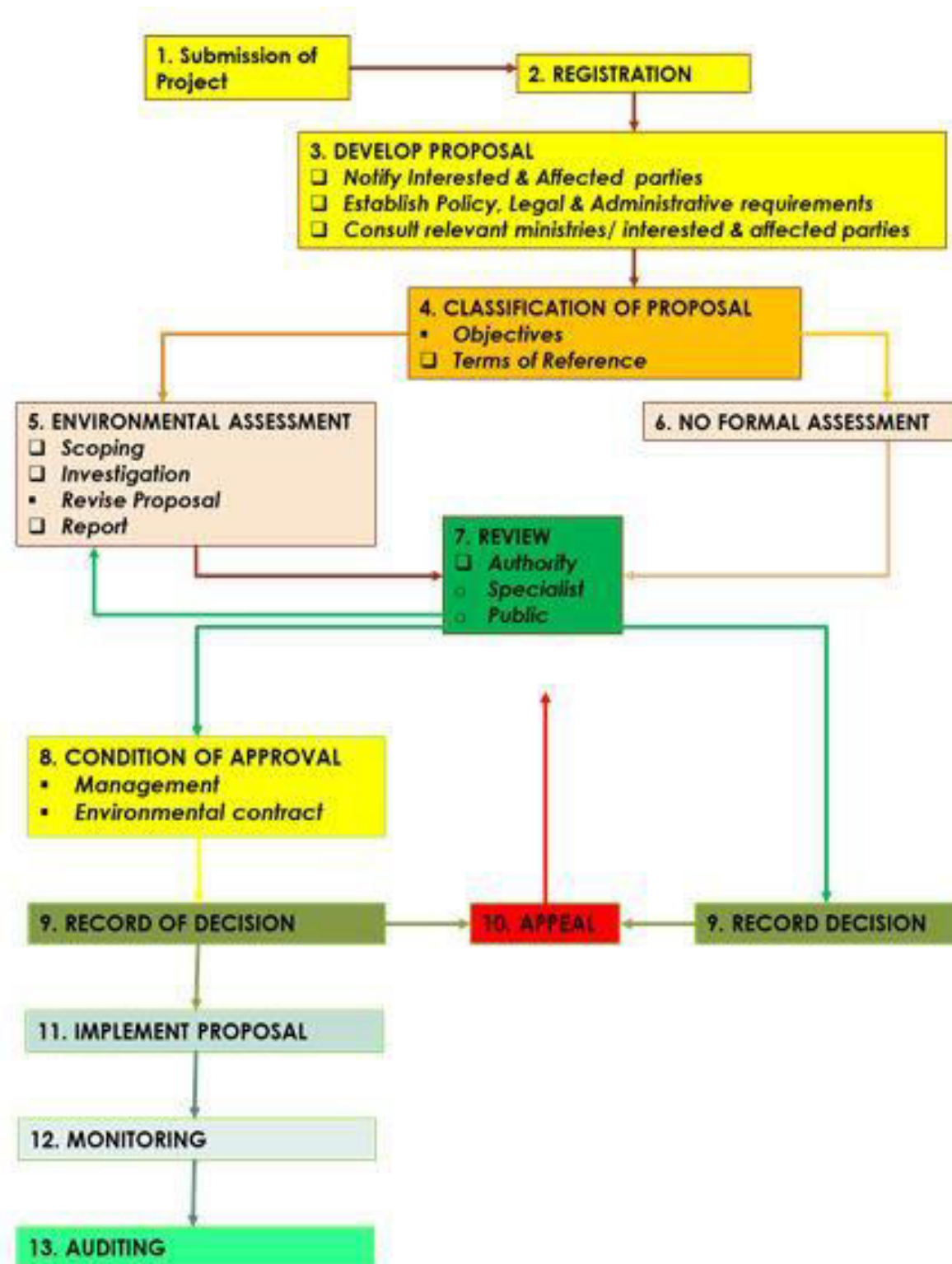
The EIA Process is conducted strictly in accordance with the stipulation of the Environmental Management Act ,2007(Act No. 7 of 2007,6-16 of Regulation No.30

- The EIA Process is conducted strictly in accordance with the stipulation of the Environmental Management Act ,2007(Act No. 7 of 2007,6-16 of Regulation No.30
- A The first public notices were placed in The New Era and Confidante national newspapers for two consecutive weeks to try reaching the I interested & Affected Parties (I&APs) and invitation to comments.
- A copy of Background Information was prepared for dissemination to I&APs.

- Placement dates were 16 to 30 September 2021 and advertisement was done on the 30th of September and the 7th of October 2022.
- In the public notices all I&APs were invited to attend a meeting held at Mushangara village on 01 October 2021.
- The second meeting was held on the 22nd of October 2022. Opinions, comments, suggestions to the proposed project were recorded and they all-encompassing contents of the EMP.
- A register of I&APs was kept and dissemination of BID was done throughout the public consultation period. The project attracted audiences from various sectors who contributed to the development of the EMP.
- The EIA team decided to re advertise the proposed project to the public in form of Invitation to comment on the Scoping report before the application was launched to MET for review.

1.5. EIA PROCESS

Figure 1.1. The EIA Process



2. ACTIVITY DESCRIPTION

2.1. POWER SECTOR IN NAMIBIA

Namibia enjoys a very high number of annual sunshine hours and offers one of the highest solar energy yields in the world. Namibia uses coal solely for generating electricity, thus through the country's only coal-powered station (Van Eck Power Station). All the coal used in Namibia is imported, and it mostly comes from South-Africa. Currently, Namibia imports most of its electricity from South Africa and other countries in the region. A special arrangement between NamPower and Eskom, the South African Power utility, enables Namibia to buy and utilize the surplus energy from SA at affordable rates. Access to electricity (% of population) in Namibia was reported at 55.2 % in 2019, according to the World Bank collection of development indicators, compiled from officially recognized sources. Namibia has its own Ruacana hydro power generation station. An 80 MW generating units are driven by water from the surge head bay on top. Electricity is generated at 11 000 volts, transformed to 330 000 volt and fed up vertical tunnels to the switchgear on the surface from where it is distributed to the central areas of Namibia.

The Ministry of Mines and Energy (MME) is the sole administrator of the Solar Revolving Fund (SRF). The SRF is a credit facility established by MME to stimulate demand for the utilization of renewable energy technologies in the rural areas, especially for communities living in off-grid areas, but also to urban clients. The SRF is an element of the Off-Grid Energization Master Plan for Namibia (OGEMP) whose objective is to provide access to appropriate energy technologies to rural areas. Namibia's installed electricity generation capacity is 498 MW. The country's electricity demand significantly exceeds this generation capacity while the Namibian Integrated Resource Plan assumes that electricity consumption will grow by 4.25 percent p.a. between 2011 and 2031. Therefore, Namibia heavily relies on energy imports. The Namibian administration, however, plans to eliminate the dependence on imports by increasing the country's electricity generation capacities.

The Ruacana hydropower plant, built on the Kunene River, is Namibia's main power producer. The hydropower plant relies on the constant flow of water, which is particularly problematic in the time of drought currently plaguing the country. The situation should be remedied, among

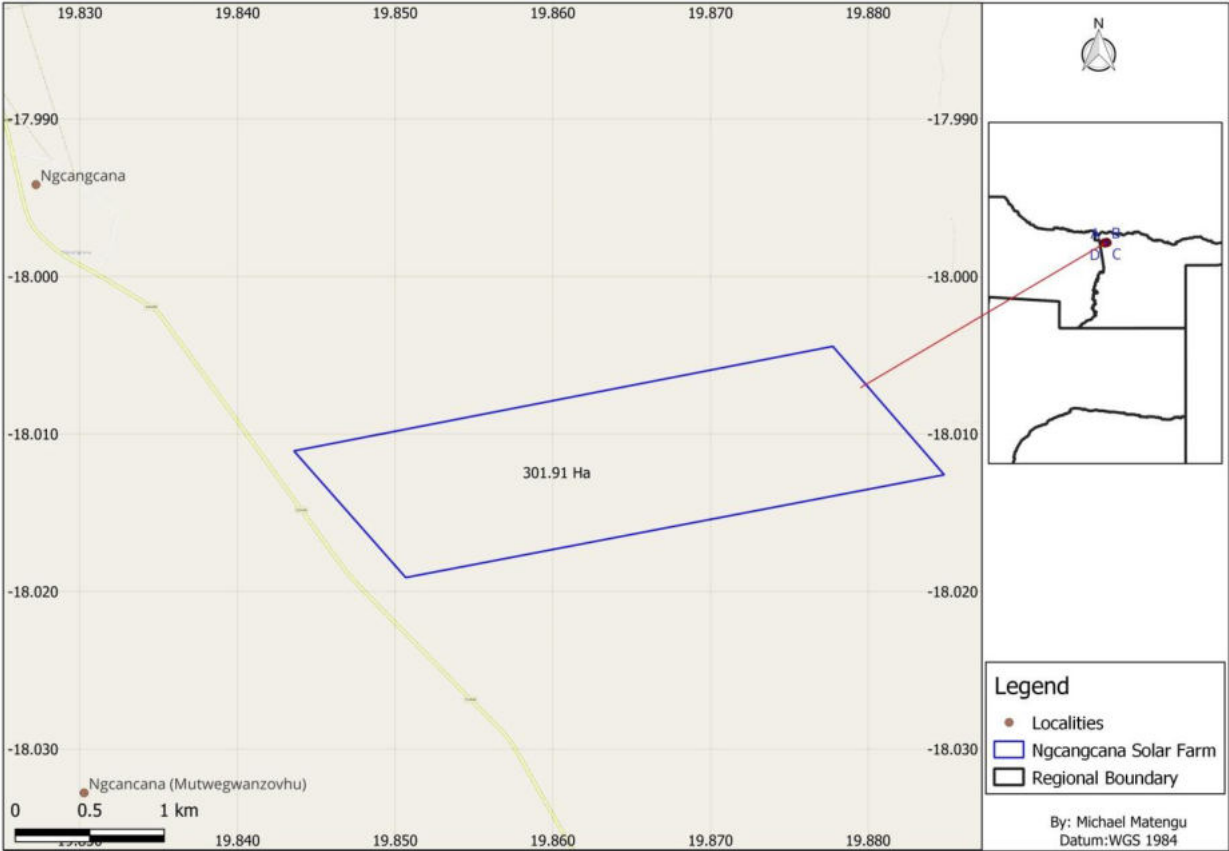
others, by large-scale projects such as the Kudu Gas project. But the completion of this project has been delayed for years now.

This situation creates opportunities also for renewable energy investors. There is enormous potential for photovoltaic panels (PV) projects.

2.2. THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

Ngcangcana is under Shambyu traditional authority/ jurisdiction. The area can be referred to a peri- urban area with the majority of the people practicing agriculture, cattle rearing among other agricultural activities. To the south Easterly part of Rundu along Cuma to Mbambi highway lies Ngcangcana village which is approximately 9 km away from Rundu.

Figure 2.1. Ngcangcana Locality Map



2.3. PROJECT BACKGROUND

The project proponent is Water and Power supply Namibia Company (Ltd) Pty. The proponent has undertaken feasibility studies for the project to be undertaken. The government of Namibia through the Ministry of Lands entrusted Shambyu traditional authority and community members of Ngcangcana with the conservation of natural resources. A member or group of the community with any other intentions or development within the communal area should launch the intentions through the local authorities, Ministry of lands and Ministry of Environment for such intentions.

A separate EIA report for the transmission line will be submitted to Ministry of Environment and Tourism (MET) for approval and this will immediately follow once the ECC has been issued with conditions concerning the development.

2.4. PHOTOVOLTAIC TECHNOLOGY

Solar power is the conversion of renewable energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. Since then, as the cost of solar electricity has fallen, grid-connected solar PV systems have grown more or less exponentially. Millions of installations and gigawatt-scale photovoltaic power stations have been and are being built. Solar PV has rapidly become an inexpensive, low-carbon technology.

The International Energy Agency said in 2021 that under its "Net Zero by 2050" scenario solar power would contribute about 20% of worldwide energy consumption, and solar would be the world's largest source of electricity. China has the most solar installations. In 2020, solar power generated 3.5% of the world's electricity, compared to under 3% the previous year. In 2020 the unsubsidized levelized cost of electricity for utility-scale solar power was around USD \$36/MWh, and installation cost about a dollar per DC watt.

2.5. TECHNOLOGY CHOICE FOR NGCANGCANA

The solar conditions in Namibia are considered to be some of the best worldwide for solar generation. The country's average high direct solar insolation is 2200 kWh/m² /year, with a minimum of cloud cover. The southern region of Namibia experiences on average 11 hours of sunshine per day, and an average direct solar radiation of 3000 kWh/m²/year. Namibia's most common PV technology application is solar PV-based pumping, which is mainly used in cattle farms. Secondary solar applications in the country would be rural electrification, powering radios, lighting, TVs, and fans.

The proponent wants to install innovative singled cell design panels, deliver more energy and savings over traditional front contact panels. With deployments across 60+ countries, these panels are the leading single cell panel on the market today and the ideal choice for large scale solar power plants. The company has designed, developed, constructed, operated and supplied more than 5 GW of their superior technology to some of the largest solar power plants around the world. The solar technology, these solar panels produce 75% more power over the first 25 years than conventional solar panels and hold the world record for producing the world's most efficient silicon solar panel. This unique technology has been designed to turn on earlier, work harder and turn off later. The panels lead all solar panels in efficiency and produce more power in high temperatures than any other panel available. Their high efficiency panels convert more of the sun's energy to electricity, and therefore run cooler than conventional panels, further increasing power in the real world. This unmatched combination of high efficiency and low operating temperature enables the panels to generate more power than any conventional panel, even in extreme temperatures.

2.6. SERVICES PROVISION

The following sections provides information on services required on the site e.g., water, sewage, refuse removal, and electricity.

Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from ground water resources, or alternatively from the local village council. A full assessment of the application for water use authorisation and extraction will only be undertaken after the Environmental Clearance Certificate has been awarded by the Ministry of Environment Forestry and Tourism. Water saving devices and technologies such as the use of dual flush toilets and low-flow taps, the management of storm water, the capture and use of rainwater from gutters and roofs would be considered by the developer

Storm Water

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. It will also be good practice to design storm water canals into which the water from the panels can be channelled. These canals should reduce the speed of the water and allow the water to drain slowly onto the land. Storm water management and mitigation measures are included in the Environmental Management Programme

Sanitation and Waste removal

Portable chemical toilets and conservancy tanks will be utilised, that will be serviced privately or by the local council. Waste will be disposed at a licensed landfill site. The construction- and hazardous waste will be removed and disposed of at licensed landfill sites accepting such kinds of wastes. During the operational phase household waste will be removed to a licensed landfill site by a private contractor or by the local council. The relevant Local council(s) will be

contacted, to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (25 years).

Electricity

During the construction phase of the development, electricity will either be generated on site through a small solar system or through the use of generators. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed. During operation electricity use will be limited and will primarily be related to the lighting of the facility and domestic use. Design measures such as the use of energy saving light bulbs would be considered by the developer. During the day, electricity will be sourced from the photovoltaic plant, and from the electricity connection at night.

Decommission of the facility

The operating period will be 25 years from the commencement date of the operation phase. Thereafter two rights of renewal periods of 25 years will be relevant. It is anticipated that new PV technologies and equipment may be implemented, within the scope of the Environmental Clearance, when influencing the profitability of the solar facility. A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures to improve the efficiency of the facility as the technology improves. The specifications of these new panels will be the same as the current panels under consideration.

3. LEGISLATIVE AND POLICY CONTEXT

3.1. INTRODUCTION

Energy generation and distribution projects fall under the Part VII 27 (h), Listing of activities and prohibition in respect of listed activities of the Environmental Management Act 2007 of the Republic of Namibia. Project proponents undertaking such projects are required to conduct EIA study before implementation.

3.2. LEGISLATIVE CONTEXT

3.2.1. Environmental Impact Assessment Regulations

Relevant provisions

These regulations are very important in the implementation of the Project because this project fall under prescribed projects that has to have an Environmental Impact Assessment undertaken before the project is given a green light for implementation. This Act and its regulations should enlighten and guide this EIA process. Cost and benefits analysis of the project are weighed systematically to find suitability of the project in terms of economic, social and bio-physical environmental.

These regulations also make it possible that both negative and positive environmental impacts are identified and weighed in their significance and relentlessness to determine whether the project will be given a permission to be carried out. This is attained through the appointment of a qualified and experienced EAP whom the project proponent chooses to do the preliminary Environmental Assessment and compilation of scoping report submitted accordance to the regulations. It mandates the Assessment process to be done in accordance with the EMA Act and its regulations.

In short, this policy makes all other policies, legal and administrative framework to be considered before the project can be allowed to be implemented. The Environmental Impact Assessment (EIA) regulatory framework was published on the 18th of January 2012.

Relevance to the project

This Act and its regulations should enlighten and guide this EIA process.

3.2.2. Environmental Management Act (2007)

This act is the most powerful in the country when it comes to environmental management. Environmental Management Act supersedes all other environmental laws. The act was enacted to supervise, monitor, audit, control and govern the entire environment sector as well as to disseminate environmental awareness to the public. The Act is set, (To promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters).

PART II of the ACT provides the principles of environmental management

1. Principles of environmental management:

(a) Renewable resources must be used on a sustainable basis for the benefit of present and future generations;

(b) Community involvement in natural resources management and the sharing of benefits arising from the use of the resources must be promoted and facilitated;

(c) The participation of all interested and affected parties must be promoted and decisions must consider the interest, needs and values of interested and affected parties;

(d) Equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be considered to ensure the sustainability of the systems and to prevent harmful effects;

(e) Assessments must be undertaken for activities which may have significant effects on the environment or the use of natural resources;

(f) Sustainable development must be promoted in all aspects relating to the environment;

(g) Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;

(h) The option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;

(i) The reduction, re-use and recycling of waste must be promoted;

(j) A person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as are reasonably required to be implemented to prevent further environmental damage;

(k) Where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and

(l) Damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled.

PART VII of the Act section 27: Projects for which environmental impact assessment required

The proposed development falls under listed activities and prohibition in respect of listed activities mentioned in Subsection 2 of the ACT. The following may include activities in respect of the proposed development of a new township and its convenience services:

Sub sections 2(a) Land use and transformation; (b) water use and disposal; (c) resource removal, including natural living resources; (d) resource renewal; (f) industrial processes; (l) waste and sewage disposal; chemical treatment;

Relevance to the proposed project

In relation to the proposed project development This Act and its regulations will be observed to guide this EIA process.

3.2.3. Nature Conservation Ordinance 4 OF 1975

The main Objectives of the Ordinance were aimed: To consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto.

Wildlife legislation The Nature Conservation Ordinance (No. 4 of 1975) is the primary legislation providing for the proclamation of protected areas and the conservation and utilization of wildlife in Namibia. The Nature Conservation Amendment Act, 1996 (Act 5 of 1996) amends the Nature Conservation Ordinance so that residents of communal areas can gain the same rights over wildlife and tourism as freehold farmers. The Act puts into effect the national policy on Wildlife Management, Utilization and Tourism on Communal Land. According to the Act any group of persons residing on communal land may apply to the Minister of Environment and Tourism to have the area they inhabit or activities to be done in accordance to the Environmental Management Plan of the National Park.

3.3. Climatic Change Policies

3.3.1. National Climate Change Strategy & Action Plan 2013 – 2020

The climate change action plan which identifies Climatic Change as a critical threat to sustainable development. Therefore, it must be addressed in a holistic manner.

Relevance to the project

There are several activities to be done as a result of project development. In respect to the Climate Change strategy, appropriate measures to combat climate change have been implemented from the initial stages of project designing.

(a). Deforestation

The project activities will include clearance of trees and bushes on the proposed site. Basing on the conclusion drawn during the site visit, the EIA team observed abundance of certain tree species both protected and un protected. The appointment of specialists was done to undertake a flora and fauna study for the proposed project.

(b). Making use of renewable sources of energy

The proposed will be one of the largest solar power plants on the world sitting in the top five. Many industrialized nations have installed significant solar power capacity into their grids to supplement or provide an alternative to conventional energy sources while an increasing number of less developed nations have turned to solar to reduce dependence on expensive imported fuels (see solar power by country). Long-distance transmission allows remote renewable energy resources to displace fossil fuel consumption.

(c). Emissions of Green House Gases (GHGs)

There are four main types of forcing greenhouse gases: carbon dioxide, methane, nitrous oxide and fluorinated gases. The main feedback greenhouse gas is water vapor. The general physical layout of the proposed project minimizes all possible activities contributing to global GHGs emissions in either ways.

3.3.2. United Nations Framework Convention on Climate Change

Relevant provisions

It is also vital to note that there are international conventions which aim to protect the environment. Namibia is a signatory to some of the conventions for example the 1992 United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC was adopted to

regulate levels of greenhouse gas concentration in the atmosphere, so as to avoid the occurrence of climate change on a level that would impede sustainable economic development, or compromise initiatives in food production. The Parties are to protect the climate system for present and future generations. The developed country Parties (and International Environmental Law from a Namibian Perspective 54 other Parties listed in annex I) commit themselves to take special measures to limit their anthropogenic emissions of greenhouse gases (GHGs.), and to enhance the capacity of their sinks and reservoirs for the stabilization of such gases

Relevance to the proposed project

All anthropogenic emissions of GHGs to be used during all phases will be strictly very limited, closely monitored by qualified personnel. The generation of solar energy or PV panels is a designed technology to combat climatic change since the whole world should try by all means to de-fossilize.

"We know the world needs to de-fossilize its energy systems," says Christian Breyer, professor of solar economics at LUT University in Lappeenranta, Finland, whose research group models transition pathways to future zero-emissions energy systems. "We need to get to net-zero greenhouse gas emissions — as quickly, safely and cost-effectively as possible, he says. "To do that, we need technologically feasible, cost-optimized transition pathways for every region of the world. Our calculations show how we can do that."

In order to avoid dangerous climate changes and long-term sea level rise, much of the carbon being released into the atmosphere now will have to be taken back out within the next few decades.

3.4. Other Relevant Regulations

3.4.1. National Heritage Act 27 of 2004

Relevant provisions

Section 48(1) states that "A person may apply to the Namibian Heritage Council (NHC) for a permit to practice any activities which might directly or indirectly disturb protected areas or National heritage

Relevance to the proposed project

In respect to the proposed project development site, there are no places of declared heritage sites and its nearby environs.

3.4.2. Soil Conservation Act 76 of 1969

Relevant provisions

The soil Conservation Act makes provision for the prevention of soil erosion. It promotes the protection and up keeping the soil structure and vegetation and all-natural resources in the soil of the Republic of Namibia.

Relevance to the proposed project

The construction phase of the project will experience land clearance. The use of traditional methods in land clearance will be encouraged than the use of heavy machineries. The proposed activities will implement the designed EMP to maintain the soil structure since the project area is not degraded. Tar and concrete paving would not be encouraged to reduce surface runoff but to promote infiltration. The disturbed soil surfaces will be rehabilitated by all means. During operation phase of the project, not further soil disturbance will be experienced. Reforestation, planting of lawns and promoting young indigenous plants will also conserve the soil structure if done on open spaces.

3.4.3. Water Act 54 of 1956

Relevant provisions

Certification in terms of Sections 21(1) and 21(2) of the Water Act is required for the disposal of industrial or domestic wastewater and effluent. Prohibits the pollution of underground and surface water bodies (S23) (1) and Accountability for costs to be met in remedying the environment as soon as project abandonment (S23 (2)).

Relevance to the proposed project

The protection of ground and surface water resources should guide the project construction phase. No Hazardous substances should be disposed in any case for example spillages Use of monitoring boreholes and ambient water samples to be kept on record.

3.4.4. Labor Act (No 11 of 2007) in concurrence with Regulation 156, 'Regulations Relating to the Health and Safety of Employees at a working place'.

Relevant provisions

The section 135 (f) of the Ministry of Labor and social Welfare specifies that “the steps to be taken by the owners of premises used or intended for use as factories or places where machinery is used, or by occupiers of such premises or by users of machinery about the structure of such buildings of otherwise to prevent or extinguish fires, and to ensure the safety in the event of fire, of persons in such building.

This act emphasizes and regulates basic terms and conditions of employment, it guarantees prospective health, safety and welfare of employees and protects employees from unfair labor practices.

Relevance to the proposed project

The project will offer a number of jobs to both semi-skilled and skilled locals and it will be the proponent or the contracted company's responsibility to ensure that the workplace is safe from Hazards. Occupational Safety and health practitioners should be hired to provide adequate safety and health trainings to key personnel. This will comprise put on suitable hazard management plans.

3.4.5. Public Health and Environmental Act, 2015

Relevant provisions

No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”, Under this act, in section 119.

Relevance to the proposed project

The proponent shall guarantee compliance to the terms of the Act.

3.4.6. Road Ordinance 1972 (Ordinance 17 Of 1972)

Relevant provisions

The ordinance set the width of proclaimed roads and road reserve boundaries (S3.1) Infringements and obstructions on and interference with proclaimed roads. (S37.1) Distance from proclaimed roads at which fences are erected (S38) Control of traffic during construction activities on trunk and main roads (S27.1)

Relevance to the proposed project

The proposed activity will have a direct impact to the D3431 Road and all users. The proposed project will accommodate the road which will pass through its intended proposed site. Permissible provision for the development will be done 100 meters away from the road. All the distances and specifications in the ordinance should be thoroughly observed during construction and operation phases. Upgrading and maintaining the road should be sustainably carried with consent.

3.4.7. Pollution and Waste Management Bill (draft)

Relevant provisions

The draft of Pollution and waste management bill clearly defines different types of pollution. It also notifies on how the Government intends to control different types of pollution to uphold a clean and safe environment for all. The bill expresses the mandatory for everyone to comply with waste management to reduce pollution in any form. The failure to comply with the obligatory is considered as an offense which is punishable.

Relevance to the proposed project

The operations of the project should be done in accord with the pollution and waste management bill to reduce all types of pollution within the vicinity of the project site during construction and operation phases. Engagement of Solid waste collectors and recycling companies like Rent A Drum is already underway.

During operation phase of the proposed development activities, the project proponent will be entitled to undertaking refuse collections and provisions for solid waste receptacles to be put in place.

3.4.8. Waste Management Regulations: Local Authorities ACT (1992)

Relevant provisions

Waste Management Regulation: Local Authorities of 1992 provides guidelines on waste management, it mandates the occupier of properties must provide a secure, hygienic, adequate and readily accessible waste storage place or area on the premises.

Relevance to the project

The waste management on site will be executed in an environmentally sound manner. All solid waste generated during construction, operational and decommissioning phase will be handled and disposed using recommended containers and to make sure right procedural disposing methods. Alternatively, a sustainable approach can be done, see Appendix I, EMP for recommendations.

3.4.9. The Namibian Constitution Act, (1990)

Relevant provisions

The Constitution of Namibia encourages wise and sustainable use of resources. According to Article 95 of Namibia's Constitution it states that, the State shall actively promote and maintain the welfare of the people by adopting policies aimed at the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources in a sustainable way for the benefit of all Namibians, both present and future. This article recommends that a relatively high level of environmental protection is called for in respect of pollution control and waste management.

Relevance to the proposed project:

The project will enable the full execution of right to practice any profession, or carry on any occupation, trade or business by availing necessary provisions such as practicing any profession, or carry on any occupation, trade or business in the country.

Through implementation of the environmental management plan will ensure conformity to the constitution in terms of environmental management and sustainability.

3.4.10. Namibia's Draft Wetland Policy

Relevant provisions

Namibia's Wetland Policy Vision is to manage national and shared wetlands wisely by protecting their vital ecological functions, life support systems for the current and future benefit of people's welfare, livelihoods and socio-economic development. The objectives of the policy are to:

- protect and conserve wetland diversity and ecosystem functioning to support basic human needs;
- provide a framework for enduring use of wetland resources;
- promote the integration of wetland management into other sectorial policies; and to
- Recognize and fulfil Namibia's international and regional commitments concerning shared wetlands and wetlands of international importance.

Relevance to the proposed project

The project site is might be an indirect water source to the downstream rivers. The project site is not recognized under wetlands in Namibia but will ensure all its activities will be environmentally receptive.

