2024

Environmental Scoping Report for the Proposed Construction and Operation of a Renewable Solar Energy Facility and Battery Energy Storage System in the Erongo Region

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LIST OF ACRONYMS

AIDS	Acquired immune deficiency syndrome
CRR	Comments and response report
dB	Decibels
DESR	Draft Environmental Scoping Report
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
EAR	Environmental Assessment Report
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
FESR	Final Environmental Scoping Report
ESR	Environmental Scoping Report
GTZ	Gesellschaft für Technische Zusammenarbeit
HIV	Human immunodeficiency virus
I&AP	Interested and Affected Party
IUCN	International Union for Conservation of Nature
MET	Ministry of Environment and Tourism
MEFT: DEA	Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs
MURD	Ministry of Urban and Rural Development
MWTC	Ministry of Works Transport and Communication

PPP	Public participation process
p/km^2	People per square kilometre
SADC	Southern African Development Community
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

INTRODUCTION

Namibia is regarded as a net exporter of electricity, local electricity generation is derived from hydropower, coal and diesel burning power stations; however, this is not enough to meet local demand necessitating the country to source the balance, amounting to more than 60%, from other countries within the Southern African region such as Zambia, South Africa, Zimbabwe and Mozambique; of which South Africa's contribution is dominant at 53%. Despite the current situation, the energy consumption in Namibia follows an upward trajectory because of the unavoidable dependency of national development on the availability, supply, demand and use of energy. Namibia will thus have to develop, as a matter of urgency, its own capacity to generate electricity.

Renewable energy sources offer numerous advantages over fossil fuels, including lower greenhouse gas emissions, improved air quality, and reduced dependence on finite resources. Solar energy, in particular, has experienced rapid growth due to falling costs and technological advancements in photovoltaic systems.

Despite these benefits, one of the main challenges of renewable energy sources is their intermittency and variability. Solar power generation is dependent on weather conditions, meaning that electricity production may not align with demand. This variability can strain the electricity grid and require backup power from fossil fuel plants, undermining the environmental benefits of renewable energy. Battery energy storage systems have emerged as a solution to this challenge, enabling the storage of excess energy generated during periods of high production for use when demand is high or production is low.

Battery energy storage systems offer several key benefits for the integration of renewable energy into the grid. They help smooth out fluctuations in energy generation, improve grid stability, and enhance the reliability of renewable energy sources. By storing excess energy when production exceeds demand and discharging stored energy when needed, battery storage systems can optimize the use of renewable energy and reduce the need for backup power from fossil fuel plants. This flexibility is essential for maximizing the value of renewable energy sources and accelerating the transition to a clean energy future.

MBA Management Solutions (the proponent) is focused on becoming a major player in the green renewable energy generation, production and trading space. They intend to generate renewable energy from solar incorporating battery energy storage systems, in the Trekkopje area of the Erongo Region to be known as #Gaingu Green Energy Industrial Park. The electricity generated will be fed to the national grid for consumption by industrial loads and export to the neighbouring countries.

The above activity is discussed in more detail in Chapter 4. The proponent appointed Environam Consultants Trading Cc (ECT) to undertake the Environmental Assessment (EA) in order to obtain an Environmental Clearance Certificate (ECC) for the activity from the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

The process will be undertaken in terms of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations (herein referred to as EIA Regulations) of the Environmental Management Act (No 7 of 2007) (herein referred to as the EMA). The EIA process will investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.

The EIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will also serve the purpose of informing the proponent's decision-making, and that of MEFT.

PROJECT LOCATION

The proposed development is located in the Erongo Region, ~ 30km North of Arandis mining town. The facility is situated on land that is under the administration of a communal conservancy called #Gaingu, and the Applicant will enter into a long-term lease agreement with the Conservancy for the duration of the operational period of the proposed development. It is situated on the coordinates lat: -22.11698; long:14.93886. See Figures 1 below for the locality map of the development site.