3.4.11. The National Land Policy 1998

Relevant provisions

Namibia's national Land Policy Of 1998 gives traditional authorities a role undertakes land administration with varying degrees of efficiency and legitimacy

Namibia's National Land Policy is based upon the principles enunciated in the Constitution and on the national commitment to redress the social and economic injustices inherited from the colonial past.

Article 10 of the Constitution of the Republic of Namibia states that all persons shall be equal before the law and that no one shall be discriminated against on the grounds of sex, color, ethnic origin, religion, creed or social or economic status.

In accordance with Article 95 (L) of the Constitution, this National Land Policy requires environmentally sustainable land and natural resource use.

Relevance to the proposed project

The proposed solar power generation is a sustainable and clean way of electricity generation.

The proposed project will in accordance with Article 95 (1) of the Constitution, Namibia's Land Policy at all times promote environmentally sustainable land use. Failure to demonstrate that proposed land uses are environmentally sustainable, will be grounds for Land Boards to terminate or deny the award of title.

3.5. CONCLUSION

These pieces of regulations should be observed throughout the project's life cycle. Any deviations from these policies, regulations and administrative frameworks may have catastrophic results to the environment (including manpower) and the work environment. These laws bring about rational work ethics that support the protection of the environment. Strict monitoring by relevant authorities will bring about sound environmental practices. WAPS Africa shall enforce these regulations on its area of jurisdiction and constant monitoring will be done in form of inspections and audits.

4. NEED AND DESIRABILITY

4.1. THE NEED FOR THE PROPOSED ACTIVITY

Namibia's top energy sources are petroleum, hydropower, imported electricity, and imported coal. The country's own internal resources supply less than one-third of its needed energy requirements. Namibia has high potential for solar, wind and biomass generation. The country is also on the top 10 listed countries, which are in possession of uranium resources worldwide, and it solely supplies about 8.2% of the global uranium production. There are around 1 million Namibians who do not have access to electricity, which means that almost half of the country is without access at all (~53% has access & ~47% has no access). A 2019 report identifies that by 2030 36% of Namibians will still not have access to modern energy under the Business-as-Usual (BaU) ("New Policies" Scenario of the International Energy Agency's World Energy Outlook 2018), while 32% will have access to the grid, 11% to a mini-grid and 22% to a SHS. Namibia's average consumption rate surpasses 3000 GWh/year, while its generation capacity is around 1305 GWh/year. Therefore, there is a supply gap, which is covered by importing power from South Africa, Zambia, and Mozambique.

The planned activity is a direct response to Namibia's increasing need for renewable energy sources and the demand for power. This rising demand could put further strain on Namibia's current power producing capacity as a result of rising economic growth and social development. Alongside this, there is a rising consciousness of the need for sustainable development, the effects of climate change, and the necessity for environmentally responsible development.

Namibia wants to fulfill its obligations under the Paris Agreement and the UN Framework Convention on Climate Change, which include reducing greenhouse gas emissions. Currently, 60% of Namibia's electricity is imported. The country has the highest CO₂ emissions per capita, where the average is 1.65 tons (based on a population of 2,358,044). This is a 2.5% shift from the 1.61 tons per person registered in 2015 and an increase of 0.04 over that number. Based on the aforementioned, Namibia is firmly committed to achieving net zero emissions and expanding its renewable energy capacity.

4.2. THE DESIRABILITY OF THE PROPOSED ACTIVITY

The solar Farm's contribution towards sustainable development and the associated benefits to society in general are as follows:

- Local economic growth - By fostering industry development in line with regional and national objectives, the proposed initiative will assist local economic growth. Government, civil society, and corporations are all likely to support the initiative heavily because they perceive potential for local money, employment, and economic opportunities. The growth in tax income for regional governments and the sale of carbon credits that will follow the development of the photovoltaic solar facility will increase foreign direct investment.
- Lower costs of alternative energy - As more solar facilities are put into operation, the price of the power produced by those facilities will eventually go down. This will help the nation achieve its goal of using more renewable energy sources and fewer fossil fuel-based power sources.
- Reduction of greenhouse gas emissions - The increased power provided by solar energy will lessen the need on the burning of fossil fuels to produce electricity. As a result of the project's implementation, there will be a decrease in the amount of CO₂ emitted when fossil fuels are burned.
- Climate change mitigation - On a worldwide scale, the project helps to reduce greenhouse gas emissions, which helps to mitigate climate change.
- Reduced environmental impacts - The reduction in electricity consumed from the grid will not only result in a reduction in greenhouse gas emissions, but also the prevention of negative impacts associated with fossil fuel burning.
- Social advantages - The project activity is probably going to have a lot of beneficial long-term, indirect social effects that could go as far as the regional and even the national level. The larger-scale effects will result from the use of solar energy and the knowledge acquired during the building and operation of the power plant.
- Creation of employment possibilities - The main advantage of the proposed development functioning in the area is that local businesses or contractors will be employed during the construction phase. Since security guards and general laborers will

be needed on a full-time basis during the operational phase, local communities in the surrounding area will have access to permanent employment possibilities. The building and operational phases will result in the creation of an additional 100 jobs or more.

- Indirect socio-economic benefits - The local community will experience more indirect socio-economic benefits as a result of the rise in demand for services like lodging, transportation, security, general upkeep, and catering.
- Efficient use of resources - Because of the site's environment, no cultivated crops are grown there, and the only use of the land that is viable for agriculture is grazing. The projected development in this area will produce alternative land use income through leasing, which will raise the community's cash flow and rural livelihood and enhance the community's ability to sustain its financial health.
- Greater supply certainty - By diversifying the nation's energy sources, the country's supply certainty will rise. Namibia's energy needs are always rising, but by incorporating solar power, this demand may be satisfied—and even exceeded—without adding to pollution from burning fossil fuels. If NamPower generation activities lead to a shortage of supply, the project may help to "secure" economic activity by helping to eliminate supply limitations. Economic growth is confined when the supply is restricted. A supply reserve presents a chance for economic expansion when it is there.
- Cumulative impacts of low to medium significance: Given the development's cumulative effects, the sparse number of other proposed solar projects nearby the Solar Power Plant, and the potential cumulative impacts' significance ratings of low and medium, the project can be viewed as desirable for development.

5. DESCRIPTION OF ENVIRONMENTAL ISSUES

5.1. CONSIDERATION OF ALTERNATIVES

These alternatives shall be justified as to why the proponent opted for them over all other available options. With respect to the proposed project, there is no other land allocated for the proposed activities. The planned area had an initial site assessment by the developer, which judged it to be favourable due to its closeness to workable grid connections, solar radiation, site ecology, and relatively flat topography. Before choosing a specific site, the site selection procedure took into account the geology, land capabilities, water availability, and present land usage of the area.

5.1.1. No go Option.

This alternative takes into account the choice to "do nothing" and keep the site's current conditions, which mostly concern agricultural use and archaeology. Currently, the area can only be used for agricultural purposes. The location will remain intact and be used to graze cattle farming should the proposed area have fossils or archaeological find. If the status quo holds, the neighbourhood would miss out on the opportunity costs of alternate land use income from leasing for solar as well as the accompanying social and economic growth.

5.1.2. Location Option

There is not a more acceptable location for the solar power plant from an environmental standpoint. Water and Power Supply Namibia (Pty) Ltd has not acquired any further properties in at Ngcangcana in order to set up a possible solar power farm. Due to its favourable climatic conditions, topography (i.e., in terms of slope), environmental conditions (i.e., agricultural potential, ecological, and sensitivity), proximity to a grid connection point (i.e., for the purpose of electricity evacuation), as well as site accessibility Ngcangcana is preferred from a local perspective (i.e. to facilitate the movement of machinery, equipment, infrastructure and people

during the construction phase).The proposed development falls within an area used for grazing and the site is therefore considered to have limited environmental sensitivity as a result.

5.1.3. Activity Option

The EIA procedure must also take into account whether building a solar PV facility will be the best use of the available land. Water and Power Supply Namibia (Pty) Ltd, believes that solar PV technology is ideal for the location.

5.1.4. Technology Option

PV solar panels today use a variety of semiconductor technologies that are readily available. But of the three, crystalline silicon, thin film, and bifacial PV panels have been the most frequently used. The following is more information about these technologies:

Crystalline (costlier, high-efficiency technology):

The initial stage in making crystalline silicon panels is to process a single silicon slice to create a single solar cell. Then, multiples of these cells are put together to form a solar panel. Wafer silicon, commonly known as crystalline silicon, is the most common and oldest component in commercial solar panels. Today's global annual market for crystalline silicon modules accounts for 85–90% of the total. For the solar facility, there are primarily two types of crystalline silicon panels to take into account:

- Mono-crystalline Solar cells in silicon-monocrystalline (also known as single crystal) panels are sliced from a block of silicon that has been produced from a single, uniform crystal. Monocrystalline panels are among the most expensive and efficient ones available. They have the most complex manufacturing processes and the highest purity requirements for silicon.
- Poly-crystalline Solar cells for silicon-polycrystalline panels are sliced from crystals of silicon that have many faces. They resemble broken glass and are less homogeneous in appearance than mono-crystalline cells. Due to their lower price compared to mono-

crystalline silicon, these solar panels are the most popular ones available. Although the performance gap has started to shrink in recent years, they are also less efficient.

5.2. PUBLIC PARTICIPATION PROCESS

The following sections provide detailed information on the public participation process conducted in terms of EMA No.7 (of 2007).

General

The public participation process was conducted strictly in accordance with EMA No.7 (of 2007). Section 36. The following three categories of variables were taken into account when deciding the required level of public participation:

5.2.1. News Paper Notices

Since the proposed development is unlikely to result in any impacts that extend beyond the area where it is located, it was deemed sufficient to advertise in a local newspaper. The first public notices were placed in The New Era and Confidante national newspapers for two consecutive weeks to try reaching the Interested & Affected Parties (I&APs) and invitation to comments. A copy of Background Information was prepared for dissemination to I&APs. Placement dates were 16 to 30 September 2021 and advertisement was done on the 30th of September and the 7th of October 2022. In the public notices all I&APs were invited to attend a meeting held at Mushangara village on 01 October 2021. The second meeting was held on the 22nd of October 2022. Opinions, comments, suggestions to the proposed project were recorded and they all-encompassing contents of the EMP.

A register of I&APs was kept and dissemination of BID was done throughout the public consultation period. The project attracted audiences from various sectors who contributed to the development of the EMP. The EIA team decided to re advertise the proposed project to the public in form of Invitation to comment on the Scoping report before the application was launched to MEFT for review.

5.2.2. Direct Notification (Meetings)

The Consultant organized forums for public participation to enable interested and affected parties to present their concerns and opinions regarding the proposed solar power project. The consultant shall identify social aspects and effects of the project to the neighbouring populace throughout the project cycle that include the construction, commissioning and operation phases. Through the facilitation of the respective project area regional officers, area chiefs, assistant chiefs, councillors and key community leaders the consultant organized for public meetings where the community members were briefed on the proposed project background, scope, design outline and the regulatory requirements for all the projects of lesser / similar /higher magnitude whose implementation approval is vested on MET.

The public was then invited to express their views given the background of the project. The views for each of the meetings were recorded.

5.2.3. Focus Group Discussion (FGDs)

The Consultant engaged groups such as local authorities, in discussion on the proposed solar farm. Their observation and concerns were recorded. These groups seemed to be the most knowledgeable and were quick to grasp the technical issues relating the project implementation. They were specifically targeted with the hope that they propagate the technical issues in a language and style that can be understood by the wider community within their vicinity.

5.3. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED ALTERNATIVE

5.3.1. People and Land use

Ngcangcana is under Shambyu traditional authority/ jurisdiction. The area can be referred to a peri- urban area with the majority of the people practicing agriculture, cattle rearing among other agricultural activities. To the south Easterly part of Rundu along Cuma to Mbambi

highway lies Ngangcana village which is approximately 15 km away from Rundu Central Business District (CBD).

5.3.2. Topography

The site is relatively flat with elevation: 1095 meters above sea level. The site is situated 15 kilometres from the Town of Rundu. The area is relatively flat and with sandy substrates making the area well suited for solar farm development. There are no significant hills and the area is relatively making it easy and cost effective for development.

5.3.3. Biophysical Environment

Vegetation type of any area is influenced by both soil type and the climate conditions of the area. The Kavango region is home to a more diverse community of plants and animals than most other areas in Namibia. Most of the diversity in the Kavango region is linked to the variety of habitats along and near the Okavango River. The plant and wildlife especially within the conservancies or parks along the Okavango is very abundant. Soils in the Region are completely dominated by sand, especially fine wind-blown sands deposited as a mantle across the region during much drier time's long ago. The loose sands also known as the Kalahari sand are usually as deep as one (1) meter.

5.3.4. Geology and Soil

The surrounding soils are light grey and brown, sandy loamy supporting less vegetation. The proposed project site is located in a peri urban set up under the traditional authorities of Kavango East. In most parts of the selected site flora is abundant and plans to acquire harvesting permits are underway. Fauna species are limited due to human wildlife conflict and land clearance.

5.3.5. Vegetation

The proposed site is dominated by Uguva/Molombe/Pterocarpus Angolensis/ Kiaat/ Mukwa/ Dolfhout (Bloodwood) and Usivi/Omusii/Muzauli/Baster Mopane/False Mopane/ Guibourtia Coleosperma (Rosewood). Vegetation type of any area is influenced by both soil type and the climate conditions of the area. region is home to a more diverse community of plants and animals than most other areas in Namibia.

5.3.6. Climate

Ngcangcana has a hot semi-arid climate (Köppen: BSh), with hot summers and relatively mild winters (with warm days and chilly to cool nights). Even though it has a hot semi-arid climate, the area experiences high diurnal temperature variation during the winter with average high temperatures at roughly 26 °C and average low temperatures at 6 °C. This large swing in daily temperature is more commonplace among areas with cold semi-arid climates. During the summer, the diurnal temperature variation is less pronounced. The average annual precipitation is 571 mm (22 in).

5.3.7. Biodiversity

Several rare large mammal and bird species are found in Bwabwata. Elephants regularly move between Namibia, Angola, Botswana and Zambia. Other species found are Cape buffalo, hippopotamus, roan antelope, sable antelope, tsessebe, zebra, wildebeest, common reedbuck, red lechwe, sitatunga and crocodile. Main predators are lion, leopard, cheetah and spotted hyena.