LEGISLATIVE FRAMEWORK

The principle environmental regulatory agency in Namibia is the Office of the Environmental Commissioner within the Directorate of Environmental Affairs of the Ministry of Environment, Forestry and Tourism. Most of the policies and legislative instruments have their basis in two clauses of the Namibian Constitution, i.e. Article 91 (c) and Article 95 (l); however, good environmental management finds recourse in multiple legal instruments.

ENGINEERING SERVICES

The infrastructure needs of the proposed project can be categorised into two broad classifications namely:

- Basic infrastructure that includes electricity and roads.
- Environmental infrastructure that consists of water supply, sewage and drainage systems, and solid waste management.

The service infrastructure such as water, sewer, drainage, electricity and roads will be designed by registered professional engineers to integrate with the existing NamPower infrastructure. These will be carried out in consultation with NamPower, Erongo Regional Council and other relevant authorities.

The existing access road to the site will be upgraded to support ease of movement to the PV power plant. Internal roads of 4m will also be constructed and will connect with the main building and the access gate. A fence will be constructed enclosing the complete plant with an access gate. The internal road network will be designed and the construction thereof supervised by professional engineers as part of the service infrastructure.

PUBLIC PARTICIPATION PROCESS

In terms of Section 21 of the EIA Regulations a call for public consultation with all I&APs during the EIA process is required. This entails consultation with members of the public and providing them an opportunity to comment on the proposed project. The Public Consultation

Process does not only incorporate the requirements of Namibia's legislation, but also takes account of national and international best practises.

A public meeting was held on 04 April 2024 at Arandis Community Hall. The comment period of the initial public participation process commenced on 28 March 2024 and ended on 11 April 2024.

The second phase of the Public Consultation Process involved the lodging of the Draft Environmental Scoping Report (DESR) to all registered I&AP for comment. Registered and potential I&APs were informed of the availability of the DESR for public comment. I&APs were given time until 16 July 2024 to submit comments or raise any issues or concerns they may have with regard to the proposed project.

POTENTIAL IMPACTS IDENTIFIED

The following planning and design phase impacts were identified:

- Surface and groundwater;
- Land use;
- Fauna and flora;
- Existing infrastructure;
- Traffic; and
- Visual impact.

The following construction phase impacts were identified:

- Fauna and flora;
- Pressure on the existing infrastructure;
- Surface and groundwater;
- Health, safety and security;
- Air quality,
- Noise,
- Traffic;
- Waste management;
- Hazardous substances;
- and Social.

The following operational phase impacts were identified:

- Environmental monitoring and evaluation;
- Surface and ground water;
- Air quality;
- Noise;
- Impact on human health;
- Fire and Explosions
- Waste management; and
- Social.

CONCLUSION

Solar powered electricity generation is experiencing rapid growth. A major motivation for deploying solar power is to reduce emissions of carbon dioxide caused by traditional power generation (Turney & Fthenakis, 2011) for the same quantity of energy produced. Although the size of land required by the photovoltaic plant is usually more than fossil fuel plants, the emissions at fossil fuel plants are considerable (air, soil, noise, etc.). Emissions from solar energy are usually negligible to none. Photovoltaic power plant impacts are reversible in the short-term because after decommissioning, the area can be returned to its previous state and become available for other activities. In addition to producing clean energy the power plant can contribute to the promotion of biodiversity, by providing a refuge for plants and animals, in particular smaller animals such as invertebrates.

Another advantage of a photovoltaic power plant over the conventional power plant is that as the lifetime of the solar power plant gets longer, the land transformation per capacity does not change, even when considering the impacts on land use. All high priority impacts are in favour of solar power displacing traditional power generation while all the harmful impacts from solar power are of low priority (Turney & Fthenakis, 2011).

Based on the evidence produced during the assessment process, it is very unlikely that this project will have any significant negative impacts on the environment. It is therefore recommended that a clearance certificate be issued for the project.

1. INTRODUCTION

1.1 Project Background

Namibia is regarded as a net exporter of electricity, local electricity generation is derived from hydropower, coal and diesel burning power stations; however, this is not enough to meet local demand necessitating the country to source the balance, amounting to more than 60%, from other countries within the Southern African region such as Zambia, South Africa, Zimbabwe and Mozambique; of which South Africa's contribution is dominant at 53%. Despite the current situation, the energy consumption in Namibia follows an upward trajectory because of the unavoidable dependency of national development on the availability, supply, demand and use of energy. Namibia will thus have to develop, as a matter of urgency, its own capacity to generate electricity.

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1.2 Project Location

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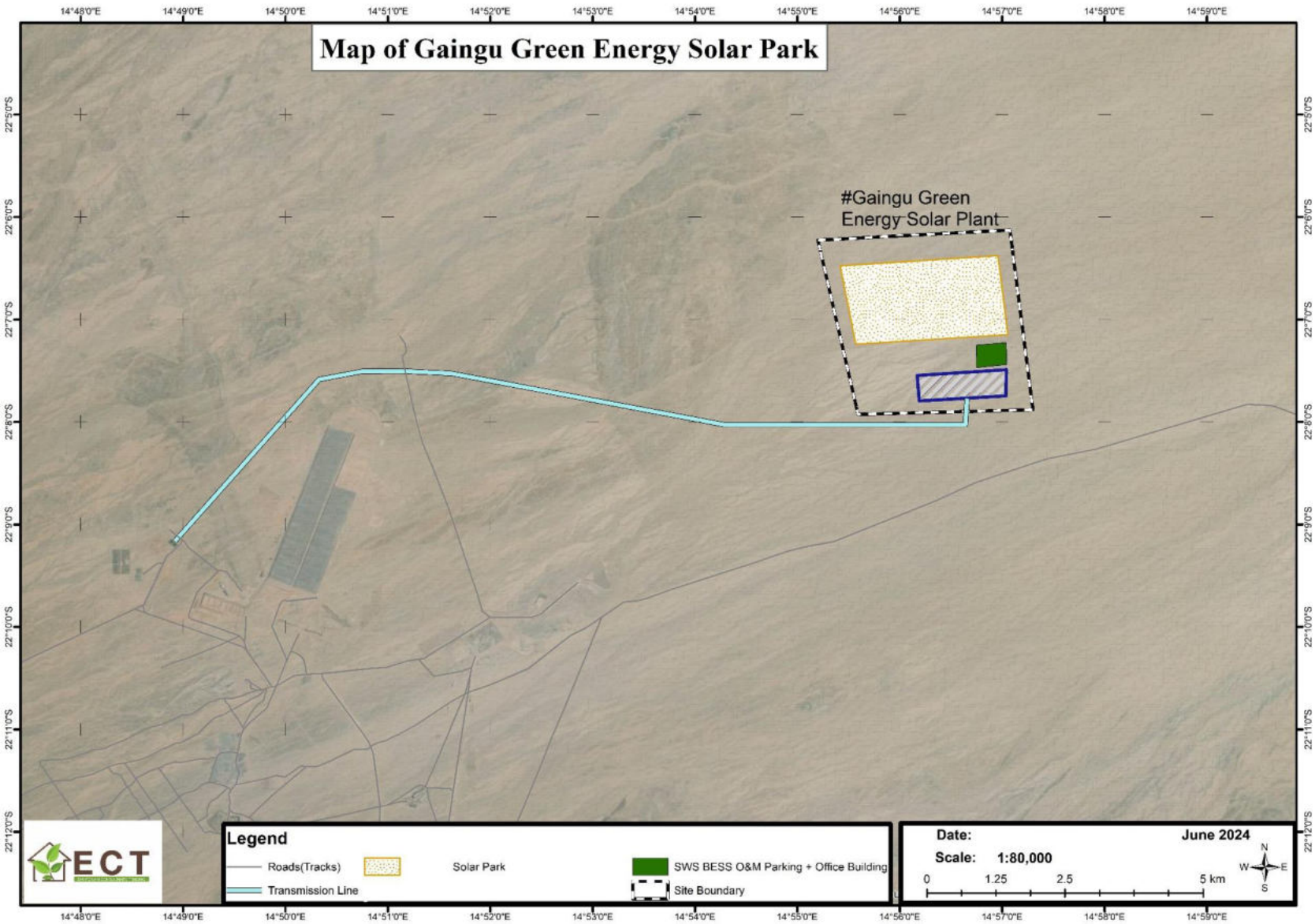