A detailed Flora and Fauna study was undertaken by Tatiya Investments cc.

5.3.8. Avifauna

The Avifauna site observations indicates that the site is situated in an area of low avifaunal diversity, not a lot of avifauna were spotted during the assessment at Ngcangcana as well. Due to poor avifaunal community and occurrence of relatively low numbers of bird species, the development has the potential to impact less species of avifauna species. The resident avifauna is also represented by relatively low species richness and abundance.

5.3.9. Traffic

equipment and relevant components will be transported to the site via gravel road from Rundu PV solar power plant will generate additional traffic on the surrounding road network in three (3) distinct phases, namely: construction, operational and decommissioning. It must be noted that these three phases will generate traffic consecutively and not simultaneously, and therefore will be considered separately from each other.

5.4. Description of social economic environment

5.4.1. Social economic conditions

The socio-economic status in Ngcangcana engages in a variety of livelihood strategies: trapping, veld food gathering, and cultivation (millet, maize and vegetables) and fishing along Kavango river. The majority of elderly people lived mainly from pensions, government food aid (mostly mealie-meal), income from piecework, employment (permanent and temporary), veld food gathering and some cultivation.

5.4.2. Socio-Economic Benefits

The proposed project has the potential to generate bigger number of employment opportunities directly and indirectly during and after the construction phase. Another socio economic benefit derived from the project during the construction phase is cleared trees that can be utilised as timber to generate income for livelihood.

Services and Infrastructure

Roads

An Integrated Sustainable approach will rehabilitate the existing Cuma-Mbambi gravel road to Ngcangcana. The road is also not in good shape (during the time of site visit) and with the project implementation it will be maintained/ up graded even into a tarred road.

Water

The proposed project will make use of water from the drilled boreholes during construction phase. An underground water source will be established for drinking water as well as other domestic uses. The operational phase of the project will also make use of underground water.

Sewerage

The construction phase of the proposed project will be serviced with movable toilets. The operational phase of the project will make use of septic tanks since a small number of site staff will be stationed on site at a specific time.

Existing National electricity grid line

The proposed solar generation at Ngcangcana will lead to the establishment of a substation at source later on to join the existing National grid line which will withhold 100 MW during phase 1 of the projects. An upgrade of the transmission line to Katima Mulilo will be done following other developmental phases of the project as well as EIAs and EMPs. The proposed photovoltaic panels plant will be fully serviced a switchyard substation at a generating station.

These facilities connect the generators to the utility grid and also provide off-site power to the plant.

Generator switchyards tend to be large installations. They are typically engineered and constructed by the power plant designers. They are subjected to planning, finance, and construction efforts different from those of routine substation projects.

Proposals to supply the electricity into the National grid were welcomed. However, the existing transmission lines will only support the first phase of the projects. Following after the first phase of the project, an upgrade to the existing transmission lines and substation will be done. The transmission line will have a separate scoping report conducted.

Solid Waste Management System

Most of the waste to be generated during all phases of the project will be recycled and reused. Arrangements were already been done with Rent a Drum to cater for the waste produced on site. A new dumpsite will be designed and developed where most of the waste from the project will be disposed off.

5.5. SITE SELECTION MATRIX

The placement of the solar farm is heavily reliant on technical and environmental elements because of the nature of the proposed development, including solar irradiation, climatic conditions, the terrain of the site, access to the grid, and the capacity of the grid. Namibia has the potential and sufficient solar resource for the generation of power from the solar resource, according to studies of solar irradiation around the world.

The area where the project is proposed to be located is considered favourable and suitable from a technical perspective due to the following characteristics:

- **Climatic conditions:** Because a solar energy plant directly depends on the yearly direct sun irradiation levels of a place, climatic circumstances decide whether the project will be economically viable. The region has a 2260 Global Horizontal Radiation. In the region, 7 kWh/m²/year is appropriate.

- **Site accessibility:** The site is available for leasing to the developer, and the traditional authority has given their approval for the development as well as the EIA procedure. From the settlement of Ngcangcana Village, Cuma-Mbambi gravel road connects to the site. Grid connection: The PV facility will need to build an on-site substation, switching station, and a power line from the project site to link to the NamPower grid in order to connect to the national grid. There are few available grid connections, which is important when choosing a suitable site. In order to link the solar power plant and evacuate the produced electricity into the national grid, one feasible grid connection sites have been identified by the developer.
- **Environmental sensitivity:** From an environmental standpoint, the proposed site is very suitable because it has little environmental sensitivity in terms of geology, soils, vegetation, and landscape features, climate, biodiversity, and the aesthetics. Apart from the settlement's small farming fields, nothing noteworthy was found on the site from an ecological, heritage or conservation point of view because the area that is being planned for development only comprises of land utilized for grazing.

The discussion above makes it clear that Ngcangcana is regarded favourably and as being a good fit for these site qualities. Following the preliminary investigation and expert studies, provisions have been made to exclude any sensitive areas that may be present. In this case, sensitive areas mainly relate to freshwater features along the river outside the development footprint and the grid connection corridor, in particular the power line proposed to connect to the connection point.

5.6. IDENTIFICATION OF THE PREFERRED GRID CONNECTION POINT

The development is thinking about using one grid connection corridor for the new power line. The corridor begins at the site's western corner and extend northward from there. Direct wiring from the facility's on-site substation to the Mahongo substation, which is already there and is situated to the north of the site close to Rundu, is the proposed connection point.

With regard to the numerous fields of research taken into consideration throughout this EIA process, the independent professionals evaluated the alternatives on an equal footing and gave an indication of the preferred option. When considering the connection point and accompanying power line, the results of the expert feedback will then identify the environmentally desirable alternative.

Table 5.1: Grid connection

Field of Study	Technical Preferred Option
Terrestrial Biodiversity	<p>The connection possibilities and the entire length of the grid connection corridor to be evaluated and this evaluation calls for which calls for crossing a freshwater feature with suggested specific mitigation measures.</p> <p>Given the foregoing, Alternative, the option that is technically preferred, is recommended for development.</p>
Aquatic Biodiversity (River/Streams)	<p>The connection possibilities and the entire length of the grid connection corridor to be evaluated, which may possibly calls for crossing a freshwater feature to Mahongo substation.</p> <p>Given the foregoing, the technically preferred option is proposed as the one to be developed.</p>
Avifauna	<p>The entire extent of the grid connection corridor, including to be assessed. However specific mitigation measures have been proposed by the specialist should the alternative be developed, which requires the crossing the river.</p> <p>Given the foregoing Alternative, the option that is technically preferred, is recommended for development.</p>

Archaeology	The options is suitable for development in terms of heritage. The technically preferred option is proposed as being preferred for development because both choices are acceptable.
Social	No favored alternative in terms of social impact. Given that the options is viable, the technically superior option is proposed as the preferred development.

5.7. CONCLUDING STATEMENT ON ALTERNATIVES

Due to the potential afforded on the site to build the project in a way that avoids the areas of environmental sensitivity, the site is chosen as preferable when taking into account the information provided by the specialists with regard to the site selection criteria.

6. DESCRIPTION OF IMPACTS AND RISKS

6.1. SCOPING METHODOLOGY

The Environmental Impact Report's approach and contents seek to provide, as far as feasible, a user-friendly analysis of data to enable for simple interpretation. An impact assessment matrix was used to assess all possible impacts of the project on the environment. In line with Namibia Environmental Management Act No. 7 of 2007 and the Environmental Impacts Regulations (GN 30 in GG 4878 of 6 February 2012) with the direction on impacts analysis the following impact assessment criteria was identified by the team and deemed suitable.

6.2. SCOPE OF WORK AND TERMS OF REFERENCE

The Terms of reference (TOR) of this EIA Project Report for the proposed 100 MW solar power plant at Mushangara addresses the following key specific objectives:

- To review existing legal and institutional framework related to the proposed project
- To collect and collate baseline information relevant to the proposed solar farm
- To collect primary data through the community participatory process
- To identify and assess positive and negative impacts of the proposed project
- To identify and analyse alternative options for the proposed project
- To develop mitigation measures and cost estimates for the negative impacts of project
- To design an Environmental Management Plan and a monitoring framework for the environmental impact of the project.

6.3. MATRIX ANALYSIS

Table 6.2. Matrix Analysis

For easy of reference the significant impacts are color coded

Low significance		Medium Significance		High Significance		Positive Impact	
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Aspect	Potential Impacts		Significant and magnitude of potential impact							Mitigation of Potential Impacts		
	Receptor	Impact Description	minor	major	extent	duration	probability	reversibility	Irreplaceable of resources	Possible Mitigation	Possible Mitigation Measures	Level of risk
CONSTRUCTION PHASE												
<p>Site clearing and preparation Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled.</p> <p><u>Civil works</u> The main civil works are: *Terrain levelling if necessary – Levelling will be minimal as the potential site chosen is relatively flat. *Laying foundation- The structures will be connected to the ground through cement pillars cement slabs or metal screws. The exact method will depend on the detailed geotechnical analysis. *Construction of access and inside roads/ paths – existing paths will be used where reasonable possible. Additionally, the turning circle for trucks will also be taken into consideration.</p>	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	*Loss of habitat, loss of indigenous species. *Fragmentation of the landscape and loss of connectivity. *Increased soil erosion and sedimentation. *Soil, water or air pollution. Spread and establishment of alien invader species. Human impacts /road mortalities.		S	L	D	PR	ML	Yes	*Permit application for land clearance *Site clearing to be restricted to footprint area. *Training *Destruction of sensitive areas/ habitats to be Avoided	L
		Avifauna	*Displacement of priority avian species from important habitats. •Displacement of resident avifauna through increased disturbance. •Loss of important		S	M	PR	PR	ML	Yes		L

<p>Transportation and installation of PV panels in Array. The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks.</p> <p>The panels will be mounted on metal structures which are fixed into the ground either through concrete foundation or a deep-seated screw.</p> <p>Wiring to the Central Inverters Sections of the array would be wired to central inverters. The inverter is a pulse width mode inverter that converts DC electricity to alternating electricity (AC) at grid frequency.</p> <p>Storage of dangerous goods – Storage facilities will be required for limited dangerous goods for the construction and operation of the solar power plant.</p>		Avian habitats.											
	Air	<ul style="list-style-type: none"> •Air pollution due to the increase of traffic of construction vehicles and the undertaking of construction activities. 			S	S	D	CR	NL	Yes	<ul style="list-style-type: none"> *Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to building materials are fitted with covers *Depositional Dust Monitoring *Speed limit control 	L	
	soil	<ul style="list-style-type: none"> •Loss of soil degradation. •Dust Impact. •Erosion. •Loss of topsoil. 			S	S	PR	PR	ML	Yes	<ul style="list-style-type: none"> *Removal of topsoil and to a demarcated stockpile area to preserve nutrient and seed containing layer *develop in many phases as possible *cover disturbed areas with Vegetation *Repair all eroded areas 	L	
	Geology	<ul style="list-style-type: none"> •Seepage. •Erodible soil. •Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving solar panel columns. 			S	S	PR	CR	NL	Yes	<ul style="list-style-type: none"> *Avoid areas where bedrock is too close to surface *Introduce engineering controls where Bedrock is too close to surface 	L	
	Existing services & Infrastructure	<ul style="list-style-type: none"> •Generation of waste that need to be accommodated at a licensed landfill site. •Generation of sewage that need to be accommodated by the local sewage plant. •Increase in construction vehicles on existing roads 			L	S	D	PR	ML	Yes	<ul style="list-style-type: none"> *Generated waste to be disposed to already and current existing landfill sites 	L	
Ground water	<ul style="list-style-type: none"> •Pollution due to construction vehicles and the storage and handling of dangerous goods 			S	S	PR	CR	ML	Yes	<ul style="list-style-type: none"> * A groundwater monitoring program (quality and groundwater levels) should be designed and installed for the site. *Monitoring boreholes should be secured 	L		

												<p>capped, and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing.</p> <p>*Sampling of monitoring boreholes should be done according to recognized national standards.</p> <p>*Store chemical in bunded areas</p>	
		Surface Water	<ul style="list-style-type: none"> •Pollution of water sources due to erosion. •Impacts on the characteristics of watercourse. •Soil and water pollution 			L	S	D	PR	ML	Yes	<p>*Periodic maintenance of vehicle and earth moving equipment</p> <p>*chemical and hazardous substances to be stored in controlled bunded areas.</p> <p>*Littering to be discouraged and avoided</p>	L
		General Environment	<ul style="list-style-type: none"> •Mechanical breakdown / Exposure to high temperatures •Fires, electrocutions and spillage of toxic substances into the surrounding environment •Spillage of hazardous substances into the surrounding environment. •Soil contamination – leachate from spillages. •Water Pollution – spillages into surrounding watercourses as well as groundwater. •Health impacts – on the surrounding communities, particularly those relying on watercourses (i.e. rivers, streams, etc) as a primary source of water. •Generation of hazardous waste 			S	M	PR	PR	ML	Yes	<p>Training on the following:</p> <ul style="list-style-type: none"> •Potential impact of electrolyte spills On groundwater •Suitable disposal of waste and Effluent •Standard Operating Procedures (SOPs) should be made available by the Supplier to ensure that the batteries are handled <p>In accordance with required best practices</p> <ul style="list-style-type: none"> •Spill kits must be made available to address any incidents associated with the flow of chemicals from the batteries into the surrounding environment 	L
	SOCIAL/EC MIC	Local unemployment	<ul style="list-style-type: none"> •Creation of direct and indirect employment and skills development opportunities. 			P	S	D	I	NA	Yes	<ul style="list-style-type: none"> *Labour force to be sourced locally *Initiate training and skill Development *Promote Gender equality 	L