Figure 1: Project Locality

1.3 Terms of Reference and Scope of Project

The scope of this project is limited to conducting an environmental assessment and applying for an Environmental Clearance Certificate for the Proposed Construction and Operation of a Renewable Solar Energy Facility and Battery Energy Storage System in the Erongo Region and associated infrastructure as indicated in section 1.1 above. This includes consultations with client; site investigations and analysis; stakeholder consultations; impact analysis; mitigation formulation; Scoping report writing; and draft Environmental Management Plan.

1.4 Assumptions and Limitations

In undertaking this investigation and compiling the Environmental Assessment, the following assumptions and limitations apply:

- Assumes the information provided by the proponent is accurate and discloses all information available.
- Various layout alternatives were initially considered by the proponent, having taken due regard of the natural and environmental constraints, and the unique character and appeal of area. The current designs thus present the most feasible results.

1.5 Content of Environmental Scoping Report

In terms of Section 8 of the gazetted EIA Regulations certain aspects must be included in a Scoping Report. **Table 1** below delineate, for ease reference, where this content is found in the Environmental Scoping Report.

Table 1: Contents of the Scoping / Environmental Assessment Report

Section	Description	Section of ESR/ Annexure
8 (a)	The curriculum vitae of the EAPs who prepared the report;	Refer to **Annexure E**
8 (b)	A description of the proposed activity;	Refer to Chapter 4
8 (c)	A description of the site on which the activity is to be undertaken and the location of the activity on the site;	Refer to Chapter 1
8 (d)	A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity;	Refer to Chapter 3
8 (e)	An identification of laws and guidelines that have been considered in the preparation of the scoping report;	Refer to Chapter 2

Section	Description	Section of ESR/ Annexure
8 (f)	Details of the public consultation process conducted in terms of regulation 7(1) in connection with the application, including	Refer to Chapter 5
	(i) the steps that were taken to notify potentially interested and affected parties of the proposed application	Refer to Chapter 5
	(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	Refer to **Annexures A** and **B** for site notices and advertisements respectively.
	(iii) a list of all persons, organisations and organs of state that were registered in terms of regulation 22 as interested and affected parties in relation to the application;	Refer to **Annexure D**
	(iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;	Refer to **Annexure D**
8 (g)	A description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity;	Refer to Chapter 4
8 (h)	A description and assessment of the significance of any significant effects, including cumulative effects, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity;	Refer to Chapter 7
8 (i)	terms of reference for the detailed assessment;	Refer to Chapter 1
8 (j)	An environmental management plan	Refer to **Annexure F**

2. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

The principle environmental regulatory agency in Namibia is the Office of the Environmental Commissioner within the Directorate of Environmental Affairs of the Ministry of Environment, Forestry and Tourism. Most of the policies and legislative instruments have their basis in two clauses of the Namibian Constitution, i.e., Article 91 (c) and Article 95 (l); however, good environmental management finds recourse in multiple legal instruments. Table 2 below provides a summary of the legal framework considered to be relevant to this development and the environmental assessment process.