	<ul style="list-style-type: none"> •Economic multiplier effects •Business opportunities 										*suppliers of basic services providers to sourced locally	
Visual landscape	<ul style="list-style-type: none"> •Potential visual impact on residents of farmsteads and motorists in close proximity to proposed facility due to the construction activities. •Lighting impacts. •Solar glint and glare Impacts. 			L	S	D	CR	NL	Yes	<ul style="list-style-type: none"> *Avoid use of bright lights *Working hours to be restricted to day li hours only 	M	
Traffic volumes	<ul style="list-style-type: none"> •Increase in construction vehicles 			L	S	PR	CR	NL	Yes	<ul style="list-style-type: none"> •Delivery and construction trips will be insignificant when compared to the Average Daily Traffic. •It can therefore be concluded that, on both routes, the road be tarred will be necessary 	L	
Health & Safety	<ul style="list-style-type: none"> •Air/dust pollution. •Road safety. •Impacts associated with the presence of construction work on site and in the area. •Influx of job seekers to the area. •Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site. •Impacts on daily living and movement patterns. •Nuisance impacts. 			L	L	PR	PR	ML	Yes	<ul style="list-style-type: none"> *Induction and training on health and Safety *Introduce use of dust masks and Respirator for all employees *Dust suppression * Encourage PPE use 	M	
Noise levels	<ul style="list-style-type: none"> •The generation of noise as a result of construction vehicles, the use of machinery such as drills and people 			L	S	D	CR	NL	Yes	<ul style="list-style-type: none"> •During construction care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the 	L	

		working on the site										surrounding residential areas. Plant equipment such as generators, compressors, concrete mixers as well as vehicles should be kept in good operating order and where appropriate have effective exhaust mufflers	
		Tourism industry	•Since there are no tourism facilities in close proximity to the site, the proposed activities will not have an impact on tourism in the area	NA	NA	NA	NA	NA	NA	NA	NA		NA
		Heritage resources	• It is not foreseen that the proposed activity will impact on heritage resources as there are no heritage resource to be impacted			S	S	U	PR	ML	Yes	*Identified and demarcated heritage and archaeological finds be preserved	L
OPERATIONAL PHASE													
<ul style="list-style-type: none"> •PV Panel Array - To produce 500 MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. •Wiring to Central Inverters - Sections of the PV array will be wired to central inverters. •Connection to the grid •Supporting Infrastructure: Auxiliary buildings with basic services such as water and electricity will be constructed on the site. •Roads: Access will be obtained via gravel road. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 6 m – 8 m. •Battery Energy Storage System •Storage of dangerous goods – Storage facilities will be required for limited dangerous for the Construction and operation of the solar power 	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> •Loss of habitat, loss of indigenous species. •Fragmentation of the landscape loss of connectivity. •Increased soil erosion and sedimentation. •Soil, water or air pollution. •Spread and establishment of alien invader species. •Human impacts / road Mortalities. 			L	L	Po	PR	ML	Yes	<ul style="list-style-type: none"> *Species Relocation of those species that can be relocated should they be any that requires relocation *Training of employees on Fauna and Flora conservation *Operate within development Footprint *Fire breaks around the development footprint *No residency to be allowed on site *Areas Security 	L
		Avifauna	<ul style="list-style-type: none"> •Displacement of priority avian species from habitats. •Displacement of resident avifauna through increased disturbance. •Collisions with PV panels leading to injury or loss of 			S	L	Pr	PR	ML	Yes	<ul style="list-style-type: none"> *Training and Monitoring *Operate within development Footprint *Avifauna Specialist to conduct study *Environmental Control Officer be appointed to monitor and implement EMP 	M

<p>plant.</p> <ul style="list-style-type: none"> •Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding properties. Fencing with a height of 2.5- to 3 meters will be used 		<ul style="list-style-type: none"> •avian life. •Collision and electrocution when flying into power line infrastructure. 											
	Air	<ul style="list-style-type: none"> •The proposed development will result in any air pollution during the Operational phase. 	NA	NA	NA	NA	NA	NA	NA	Yes	<ul style="list-style-type: none"> *Continued dust suppression using sprinkler system *Dust Monitoring *Speed limit control 	N/A	
	soil	<ul style="list-style-type: none"> •Loss of agricultural potential by degradation. •Dust Impact. •Erosion. •Loss of topsoil. 			L	L	D	PR	SL	yes	<ul style="list-style-type: none"> *Hazardous material to be stored in Concrete surfaces and bunded *Develop storm drainage System *No dumping of waste *repair eroded areas *Spill Kits to be hands on 	L	
	Alien Evasive species	<ul style="list-style-type: none"> •Spread of alien invasive species 			S	S	Po	CR	NL	Yes	<ul style="list-style-type: none"> *Alien invasive never to be allowed to colonise the area *Monitoring programme to monitor alien invasive species *Early intervention: Remove before Seedling. 		
	Geology	<ul style="list-style-type: none"> •Active soil (high soil heave). •Erodible soil. •Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving power line columns. •The presence of undermined ground •Instability due to soluble rock. •Steep slopes or areas of unstable natural slopes. 			S	S	Po	PR	ML	Yes	<ul style="list-style-type: none"> *Surface drainage should be provided to prevent water ponding. *Mitigation measures proposed for engineering geological investigation before construction 	L	
	Ground water	<ul style="list-style-type: none"> •Leakage of hazardous materials. development will comprise of a distribution substation and will 			L	L	Po	PR	ML	Yes	<ul style="list-style-type: none"> *All areas in which substances potentially hazardous to groundwater to be stored, loaded, should be securely bunded 		

		include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies. •Pollution due to maintenance vehicles and the storage and handling of dangerous goods.									(impermeable floor and sides) to prevent accidental discharge to Groundwater. *Monitoring boreholes should be securely capped, and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside casing. *Full construction details of monitoring boreholes must be recorded when they are drilled. *Sampling of monitoring boreholes should be done according to Recognised national standards.	
	Surface Water	•Destruction of watercourses •Compacted and exposed soils are prone to further degradation and erosion.			L	L	D	PR	ML	Yes	*develop storm and water drainage System to redirect water to appropriate channels	L
	SOCIAL ECONOMIC ENVIRONMENT	Visual landscape	•Visual impact on observers travelling along the roads and residents at homesteads (sensitive visual receptors) •Visual impacts of lighting at night on sensitive visual receptors in close proximity to the proposed facility. •Visual impacts of glint and glare on sensitive visual receptors in close proximity to the proposed facility. •Visual impacts on observers travelling along the roads and residents at homesteads (sensitive visual receptors) in close proximity to the power line structures.			L	L	D	PR	ML	Yes	*Avoid use of bright lights during night *Maintain Natural vegetation where possible *Where natural vegetation is insufficient, Use indigenous fast growers *shield source of light by physical barrier

	Social Aspects Contributions	<ul style="list-style-type: none"> •Direct and indirect employment and skills development opportunities •Development of non-polluting, renewable energy infrastructure. •Contribution to local economic development and social development 			P	L	D	N/A	N/A	Yes	<ul style="list-style-type: none"> *Labour force to be sourced locally *Initiate training and skill Development *Promote Gender equality *suppliers of basic services providers to be sourced locally 	M
	Traffic volumes	•The proposed development will not result in any traffic impact during the operational phase.			L	L	Po	CR	NL	Yes	*Speed Limit enforcement	L
	Health & Safety	•The proposed development will result in any health and safety impact during the operational phase.	NA		N/A	N/A	N/A	N/A	N/A	N/A	<ul style="list-style-type: none"> *enforcement of laws and regulation *Induction and Training *Appoint local security companies *Controlled access 	NA
	Noise levels	•The proposed development will result in any noise pollution during the operational phase.	NA		N/A	N/A	N/A	N/A	N/A	N/A		NA
	Heritage resources	• It is not foreseen that the proposed activity will impact on heritage resources as there are no heritage resource to be impacted			S	S	U	PR	ML	Yes	*Demarcate identified heritage and archaeological finds	L
	Electricity Supply	•Generation of additional electricity The power line will transport generated electricity into the grid.			I	L	D	I	N/A	Yes	*Policy to benefit local communities at Affordable rate	NA

		Electrical Infrastructure	<ul style="list-style-type: none"> The proposed solar facility will aid to lessen the reliance of electricity generation import 			I	L	D	I	N/A	Yes	<ul style="list-style-type: none"> Reduced electricity tariffs for locals Motivation for solar usage 	NA
DECOMMISSIONING PHASE													
<ul style="list-style-type: none"> Dismantlement of infrastructure during the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled Rehabilitation of biophysical environment The biophysical environment will be rehabilitated. 	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> Poor recovery of habitat owing to clearance of site. An increased infestation of exotic or alien invasive plant species owing to clearance or disturbance Contamination of soil during decommissioning. Direct habitat destruction. Habitat fragmentation. Increased soil erosion and sedimentation. Soil and water pollution. Air pollution Negative effect of human activities on fauna and road fatalities 			S	L	Po	N/A	N/A	Yes	<ul style="list-style-type: none"> Rehabilitation through planting of indigenous plants Monitoring programme to monitor alien invasive species Early intervention: Remove before Seedling Treat all contaminated soil Planting of vegetation on all eroded areas 	L
		Avifauna	<ul style="list-style-type: none"> Displacement of priority avian species from important habitats. Displacement of resident avifauna through increased disturbance 			S	S	Po	N/A	N/A	Yes	<ul style="list-style-type: none"> Monitoring and evaluation programs 	L
		Air quality	<ul style="list-style-type: none"> Air pollution due to the increase traffic of Construction and other vehicles. 			S	S	D	CR	NL	Yes	<ul style="list-style-type: none"> Regular maintenance of equipment to ensure reduced exhaust emissions. Dust suppression. 	L
		Soil	<ul style="list-style-type: none"> Loss of agricultural potential by occupation of land. Loss of agricultural potential by degradation. Dust Impact. Erosion. Loss of topsoil. 			S	S	Pr	PR	M	Yes	<ul style="list-style-type: none"> rehabilitate using stockpiled topsoil watering of rehabilitated areas using Sprinklers Re pair of eroded areas by planting Of Indigenous plants 	L

		Geology	<ul style="list-style-type: none"> •Geology will not be impacted during the decommission phase 			N/A	N/A	N/A	N/A	N/A	N/A	NA	NA
		Existing services infrastructure	<ul style="list-style-type: none"> •Generation of waste that needs to be accommodated at a licensed landfill site. •Generation of sewage that needs to be accommodated by the village council system and the local sewage plant. •Increase in construction vehicles. 			L	S	D	I	NL	Yes	<ul style="list-style-type: none"> *Waste to existing landfill *Sewerage to existing town council Sewerage ponds *Regular maintenance of construction vehicles 	L
		Groundwater	<ul style="list-style-type: none"> •Pollution due to construction vehicles. 			S	S	Pr	CR	ML	Yes	<ul style="list-style-type: none"> *Avail spill kits for all moving Equipment's *Regular servicing of construction Vehicles to reduce emissions *Dust suppression of roads and surfaces *All routes to be tarred and maintained 	L
		Surface water	<ul style="list-style-type: none"> •Increase in storm water run- off. •Pollution of water sources due to soil erosion. 			L	S	Pr	PR	ML	Yes	<ul style="list-style-type: none"> *Maintain storm water drains *Water treatment ponds and filtration Before disposal into environment 	M
	SOCIO ECONOMIC ENVIRON	Visual landscape	<ul style="list-style-type: none"> •Potential visual impact on visual receptors in close proximity proposed facility. •The decommissioning phase of the project will result in the same visual impacts experienced during the construction phase of the project. 			L	S	D	CR	NL	Yes		L

		Traffic volumes	<ul style="list-style-type: none"> •Increase in construction and other vehicles. 			L	S	Pr	CR	NL	Yes	*Delivery and construction trips will be insignificant when compared to Average Daily Traffic (ADT) and will not affect the existing Level of Service (LOS) can therefore be concluded that, on both routes, no mitigation measures will be necessary.	L
		Health & Safety	<ul style="list-style-type: none"> •Air/dust pollution. •Road safety. •Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people. 			L	S	Pr	PR	ML	Yes		L
		Noise levels	<ul style="list-style-type: none"> •The generation of noise as a result of construction vehicles and machinery on the site. 			L	S	D	CR	NL	Yes		L
		Heritage resources	<ul style="list-style-type: none"> •No identified heritage resources will be impacted during decommissioning phase 			S	S	U	PR	ML	Yes		L

Nature of the impact:	(N/A) No impact	(+) Positive Impact (-)	Negative Impact	
Geographical extent:	(S) Site;	(L) Local/District;	(P) Province/Region;	(I) International and National
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-

Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-

Table 6.3. Cumulative Rating system

CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.

74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
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6.1. KEY ISSUES IDENTIFIED

6.1.1. Impact during construction Phase

During the construction phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

Assessment	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial biodiversity impact assessment	Habitat destruction caused by clearance of vegetation	Negative High	Negative Medium	<ul style="list-style-type: none"> • The removal of indigenous trees and shrubs should be kept to a minimum necessary. Trim, rather than fell of woody species along the edges of the development site where possible. Where protected trees will need to be cleared or pruned, permits should be obtained from the relevant authority. • Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum, while the rehabilitation of the site should be prioritized after construction has been completed. • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • An avifauna specialist should be consulted to conduct a specialist study for the project area and monitoring of the potential impact of the solar plant in the future. • All development activities should be restricted to specific recommended areas. The Environment Control Officer (ECO) should control these areas. Storage of equipment, fuel and other materials should be limited to demarcated areas. Layouts should be adapted to fit natural patterns rather than imposing rigid geometries. The entire development footprint should be clearly demarcated prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This would only be applicable to the construction phase of the proposed development.
				<ul style="list-style-type: none"> • The ECO should advise the construction team in all relevant matters

				<p>to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary.</p> <ul style="list-style-type: none"> • Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation. • Where holes for poles pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling during planting of the poles along the lines. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. • Monitoring should be implemented during the construction phase of the development to ensure that minimal impact is caused to the fauna and flora of the area. • Disturbances in close vicinity of the development (periphery) should be limited to the smallest possible area to protect species habitat. • Corridors need to be kept intact as they are important to allow fauna to move freely between the areas of disturbance.
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	Habitat Fragmentation	Negative High	Negative Medium	<ul style="list-style-type: none"> • Use existing facilities (e.g., impacted areas) to the extent possible to minimize the amount of new disturbance. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive features such as surrounding woodland woodland outside the project area during construction. • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.
	Increased Soil Erosion and Sedimentation	Negative High	Negative Medium	<ul style="list-style-type: none"> • The project should be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time. • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.