Table 2: Legislation applicable to the proposed development

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	Article 91 (c) provides for duty to guard against "the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia." Article 95(l) deals with the "maintenance of ecosystems, essential ecological processes and biological diversity" and sustainable use of the country's natural resources.	Sustainable development should be at the forefront of this development.
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that. Section 3 details the principle of Environmental Management	The development should be informed by the EMA.
EIA Regulations GN 28, 29, and 30 of EMA (2012)	GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process.	**Activity 1 (a)** The generation of electricity. **Activity 1 (b)** The transmission and supply of electricity.
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EA process should incorporate the aspects outlined in the guidelines.
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Water Resources Management Act 11 of 2013	Section 68 (1): Prohibits pollution of water resources. Section 68 (2): Prevents the pollution of Water resources.	The pollution of water resources should be avoided during the operation of the development.
The Ministry of Environment, Forestry and Tourism (MEFT) Policy on HIV & AIDS	MEFT has developed a policy on HIV and AIDS. In addition, it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments.	The proponent and its contractor/s have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when construction workers interact with local communities.
Urban and Regional Planning Act (Act of 2018).	Urban and Regional Planning Act (Act of 2018) regulates subdivisions of portions of land falling within a proclaimed Local Authority area.	Section 16 of Chapter 3 deals with the Ministers' declaration of authorised planning authorities and establishment of joint committees.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council.	The development has to comply with the provisions of the Local Authorities Act.
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections. Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	The developer and contractors are to comply with these legal requirements.
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All activities on the site will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.
Electricity Act, 2007 (Act No. 4 of 2007)	The Act provides for the requirements and conditions for obtaining licences for the generation of electricity.	Compliance with this legislation is essential.

This EA process will be undertaken in accordance with the EIA Regulations. A Flow Diagram (refer to Figure 2 below) provides an outline of the EIA process to be followed.