				<ul style="list-style-type: none"> Gravel roads to the construction sites must be well drained to limit soil erosion. Control the flow of runoff to move the water safely off the site without destructive gully formation. Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.
	Dust / Air Pollution	Negative Medium	Negative Low	<ul style="list-style-type: none"> A speed limit should be enforced on dirt roads (preferably 30-40km/h). Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.
	Soil and water pollution	Negative Medium	Negative Low	<ul style="list-style-type: none"> Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. Spill kits should be on-hand to deal with spills immediately. All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.
	Spread and establishment of alien invasive species	Negative Medium	Negative Negligible	<ul style="list-style-type: none"> Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin prior to the construction phase considering that small populations of these species was observed during the field surveys.

				<ul style="list-style-type: none">• Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species should be eradicated.• Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.• Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.
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<p>Negative effect of human activities on fauna and road mortalities</p>	<p>Negative Moderate</p>	<p>Negative Negligible</p>	<ul style="list-style-type: none"> • No staff should be accommodated on the site. If practical, construction workers should stay in one of the nearby villages and transported daily to the site. • The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals. • Maintain proper firebreaks around the entire development footprint. • Educate construction workers regarding risks and correct disposal of cigarettes. • More fauna is normally killed the faster vehicles travel. A speed limit should be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night should be avoided or limited as much as possible.
<p>Soil compaction and increased risk of sediment transport and erosion</p>	<p>Negative High</p>	<p>Negative Medium</p>	<ul style="list-style-type: none"> • Stringent controls must be put in place to prevent any unnecessary disturbance or compaction of alluvial soils. Compaction of soils should be limited and / or avoided as far as possible. Compaction will reduce water infiltration and will result in increased runoff and erosion. Where any disturbance of the soil takes place), these areas must be stabilized and any alien plants which establish should be cleared and follow up undertaken for at least 2 years

				<p>thereafter and preferably longer. Where compaction becomes apparent, remedial measures must be taken (e.g., “ripping” the affected area). Topsoil should preferably be separated from the subsoil, and topsoil sections should be kept intact as deep as possible.</p> <ul style="list-style-type: none">• Reseed any areas where earthworks have taken place with indigenous grasses to prevent further erosion.• Erosion control mechanisms must be established as soon as possible. Further financial provision should be continued over the subsequent years to allow for maintenance of the gabions, reno mattresses, and associated structures.• A stormwater plan must be developed with the aid of an engineer to ensure that water runoff is diverted off the site without pooling and stagnation or erosion. Financial provision for closure will include the estimated costs for erosion control post-construction.• If compaction occurs, rectification can be done by application and mixing of manure, vegetation mulch or any other organic material into the area. Use of well cured manure is preferable as it will not be associated with the nitrogen negative period associated with organic material that is not composted.• Vehicle traffic should not be allowed on the rehabilitated areas, except on allocated roads, must not be allowed. It will have a negative impact due to the dispersive/compaction characteristics of soils and its implications on the long term.• Appropriate design and mitigation measures must be developed and implemented to minimise impacts on the natural flow regime of the watercourse i.e., through placement of structures/supports and to minimise turbulent flow in the watercourse.
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				<ul style="list-style-type: none"> Perform scheduled maintenance to be prepared for storms. Ensure that culverts have their maximum capacity, ditches are cleaned, and that channels are free of debris and brush than can plug structures.
	Soil and water pollution	Negative Medium	Negative Low	<ul style="list-style-type: none"> Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. No dumping of waste should take place within the riparian zone. If any spills occur, they should be immediately cleaned up. Contain all dirty water in the dirty water system and contain all dirty storm water up to a 1:50 year flood event as a minimum. Ensure that all activities impacting on ground water resources of the subject property are managed. Appropriate sanitary facilities must be provided for the duration of the proposed development and all waste removed to an appropriate waste facility. Excess waste or chemicals should be removed from site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off.

				<ul style="list-style-type: none"> • Spill kits should be on-hand to deal with spills immediately. • All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays to capture spills. Drip trays should be emptied into a holding tank and returned to the supplier. • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) and chemical dust suppressants of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation. • A speed limit (preferably 40 km/hour) should be enforced on dirt roads. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
	Spread and establishment of alien invasive species	Negative Moderate	Negative Low	<ul style="list-style-type: none"> • Alien and invader vegetation must not be allowed to colonise the area. Control involves killing alien invasive plants present, seedlings and establishing an alternative plant cover to limit re-growth. The use of indigenous plants must be encouraged in the rehabilitated areas (storm water canals), and stockpiles containing mostly exotic or weedy species should receive specialised handling and should be invasion • Institute strict control over materials brought onto site, which should be inspected for seeds and steps taken to eradicate these before transport to the site. The contractor is responsible for the control of weeds and invader plants.

				<ul style="list-style-type: none"> • Rehabilitate disturbed areas as quickly as possible. • Institute a monitoring programme to detect alien invasive species early. • Institute an eradication/control programme for early intervention if invasive species are detected. The use of indigenous plants must be encouraged in the rehabilitated areas (storm water canals), and stockpiles containing mostly exotic or weedy species should receive specialized handling and should be covered for extended periods to inhibit seedling germination of these species. Active management and eradication of exotic / alien plant species should also occur when seedlings are found.
Avifauna Impact Assessment	Displacement of priority avian species from important habitats	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Limit the construction footprint and retain indigenous vegetation wherever possible, limit access to the remainder of area, avoid breeding season (summer), lay-down areas must be placed only on disturbed zones, construct in shortest timeframe possible, control noise to minimum.
	Displacement of resident avifauna through increased disturbance	Negative Low	Negative Low	<ul style="list-style-type: none"> • Limit construction footprint and retain indigenous vegetation wherever possible, limit access to the remainder of area, avoid breeding season (summer), lay-down areas only to be placed in zones that have been disturbed, construct in shortest timeframe possible, control noise to minimum.
Visual Impact Assessment	Visual impact of construction activities on sensitive visual receptors in close proximity to the SPP.	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Retain and maintain natural vegetation immediately adjacent to the development footprint. • Ensure that vegetation is not unnecessarily removed during the construction phase. • Plan the placement of laydown areas and temporary construction equipment camps in order to minimize vegetation clearing (i.e., in already disturbed areas) where possible.

				<ul style="list-style-type: none"> • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licensed waste site. • Reduce and control dust during construction by utilizing dust suppression measures. • Limit construction activities to between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. • Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
Soils Compliance Statement	Loss of agricultural potential by occupation of land	Negative Low	Negative Low	<ul style="list-style-type: none"> • No mitigation measures are proposed.
	Soil degradation	Negative Low	Negative Low	<ul style="list-style-type: none"> • Loss of topsoil can result from poor topsoil management during construction related excavations. Topsoil should be stored for later use. • Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth. Spillage and contamination of soil should be avoided. • Due to the very low slope of the land, the site has a low susceptibility to soil degradation.
	Erosion	Negative Low	Negative Low	<ul style="list-style-type: none"> • Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points, and it must prevent any potential down slope erosion.

				<ul style="list-style-type: none"> • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
	Topsoil loss	Negative Low	Negative Low	<ul style="list-style-type: none"> • If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.
Social Impact Assessment	Creation of direct and indirect employment opportunities	Positive Low	Positive Medium	<ul style="list-style-type: none"> • A local employment policy should be adopted to maximize opportunities made available to the local labour force. • Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable should labour be sourced from other regions or elsewhere. • Where feasible, training and skills development programs should be initiated prior to the commencement of the construction phase. • As with the labour force, suppliers should also as far as possible be sourced locally. • As far as possible local contractors that are compliant with Black Economic Empowerment (BEE) criteria should be used. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
	Economic multiplier effects from the use of local goods and services	Positive Low	Positive Medium	<ul style="list-style-type: none"> • It is recommended that a local procurement policy is adopted to maximise the benefit to the local economy. • A database of local companies, specifically Previously Disadvantaged Group (PDGs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.

				<ul style="list-style-type: none"> Local procurement is encouraged along with engagement with local authorities and business organizations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.
Potential loss in productive farming areas	Negative Medium	Negative Low		<ul style="list-style-type: none"> The proposed site for solar power plant needs to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area. Livestock grazing on the proposed site need to be relocated. All affected areas, which are disturbed during the construction phase, need to be rehabilitated prior to the operational phase and should be continuously monitored by the Environmental Control Officer (ECO). Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints. Mitigation measures from the Soil Compliance Statement should also be implemented.
In-migration of labourers in search of employment opportunities, and a resultant change in population	Negative Medium	Negative Low		<ul style="list-style-type: none"> Develop and implement a local procurement policy which prioritizes “locals first” to prevent the movement of people into the area in search of work. Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy. Provide transportation for workers to ensure workers can easily access their place of employment and do not need to move closer to the project site. Working hours should be kept between daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. Compile and implement a grievance mechanism. Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour. Prevent the recruitment of workers at the site.

				<ul style="list-style-type: none"> • Implement a method of communication whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. • Establish clear rules and regulations for access to the proposed site. • Appoint a security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours. • Inform local community organizations and policing forums of construction times and the duration of the construction phase. • Establish procedures for the control and removal of loiterers from the construction site.
	Temporary increase in safety and security concerns associated with the influx of people	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Working hours should be kept within daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Provide transportation for workers to prevent loitering within or near the project site outside of working hours. • The perimeter of the construction site should be appropriately secured to prevent any unauthorized access to the site. The fencing of the site should be maintained throughout the construction period. • The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented. • Access in and out of the construction site should be strictly controlled by a security company appointed to the project. • A CLO should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process. • The EPC Contractor should implement a stakeholder management plan to address neighboring farmer concerns regarding safety and security.

				<ul style="list-style-type: none"> • The project proposed must prepare and implement a Fire Management Plan; this must be done in conjunction with surrounding landowners. • The EPC Contractor must prepare a Method Statement which deals with fire prevention and management.
	Impacts on daily living and movement patterns	Negative Medium	Negative Medium	<ul style="list-style-type: none"> • All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. • Heavy vehicles should be inspected regularly to ensure their road worthiness. • Provision of adequate and strategically placed traffic warning signs and control measures along the main road and main access road to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night. • Implement penalties for reckless driving to enforce compliance to traffic rules. • Avoid heavy vehicle activity during “peak” hours (when children are taken to school, or people are driving to work). • The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities. • The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities. • The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase. • A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.

	Nuisance impact (noise and dust)	Negative Medium	Negative Low	<ul style="list-style-type: none"> • The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues. • A CLO should be appointed, and a grievance mechanism implemented.
	Increased risk of potential veld fires	Negative Medium	Negative Low	<ul style="list-style-type: none"> • A firebreak should be implemented before the construction phase. The firebreak should be controlled and constructed around the perimeters of the project site. • Adequate fire-fighting equipment should be provided and readily available on site and all staff should be trained in firefighting and how to use the fire-fighting equipment. • No staff (except security) should be accommodated overnight on site and the contractor should ensure that no open fires are allowed on site. • The use of cooking or heating implements should only be used in designated areas. • Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly. • Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry.

	Impacts on the sense of place	Negative Low	Negative Low	<ul style="list-style-type: none"> • Limit noise generating activities to normal daylight working hours and avoid weekends and public holidays. • The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. • Communication, complaints, and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the site.
Traffic Impact Assessment	Increase in traffic	Negative Low	Negative Low	<ul style="list-style-type: none"> • It can be seen that the delivery and construction trips will be insignificant when compared to the Average Daily Traffic and will not affect the existing Level of Service . It can therefore be concluded that, no mitigation measures will be necessary.
	Increase in traffic for commuter trips	Negative Low	Negative Low	<ul style="list-style-type: none"> • It can be concluded from the table above that the estimated additional traffic generated by the construction staff, when travelling to/ from the Solar Plant, can be accommodated on the existing road network. Therefore, no mitigation measures will be necessary.

6.1.2. Impacts during the operational phase

During the operational phase the site will serve as a solar plant. The potential impacts will take place over a period of 20 – 25 years. During the operational phase the following activities will have various potential impacts on the biophysical and socio-economic environment

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial biodiversity impact assessment	Habitat destruction caused by clearance of vegetation	Negative High	Negative Medium	<ul style="list-style-type: none"> • Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum. • An avifauna specialist should be consulted to conduct a specialist study for the project area and monitoring of the potential impact of the solar plant in the future. • All development activities should be restricted to specific recommended areas. The Environment Control Officer (ECO) should control these areas. Storage of equipment, fuel and other materials should be limited to demarcated areas. • The Environmental Control Officer (ECO) should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

Habitat fragmentation caused by clearance of vegetation	Negative Low	Negative Low	<ul style="list-style-type: none"> • Use existing facilities (e.g., impacted areas) to the extent possible to minimise the amount of new disturbance.
Increased Soil Erosion and Sedimentation	Negative Low	Negative Low	<ul style="list-style-type: none"> • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Control the flow of runoff to move the water safely off the site without destructive gully formation.
Soil, Water and air Pollution	Negative Low	Negative Low	<ul style="list-style-type: none"> • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. • Spill kits should be on-hand to deal with spills immediately. • All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier. • A speed limit should be enforced on dirt roads (preferably 30-40km/h).
Spread and establishment of alien invasive species	Negative Low	Negative Low	<ul style="list-style-type: none"> • Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin prior to the construction phase

				<ul style="list-style-type: none"> • Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.
	Negative effect of human activities on fauna and road mortalities	Negative Low	Negative Low	<ul style="list-style-type: none"> • No staff should be accommodated on the site. • The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals. • Maintain proper firebreaks around the entire development footprint. • More fauna is normally killed the faster vehicles travel. A speed limit should be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night should be avoided or limited as much as possible.

Soil and water pollution	Negative Low	Negative Low	<ul style="list-style-type: none"> • Ensure that all hazardous storage containers and storage areas comply with the relevant standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • No dumping of waste should take. If any spills occur, they should be immediately cleaned up. • Contain all dirty water in the dirty water system and contain all dirty storm water up to a 1:50 year flood event as a minimum. Ensure that all activities impacting on ground water resources are managed according to the relevant Licensing regulations and ground water monitoring and management requirements. • Appropriate sanitary facilities must be provided for the duration of the proposed development and all waste removed to an appropriate waste facility. • Spill kits should be on-hand to deal with spills immediately.
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				<ul style="list-style-type: none"> • A speed limit (preferably 40 km/hour) should be enforced on dirt roads. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
	Spread and establishment of alien invasive species	Negative Low	Negative Low	<ul style="list-style-type: none"> • Alien and invader vegetation must not be allowed to colonize the area. Control involves killing alien invasive plants present, seedlings and establishing an alternative plant cover to limit re-growth. • Institute a monitoring programme to detect alien invasive species early. • Institute an eradication/control programme for early intervention if invasive species are detected. The use of indigenous plants must be encouraged in the rehabilitated areas (storm water canals), and stockpiles containing mostly exotic or weedy species should receive specialized handling and should be covered for extended periods to inhibit seedling germination of these species. Active management and eradication of exotic / alien plant species should also occur when seedlings are found.
Avifauna Impact Assessment	Displacement of priority avian species from important habitats	Negative Medium	Negative Medium	<ul style="list-style-type: none"> • Limit ongoing human activity to the minimum required for ongoing operation, control noise to minimum, rehabilitate with indigenous vegetation, limit roadways and vehicle speeds.
	Displacement of resident avifauna through increased disturbance	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Limit ongoing human activity to the minimum required for ongoing operation, control noise to minimum, rehabilitate with indigenous vegetation, limit roadways and vehicle speeds.

	Collisions with PV panels leading to injury or loss of avian life	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Panels to be flat at night, preferably low sheen/matt surfaces, quarterly fatality monitoring.
	Collision when flying into power line infrastructure	Negative very High	Negative Medium	<ul style="list-style-type: none"> • Require walk-through after power line pole positions are determined to demarcate sections requiring bird deterrents/flappers, install flappers on all required sections of power lines (as directed by avifaunal specialist) on or directly adjacent to site, quarterly fatality monitoring.
	Electrocution when perched on power line infrastructure	Negative High	Negative Medium	<ul style="list-style-type: none"> • Pole designs to discourage bird perching and to be signed off by avifaunal specialist, quarterly fatality monitoring.
Visual Impact Assessment	Visual impact on observers travelling along the roads and residents at homesteads within a 5km radius of the Solar Plant.	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted using endemic, fast growers that are water efficient. • Maintain general appearance of the facility as a whole.
	Visual impact on observers travelling along the roads and residents at homesteads within a 5-10km radius of the Solar Plant.	Negative Low	Negative Low	<ul style="list-style-type: none"> • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted using endemic, fast growers that are water efficient. • Maintain general appearance of the facility as a whole.
	Visual impacts of lighting at night on visual receptors in close proximity to the SPP.	Negative Medium	Negative Low	<ul style="list-style-type: none"> • Shield the source of light by physical barriers (walls, vegetation etc.) • Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights. • Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shield fixtures.

				<ul style="list-style-type: none"> • Make use of low-pressure sodium lighting or other types of low impact lighting. • Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
	Glint and glare on sensitive visual receptors in close proximity to the proposed facility.	Negative Low	N/A	<ul style="list-style-type: none"> • No mitigation measures applicable
	Visual impacts on observers travelling along the roads and residents at homesteads in close proximity to the power line structures.	Negative Medium	Negative Medium	<ul style="list-style-type: none"> • Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. • Maintain the general appearance of the servitude as a whole.
	Visual impact and impacts on sense of place	Negative Medium	Negative Low	<ul style="list-style-type: none"> • The subjectivity towards the project in its entirety can be influenced by creating a “Green Energy” awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an ‘open day’ where the local community can have the opportunity to view the completed project which may enlist a sense of pride in the renewable energy project in their area.
Agricultural and Soils Compliance Statement	Enhanced agricultural potential through increased financial security for farming operations	Positive Low	Positive Low	<ul style="list-style-type: none"> • No enhancement measures are proposed.
	Dust impact	Negative Low	Negative Low	<ul style="list-style-type: none"> • Implement dust suppression during the construction phase.

	Erosion	Negative Low	Negative Low	<ul style="list-style-type: none"> • Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points, and it must prevent any potential down slope erosion. • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion
	Topsoil Loss	Negative Low	Negative Low	<ul style="list-style-type: none"> • If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.
Social Impact Assessment	Creation of employment opportunities and skills development	Positive Low	Positive Medium	<ul style="list-style-type: none"> • It is recommended that local employment policy is adopted to maximise the opportunities made available to the local community. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. • Vocational training programs should be established to promote the development of skills.
	Development of non-polluting, renewable energy infrastructure	Positive Medium	Positive Medium	<ul style="list-style-type: none"> • No mitigation measures are proposed
	Loss of agricultural land and overall productivity	Negative Medium	Negative Low	<ul style="list-style-type: none"> • The proposed mitigation measures for the construction phase should have been implemented at this stage.

Potential impacts related to the impact on tourism.	Low Positive / Negative	Low Positive / Negative	<ul style="list-style-type: none"> Due to the extent of the project no viable mitigation measures can be implemented to eliminate the visual impact of the PV panels, but the subjectivity towards the PV panels can be influenced by creating a “Green Energy” awareness campaign, educating the local community and tourists on the benefits of renewable energy. Tourists visiting the area should be made aware of Namibia’s movement towards renewable energy. This might create a positive feeling of a country moving forward in terms of environmental sustainability. This could be implemented by constructing a visitor’s centre on the property allocated to the proposed solar farm which should be open to school fieldtrips, the local community, and tourists.
Visual impact and impacts on sense of place	Negative Low	Negative Low	<ul style="list-style-type: none"> To effectively mitigate the visual impact and the impact on sense of place during the operational phase of the proposed solar plant, it is suggested that the recommendations made in

				the Visual Impact Assessment (specialist study) should be followed in this regard.
--	--	--	--	--

6.1.3. Impacts during the commissioning phase

The physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state. Table below provides a summary of the impacts during the decommissioning phase.

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial biodiversity impact assessment	Habitat destruction caused by clearance of vegetation.	Negative High	Negative Medium	<ul style="list-style-type: none"> The same mitigation measures applicable during the construction phase will apply.
	Habitat fragmentation caused by clearance of vegetation	Negative Low	Negative Low	
	Increased Soil Erosion and Sedimentation	Negative Medium	Negative Low	
	Soil, water and air Pollution	Negative Low	Negative Low	
	Spread and establishment of alien invasive species	Negative Medium	Negative Low	
	Negative effect of human activities on fauna and road mortalities	Negative Low	Negative Low	

Continued loss of indigenous vegetation owing to poor recovery of vegetation.	Negative Medium	Negative Low
Contamination of soil by leaving rubble/ waste or spilling petroleum fuels or any pollutants on soil which could infiltrate the soil during rehabilitation	Negative Medium	Negative Low
Displacement of priority avian species from important habitats	Negative Low	Negative Low
Displacement of resident avifauna through increased disturbance	Negative Low	Negative Low
Erosion	Negative Low	Negative Low

Top Soil	Negative Low	Negative Low
Loss of employment opportunities	Negative Low	Negative Low
Loss or damage to sites, features or objects of cultural heritage significance	Negative Low	Negative Low

6.2. METHOD OF ENVIRONMENTAL ASSESSMENT

The objective of the environmental assessment is to catalogue all potential environmental effects that might emerge from the proposed activity. It is necessary to assess each impact's importance in order to identify the most pressing problems that need to be solved. A synthesis of impact qualities, such as context and impact intensity, is used to establish significance. Context relates to the geographic scale, such as the location, local, national, or global, whereas intensity refers to the impact's level of seriousness. The level of mitigation needed is determined by significance, which reflects the significance of the impact in terms of both physical scope and time scale.

Whether they are good or negative, environmental impacts must be included in the nature, scale, and duration of the impact assessment. Additionally, each impact is evaluated based on the following project phases:

- planning
- construction
- operation
- decommissioning

Study Approach

The Consultant undertook desk study of the project through:

- Study of the project literature background
- Interviews and meetings with the proponent
- Interview with the project Surveyors

6.2.1. Questionnaires

Structured and semi structured questionnaire were prepared and administered to the key informants of the interview. This included members of the public, local leaders, key institutions, group ranches owners and key community owners. The respondents were introduced to the project background, scope. Appendix III present sample questionnaires administered to Community members, community leaders and various institutions. The main aim of the questionnaires was to obtain views of the stakeholders and distil the main concerns elicited by the proposed project.

6.2.2. Transect Walks

To understand the biophysical nature of the project area the field teams had to walk through the proposed project site. In the walks the teams were able to identify the salient features of the project area and meet the stakeholders, identify sampling points and assess possible alternatives to the proposed power line.

6.2.3. Meetings

The Consultant organized forums for public participation to enable interested and affected parties to present their concerns and opinions regarding the proposed solar power project. The consultant shall identify social aspects and effects of the project to the neighbouring populace throughout the project cycle that include the construction, commissioning and operation phases. Through the facilitation of the respective project area regional officers, area chiefs, assistant chiefs, Councillors and key community leaders the consultant organized for public meetings where the community members were briefed on the proposed project background, scope, design outline and the regulatory requirements for all the projects of lesser / similar /higher magnitude whose implementation approval is vested on MET.

The public was then invited to express their views given the background of the project. The views for each of the meetings were recorded.

6.2.4. Focus Group Discussion (FGDs)

The Consultant engaged groups such as local authorities, in discussion on the proposed solar farm. Their observation and concerns were recorded. These groups seemed to be the most knowledgeable and were quick to grasp the technical issues relating the project implementation. They were specifically targeted with the hope that they propagate the technical issues in a language and style that can be understood by the wider community within their vicinity.

6.2.5. Observations

Observations of the biophysical, economic and social environment of the project areas were made. These informed the subsequent interviews that the consultant undertook and in the final analysis of the impacts of the project.

6.2.6. Photography

Photography was employed to capture the public meeting attendance and the physical environment of the project area. A sample of photo gallery capturing key features along the proposed site presented in Appendix IV.

6.2.7. Sampling

The consultant took water sample from the major water source (Kavango River) where the project will have a direct or indirect impact for analysis. This was principally meant to capture the chemical and physical baseline characteristics of the water sources. The water samples were taken for analysis. This will form the blue print for future environmental audits and assessment of project impacts on the water supplies. Appendix VII presents result of the chemical characteristics for water samples from Kavango River, Mushangara point.

7. CUMULATIVE EFFECT ASSESSMENT

7.1. INTRODUCTION

Cumulative impacts are defined as "the past, present, and reasonably foreseeable future impacts of an activity, considered together with the impact of activities associated with that activity, which in and of themselves may not be significant, but which may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (in relation to an activity). Impacts that add up may be progressive, interactive, sequential, or synergistic. For the purposes of this report, a "cumulative effect" is defined as the accumulation of effects over time that can be linked to the Project's operation.

7.2. Geographic Area of Evaluation

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 20km radius surrounding the proposed development.

7.3. Temporal Boundary of Evaluation

A temporal boundary is the timeframe during which the cumulative effects are reasonably expected to occur. The temporal parameters for this cumulative effects analysis are the anticipated lifespan of the proposed project, beginning in 2024 and extending out at least 25 years, which is the minimum expected project life of the proposed project.

7.4. IMPACT ASSESSMENT

This assessment will take into account "residual impacts on the environment," or effects that remain after mitigation measures have been implemented, along with the environmental effects of past, present, and upcoming projects and activities.

7.4.1. Potential Cumulative Effects

Table 7.1 : Potential Cumulative Effects of the proposed project

	Valued Ecosystem Components (VECs)	Rationale for Inclusion / Exclusion	Level of Cumulative Effect
Construction Phase			
Terrestrial Biodiversity Impact Assessment	Habitat loss owing to clearing of vegetation	Clearing of vegetation at the proposed Solar Plant footprint. This will entail the partial destruction of habitat of low or medium sensitivity.	- Medium
	Fragmentation of corridors of particular conservation concern	Owing to the possibility of a number of solar plants to be developed in the local area the possible impact to fragmentation of the landscape are real. Otherwise, there are no indications of particular conservation importance at the site.	- Negligible

	Displacement of resident avifauna	The displacement of resident avifauna through increased disturbance a leading to injury or loss of avian life are considered as a cumulative impact due to the magnitude of the project	- Low
	Loss of important avian habitats	The displacement of priority avifauna through increased disturbance leading to injury or loss of avian life and important habitat are considered as a cumulative impact due to the magnitude of the project.	- Medium
Heritage Impact Assessment	Loss or damage to sites, features or objects of cultural heritage significance	Mushangara Solar project is located in an area with a very low zero presence of heritage sites and features. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.	- Low
Social Impact Assessment	Impacts of employment opportunities, business opportunities and skills development	Mushangara solar power projects has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in turn, can result in positive social benefits. The cumulative benefits to the local, regional, and national economy	+ Medium
		through employment and procurement of services are more considerable.	
	Impact with large-scale in-migration of people	The development of several projects may have a cumulative impact on the in-migration and movement of people. Levels of un employment and the low level of earning potential may attract individuals to the area in search of better job opportunities and higher standards of living.	- Medium

Traffic Impact Assessment	Increase in construction vehicles	The construction of the solar power plants will have a minimal impact on the current traffic volumes for long distance transportation routes. The chances of local traffic being adversely affected by the construction traffic are considered extremely low. The construction of the solar power plants will have a definite positive impact on communities of the surrounding towns. The impacts on the surrounding area will only be temporary. All of the impacts are completely reversible, as the project is of short duration. The significance of the above-mentioned impacts is low, as they are only temporary and extend over a short time period.	- Low
	Operational Phase		
Terrestrial Biodiversity Impact Assessment	Emissions and pollutants into air, water and soil	Overall emissions and pollutants from solar plants are limited when operational. During the operational phase cumulative impacts to the pollution of soils could happen. Rubble or waste could lead to infiltration of unwanted pollutants into the soil. Spilling of petroleum fuels and unwanted chemicals onto the soils that infiltrate these soils could lead to pollution of soils and if this happens at a number of solar plants in an area, the cumulative effect could be detrimental to the local environment.	- Low
	Avifaunal Impact Assessment	Collisions when flying into power line infrastructure	Collisions with power line infrastructure leading to injury or loss of avian life are cumulative impacts due to the large number of planned solar developments and power lines.
Electrocutions when perched on power line infrastructure		Electrocutions when perched on power line infrastructure are cumulative impacts due to the large number of planned solar developments and power lines.	- Medium

Visual Impact Assessment	Visual impacts related to the power line	The anticipated cumulative visual impact of the proposed plant is expected to include the change in sense of place. Due to the abundance of natural vegetation in the area, the scenic quality of the region is high, further construction and operation of Mushangara in the area is likely to have a negative impact.	- Medium
Decommissioning Phase			
Visual Impact Assessment	Visual Intrusion	The decommissioning of the PV plant and 132kV power line may increase the cumulative visual impact together with farming activities and people using the existing gravel roads. Dust control and housekeeping will be the main factors to take note of.	- Low
Other	Generation of waste	An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	- Medium

7.5. CONCLUSION

This chapter of the Final Assessment Report, addressed the cumulative environmental effects of the construction, operation and decommissioning project phases. The information to date has shown that no significant adverse residual impacts are likely. However, cumulative impacts could arise as other similar projects are constructed in the area. The potential most significant cumulative impacts relate to:

Cumulative effects during construction

- Habitat loss (including avian habitats) owing to clearing of vegetation
- Displacement of priority avian species
- Impacts of employment opportunities, business opportunities and skills development
- Impact with large-scale in-migration of people

Cumulative effects during the operational phase:

- Collisions when flying into power line infrastructure.
- Electrocutions of avifauna when perched on power line infrastructure
- Visual impacts related to the and power line .