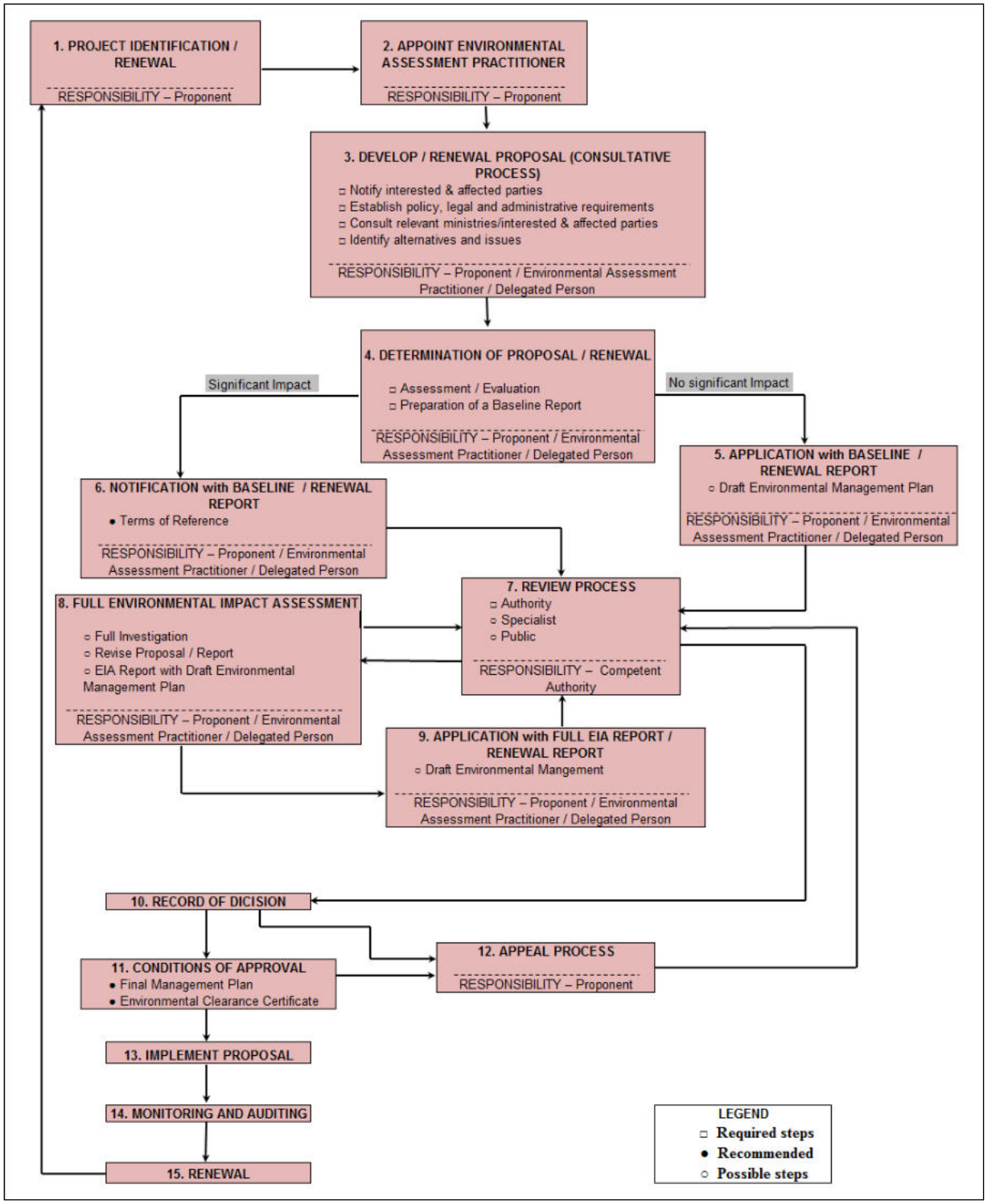

Figure 2: Environmental Assessment Procedure for Namibia *(Environmental Assessment Policy of 1995)*

3. ENVIRONMENTAL BASELINE DESCRIPTION

3.1 Social-Economic Environment

3.1.1 Regional Information

The Erongo Region, comprising seven constituencies: Omaruru, Karibib, Daures, Arandis, Swakopmund, Walvis Bay Rural, and Walvis Bay Urban (NSA, 2014) is a dynamic region reflecting diverse population characteristics. The following table shows the population trend of Erongo region, in which the project will be located.

Table 3: Population of Erongo Region, 2023

No	Town	Population
1.	Walvis Bay	102,704
2.	Swakopmund	75,921
3.	Arandis	5,726
4.	Henties Bay	7,569
5.	Usakos	5 094
6.	Karibib	6,938
7.	Omaruru	10,670
	Total	**240,206**

Rural areas in the region experience considerably higher poverty rates, with 25.1% of the rural population categorized as poor and 15.9% as severely poor, in contrast to 8.6% and 4.8% respectively in urban areas. The rural constituencies of Daures, Walvis Bay Rural, and Omaruru have the highest poverty rates. Poverty serves as a significant driver of migration from rural to urban areas. In terms of non-financial aspects of deprivation like access to healthcare, education, and employment, the Erongo region generally fares better.

The Erongo Region ranks amongst the least impoverished regions in Namibia, with a poverty rate of 4.4% and a severe poverty rate of 1.1% in 2016, as compared to the respective national rates of 17.4% and 10.7% (NSA, 2017). Of Namibia's 20 least deprived constituencies in 2011, five were in the Erongo Region: Omaruru, Walvis Bay Rural, Arandis, Swakopmund and Walvis Bay Urban. The Erongo Region coastal towns rely heavily on tourism. COVID-19 interrupted most businesses abruptly for most of 2020 and 2021. Many businesses, employees and their families suffered losses in income, jobs and livelihoods. The Project should make a positive contribution to improving livelihoods. Generally, the main source of income for most households (67.5%) in the region comes from salaries and wages, followed by business activities (non-farming) (12.6%), pensions (7.6%) and cash remittances (3.7%) (NSA, 2019).

The Erongo Region has a higher number of individuals between the ages of 15 and 65 actively participating in the labour force compared to other regions in Namibia. Within the employed population, 40.9% are engaged in informal employment, such as working in private households, agriculture, or fishing, without access to social protections like a pension scheme, medical aid, or social security.

The region also faces challenges in youth unemployment, with an unemployment rate of 36.8% among individuals aged 15-34 years. Interestingly, youth unemployment rates are slightly higher among men (37%) compared to women (36.5%), despite the general population showing a higher unemployment rate for young males (44%) compared to young females (48.5%). These statistics indicate limited opportunities for youth in the region.

3.1.2 Employment Opportunities

The proposed development is likely to increase the job opportunities in the local communities and the Erongo region at large. The Construction phase of the project will provide job opportunities, of which 80% are expected to be unskilled and semi-skilled people and can be sourced from the unemployed labour force of the surrounding communities. The principle of maximising local employment creation can be applied by identifying suitable workforce and construction contractors in the region.

Erongo Region is well-equipped with competent small and medium enterprise (SME) construction companies to conduct the proposed development. The project would also give rise to indirect economic benefits through the procurement of materials, goods and local services.

The local economy is expected to benefit from the project. A percentage of moneys derived from salaries and wages earned by construction workers is likely to be spent in the area. The moneys spent in communities around the project location would create substantial flows of revenue within these communities, thus acting as a catalyst for growth in the local economy.

In addition, procurement of construction materials, goods and services would have beneficial downstream economic impacts by stimulating demand up the supply chain. The more goods and services procured from local SMEs or enterprises in the nearby centres, the greater the project's contribution to the growth of the local economy.

3.1.4 Archaeological and Heritage Context

Archaeological assessments previously carried out in the Trekkopje area have found that the area is poor in Holocene remains, although there are artefacts that warrant protection under National Heritage Act, such as the historical Annaberg tin workings (Turgis, 2008).

It is unlikely that the development site will have any significant archaeological resources; however, an accidental find procedure may be required. If any heritage or culturally significant artefacts, such as graves, are found during the construction, construction must stop and the National Heritage Council of Namibia immediately notified.

3.2 Bio-Physical Environment

3.2.1 Air Quality

Air quality in the project area and surroundings can be characterised as comparatively good as it is largely undisturbed communal land, with the surrounding use consisting of another green solar energy renewable facility and substation. Any construction activity will result in fugitive dust, which can be both a nuisance and a health risk. Dust on leaves blocks stomata and lowers the plant's ability to photosynthesize. Therefore, it is not only important to view the impacts of dust on the human population within the confines of the construction area and region but also on the sensitive flora and faunal ecosystems that surround the area. Dust may be generated by a variety of activities on site, but given the existing background dust levels, the increase resulting from this activity will be negligible under normal circumstances or when considered in combination with the other activities.

3.2.2 Climate

The Central Namib is composed primarily of flat, gently sloping plains with few topographic features. This results in steady gradients that affect rainfall, fog, humidity, temperature, and wind patterns between the coast and the interior.

The Namib has no distinct seasons, and temperatures and humidity do not vary greatly over the course of a year. The Namib Desert receives an average annual rainfall of 5 millimeters in the west and 85 millimeters in the east. A wet year with more than 100mm of precipitation (maximum 115mm) is extremely rare near the coast, and only occurred in 1934, 1976, and 1978. In the western Namib, fog is more frequent and predictable than rainfall and can extend up to 110 km inland. In this arid environment, coastal fog provides life-sustaining moisture to a wide variety of fauna and flora.

There is a steady increase in potential evaporation from the coast inland, which exceeds precipitation by 10 to 60 times. The Central Namib experiences winds exceeding 2 m/s 70 - 80 percent of the time, and at any time of the day. The highest average annual wind speeds are recorded between 12h00 and 20h00. Berg wind conditions occur annually when low winter temperatures inland create continental low pressure systems. The hot, desiccating winds may prevent rehabilitation of disturbed surfaces and may cause sandblasting hazards.

From the coast (15° C) to the escarpment (22° C), the average annual air temperature rises without significant seasonal variation. Trekkopje/Arandis area is a hot, dry region with daytime

temperatures reaching up to 50°C and nighttime temperatures as low as 0°C. As a result of the site's proximity to the coast, frost rarely occurs. During the day, sun shines for 84 percent of the time in the interior, while it shines for 47 percent in the coast (Turgis, 2010).

3.2.3 Topography, Geology and Hydrogeology

Underlying the Trekkopje area is a thick sequence of schist that is almost 10,000 m thick and has been metamorphosed heavily. As the valley opens up, the landscape is dominated by the typical sediments of the Namib Desert that form a thin cover over the underlying rocks.