Cumulative effects during the decommissioning phase:

- Generation of waste (- Medium)

The cumulative impact for the proposed development is medium to low and no high, unacceptable impacts related to the project are expected. Considering the extent of the project and information presented in Section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment. Photovoltaic solar energy technology is a clean technology which contributes toward a better-quality environment. The proposed project will contribute to local economic growth by supporting industry development. No cumulative impacts with a high residual risk have been identified. Also, the acceptable cumulative impacts (of a medium and low significance) expected will not result in a whole-scale change of the environment and therefore are

considered to be acceptable, and considering the associated positive impacts associated with the development of solar energy facilities the proposed facility is considered desirable.

8. ENVIRONMENTAL IMPACT STATEMENT

8.1. SUMMARY OF KEY FINDINGS AND ASSESSMENT RESULTS

Based on the contents of the report the following key environmental issues were identified, which were addressed in this Final EIA report:

Impacts during construction phase:

- Habitat destruction and fragmentation caused by clearance of vegetation
- Increased soil erosion and sedimentation
- Soil compaction and increased risk of sediment transport and erosion
- Displacement of priority avian species from important habitats
- Creation of direct and indirect employment opportunities
- Economic multiplier effects from the use of local goods and services
- Impacts on daily living and movement patterns

Impacts during the operational phase:

- Habitat destruction caused by clearance of vegetation
- Displacement of priority avian species from important habitats
- Collision of avifauna when flying into power line infrastructure
- Electrocuting of avifauna when perched on the power line infrastructure
- Visual impacts on observers travelling along the roads and residents at homesteads in close proximity to the power line structures
- Creation of employment opportunities and skills development
- Development of non-polluting, renewable energy infrastructure
- Contribution to Local Economic Development and social upliftment

Impacts during the decommissioning phase:

- Habitat destruction caused by clearance of vegetation
- Impact on the characteristics of the watercourse

The cumulative impact assessment included in Section 7 of this report has indicated that all cumulative impacts will be of a medium or low significance, with no impacts expected to be of a high and unacceptable significance.

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C. Other References

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10. APPENDICES

Appendix A	Application for Environmental Clearance Form
Appendix B	Basic Document Information
Appendix C:	Declaration and CV
Appendix D:	Press Adverts
Appendix E:	List of Interested and Affected Parties
Appendix F:	Proof of Public Participation
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APPENDIX A: Application for Environmental Clearance Report Form

APPENDIX B: Basic Information Document (BID)

APPENDIX C: EAP declaration and CV

CURRICULUM VITAE (CV) FOR CONSULTANT

Name of Consultant: Michael Matengu

Profession: Independent Environmental Assessment Practitioner

Date of Birth: 19 February 1985

Nationality: Namibian

Membership in Professional Bodies: EAPAN

Key Qualification:

Name of Task/ Assignment:	Construction of main mine features by China State Construction and Engineering Corporation for Husab Swakop Uranium Mine
Year:	May 2014- Jan 2017
Location:	Husab Swakop Uranium Mine
Client:	Husab Swakop Uranium Mine
Main Project Feature:	Construction, Environmental Management Plan, Compliance Monitoring
Position Held:	Environmental Compliance Officer
Degree of Responsibility:	EMP Development, Compliance Monitoring, Documentation and writing of report

Name of Task/ Assignment:	Environmental Impact Assessment and EMP Development by Gobabeb Research and Training Centre for Husab Swakop Uranium Mine
Year:	2009- 2010
Location:	Husab Swakop Uranium Mine
Client:	Husab Swakop Uranium Mine
Main Project Feature:	Environmental Impact Assessment, Monitoring and Reporting
Position Held:	Research Technician
Degree of Responsibility:	Biodiversity Monitoring, Data collection and Analysis, Reporting

Name of Task/ Assignment:	Baseline Environmental Assessment by Gobabeb Research and Training Centre for Langer Heinrich Uranium Mine
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Year:	2008
Location:	Langer Heinrich Uranium Mine
Client:	Langer Heinrich Uranium Mine Pty (Ltd)
Main Project Feature:	Baseline Environmental Assessment and Monitoring
Position Held:	Research Technician
Degree of Responsibility:	Biodiversity Monitoring, Analysis and Reporting

Name of Task/ Assignment:	Environmental Impact Assessment by Gobabeb Research and Training Centre for Valencia Uranium Mine Pty (Ltd)
Year:	2007- 2008
Location:	Valencia Uranium Mine
Client:	Valencia Uranium Mine
Main Project Feature:	Environmental Impact Assessment and EMP
Position Held:	Research Intern
Degree of Responsibility:	Biodiversity Monitoring, Analysis and Reporting

Education:

Name of Institution	Qualification Name	Qualification	Year
University of South Africa	BSc Hon	Environmental Management	2020-Current
Steinbeis University	MBA	Business Administration	Current
Institute of Business Management of Southern Africa	Certificate	Health, Safety and Security Administration	2016-2017
Advance Learning Interactive System Online	Diploma	Environmental Science	2012-2013
University of Namibia	B.A. Degree	Tourism (Geography and Environmental Studies Major)	2003-2007

Employment Record:

Year	Company	Responsibility	References
2021-Current	Dundee Precious Metals Tsumeb	Environment Officer: air quality monitoring and management, air quality instrument calibrations, air quality instrument maintenance, dust bucket monitoring, weather data download	Ms. Ndeshi Simon Contact: 0812749270
2019-2021		Environmental Assistant: <ul style="list-style-type: none"> Air Quality Monitoring, Calibrations and 	

Year	Company	Responsibility	References
	Dundee Precious Metals Tsumeb	Management, <ul style="list-style-type: none"> • Management and maintenance of fallout dust buckets and sites • Dust buckets preparation and installation, Basic Laboratory work • Preparation of sampling equipment's • Ground water monitoring, sampling and management, Manage and ambient air quality monitoring stations, • Calibration of Air Quality Monitoring Stations, Installation of basic equipment in Air Quality Monitoring Station • Maintenance of air quality instruments (PM2.5, PM10, SO2 Analyser, TEOM Monitor, Partisol Sequential Monitor) • Maintain and download weather data) • Cleaning air quality stations and sampling ports • Basic maintenance of sampling equipment's and tools , HSE inspections	
2018-2019	Environmental Compliance Consultancy	Environmental Control Officer <ul style="list-style-type: none"> • Undertaking of Environmental Impact Assessments (EIA) • Collect environmental and rangeland information and conduct data entry into the management system • Responsible for Geographic Information System and database management • Conduct inspections on all Jumbo FSC Group Scheme farms and assess compliance to Namibian legal requirements and FSC International Standards, • Keep record of all non-compliances observed on farms visited, Mitigate negative environmental effects through regulations and policy enforcement • Develop and update inspection checklist, Site visits and assessments 	Mrs. Charne Eimann Phone: 0812103970
2014-2017	China State Construction and Engineering Corporation	Environmental Compliance Officer: <ul style="list-style-type: none"> • Develop and manage Mini Environmental Management Plan • Implement the conditions of the Construction Environmental Management Plan (CEMP) and Mini Environmental Management Plan (Mini- 	Mr. Timothy Thikundeko Phone: 0813149598

Year	Company	Responsibility	References
		<p>EMP)</p> <ul style="list-style-type: none"> • Conduct environmental inspections mine to assess compliance to the set policies, procedures, standards • construction environmental management plan and the national legislations • Maintain detailed records of inspections, audits reports and register, training records, MSDS, waste management • Implementation of corrective and preventative measures • Mitigation of negative environmental impacts through enforcement of policies, regulations, and national legislations • Waste management on all China State sites on the mine • Site wide chemical management and inspections • conduct training • Implement environmental management system according to ISO 14001 standards • Responsible for occupational health and hygiene of all employees on all sites, Site wide environmental rehabilitation 	
2012-2013	Namibia Statistic Agency	<p>Regional GIS Analyst:</p> <ul style="list-style-type: none"> • Provide service to customers via telephone and email • Compile data belonging to core function of the Regional Council and NSA • Data dissemination, including web-based GIS, With RC and other stakeholder • Produce atlases, posters of interest to the general public • Perform spatial analysis to combined statistical and geographical data based on user demand perform spatial analysis to combined statistical and geographical data based on user demand • provide support in the use of geographical data to internal as well as external users, technical assistance on GIS and related land use planning activities • Management of Regional GIS Database • Production of required thematic maps and mapping activities for Oshikoto Regional 	<p>Mr. Essen Mowa Email: Phone: 061 431 3200</p>

Year	Company	Responsibility	References
		Council and other regional stakeholders	
2010-2011	National Planning Commission	Regional Supervisor: <ul style="list-style-type: none"> Logistics, Publicity, supervising field-based teams and updating Enumeration Area (EA) maps Capturing physical locations building structures and other non-spatial attributes to create a dwelling unit frame, Capturing data Using Personal Digital Assistant (PDA) with integrated GPS Checking quality of data collected by field teams using G-Survey application and Uploading and Downloading data from the PDA to the laptop and vice versa, Supervision of field Staff 	Mr. Michael Lukubwe Contact: 0813070084
2008-2010	Gobabeb Research and Training Centre	Research Technician: <ul style="list-style-type: none"> Data collection and analysis of Biota- Africa Project Environmental Impact Assessment (Valencia, Langer Heinrich, Swakop Uranium) Monitoring (ground water, air quality, vegetation, weather and biodiversity) Support and assist visiting scientist with field activities and data collection Research equipment management and maintenance, Responsible for NOAA sampling, collection, shipping and updating database once results have been received Basic laboratory work (sampling, filtration, identification, sorting) 	Mr. Hiskia Mbura Phone:0812931568

Languages:

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Afrikaans	Fair	Excellent	Good
Silozi	Excellent	Excellent	Excellent
Oshiwambo	Poor	Good	Good

Certification:

I, the undersigned, certify that to the best of my knowledge and belief that, these data correctly describe me, my qualification, and experience.

Date: 18 July 2022

A handwritten signature in black ink, appearing to read 'Matengu', with a stylized flourish at the end.

Full name of Consultant:

Michael Matengu

APPENDIX D: Press advertisement

PUBLIC NOTICE
ENVIRONMENTAL IMPACT ASSESMENT AND ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED 9.8 KM ELECTRIC TRANSMISSION LINES FROM NGCANGCANA TO NDAMA (RUNDU TRANSMISSION STATION), KAVANGO EAST REGION, NAMIBIA

Notice is hereby given to all interested and affected parties (I&APs) that an application will be made to the Environmental Commissioner in terms of The Environmental Management Act (No. 7 of 2007) and Environmental Impact Assessment Regulations (2012) for the above-mentioned proposed activities.

Project Description: The project proponent is Water and Power supply Africa Company Limited (WAPS Africa). Their intentions are to establish a 9.8 km high voltage electric transmission lines. The major driver for the development being to adequately produce solar energy with its advantages with bulky supply locally and regionally. Phase 1 of 8 the proposed activities will cover 400 acres that is estimated to generate 227 619 840 kilowatt hours each year.

Environmental Assessment was done and application for ECC will be made to MET. We therefore announce the AVAILABILITY OF THE SCOPING REPORT FOR THE PROPOSED 221 MW SOLAR FARM. All IAPs can request a BID, Environmental Assessment report and Environmental Management Plan for the Solar Power generation Please request before deadline of submission of comments or Attend a public meeting to be held on site as follows:

Ngcangcana: 23/10/22 at 11:00 Hrs
Ndama: 23/10/22 at 14:00 Hrs
Project Location: Ngcangcana to Ndama, Kavango East Region
Project Area size: 9.8km
Consultant: CONSERVER INVESTMENT CC
Deadline for submission of comments: 24/10/22
Contact Consultant 0817637974
E-Mail: hausiku2007@yahoo.co.uk

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Friday 7 October 2022 - 09:00 BSA | 27

CLASSIFIEDS

Tel: (061) 208 0800/4 | Fax: (061) 220 584 | Email: classifieds@nepc.com.na

Services	Notice	Notice	Notice	Notice	Notice	Notice
CLASSIFIED						

APPENDIX E: List of I & APs

1. Vanessa Stein, Forester, MET, National Botanical Research Institute (NBRI), Tel +264-612022013, Fax +264-61-258153, Vanessa.Stein@mawf.gov.na
2. Hilka Hamukuaja, Sales and PR Manager, Rent a drum, Cell +264811277913, Tel +264 61 244097, pr@rent-a-drum.com.na
3. John Pallett, Principal scientist SAIEA, Tel +264 61 220579, Fax +264 61 2559183, Cell +264 812402528, john.pallett@saiea.com
4. MR Filemon Nakashole, NORED, Tel: +264832822102, f.nakashole@nored.com.na
5. Ms Ndilinawa Ladja, Tel: +2648362822101, l.ndilinawa@nored.com.na
6. Mr Aaron Muri, Tel: +26466714300, muri@namwater.com.na
7. Mr Nehemia, nehemiaa@namwater.com
8. Ngcangcana Village Headman
9. Mr Chinkanda, Nkurenkuru Town Council, [Tel: +264 66258089](tel:+26466258089), smushong@nkurenkurutc.com.na
10. Mr Sinime John, [Tel: +264 811244370](tel:+264811244370), sinime@iway.com

APPENDIX F: Proof of Public Participation)



APPENDIX G: Environmental Management Plan (EMP)