Located below the prominent escarpment that divides the Erongo coastal zone from the interior highlands, the Trekkopje area lies on a flat coastal plain. The plain dips gently towards the coast. The area is essentially flat and the plains are dissected by numerous dry washes, draining towards the coast. The Swakop River is fed by ephemeral (dry) rivers south of Trekkopje. There are predominantly mineral soils (aridisols) in the Namib.

The soil at Trekkopje consists of a variety of particles ranging in size from fine sand to coarse calcareous minerals. In soils close to the ocean, salt crusts are common, and water accumulates repeatedly, forming salt layers. As deserts experience high evaporation rates, water is kept close to the surface and therefore prone to evaporation. Trekkopje is a salty area that has built up after water evaporated, leaving behind minerals.

It is only during and immediately after heavy rainfall that surface water is present on site. Rainfall in the catchment area generally leads to short-lived runoff. Several shallow, sandy, ephemeral and dry riverbeds are present in the project area as evidence of runoff. The drainage in the local area originates in the Spitzkoppe area, which, along with the low rainfall in the region, reduces the possibility of substantial groundwater resources. Groundwater levels range from 10 to 25 meters deep, and groundwater flows westward (Turgis, 2010).

3.2.4 Flora of study Area

The area of interest falls within the Namib Desert Biome (Mendelsohn, Javis, Roberts, & Robertson, 2002). All endemic plant species found within the area are considered to be drought tolerant, drought resistant or succulent. Short lived annuals, which occur after local rainfalls and floods, provide a vital source of food for game grazing within the Namib plains. The area is also sparsely vegetated and dominated by Acacia thornveld trees at some places. Other trees; *tamarix, prosopis, euclea* and *salvadora* are sparsely disseminated within the area (SSC, 2024).

3.2.5 Fauna of study Area

Reptile, mammal, and bird species diversity is abundant along the northwest escarpment and ecotone areas, including the Trekkopje area. Deserts are often incorrectly believed to be "lifeless" due to their extremely harsh and marginal landscapes. There are fewer mammals in deserts than reptiles and arthropods due to a variety of reasons, but mainly due to the lack of water. Mammals are typically associated with significant life, but this does not mean diversity is low, but rather unique. In the general/immediate Trekkopje area, 63 species of reptiles, 6 amphibians, 52 mammals, and 126 bird species are estimated to exist, of which a high proportion are endemic.

From an environmental point of view, the Trekkopje area is fortunately less unique and diverse than other areas within the general location (e.g. lichen fields, rocky outcrops, and significant ephemeral drainage lines).

The footprint of the proposed solar plant will be relatively small and thus only have localised negative implications on the environmental and associated fauna. The associated infrastructure would have a similar effect. The overall impact on the local fauna (e.g. reptiles, amphibians, mammal & birds) and associated habitat destruction would be relatively small. Good planning prior to construction and operation (including associated infrastructure development) and access route(s) development as well as adhering to proposed mitigation measures would minimise the overall effect on the local fauna in the Trekkopje area (Cunningham, 2006).

3.3 Surrounding Land Use

The project site is situated on farmland, which in turn is surrounded by other farmlands. Most private farms and conservancies in the area offer protection to wildlife which then becomes an attraction to tourists and trophy hunters, in turn providing farm owners with alternate livelihoods as well as sources of income from game farming, hunting and ecotourism.

3.4 Physical Environment

The infrastructure needs of the proposed project can be categorised into two broad classifications namely:

- Basic infrastructure that includes electricity and roads.
- Environmental infrastructure that consists of water supply, sewage and drainage systems, and solid waste management.

The service infrastructure such as water, sewer, drainage, electricity and roads will be designed by registered professional engineers to integrate with the existing NamPower infrastructure. These will be carried out in consultation with NamPower, Erongo Regional Council and other relevant authorities.

The existing access road to the site will be upgraded to support ease of movement to the PV power plant. Internal roads of 4m will also be constructed and will connect with the main building and the access gate. The fence will be constructed enclosing the complete plant with an access gate. The internal road network will be designed and the construction thereof supervised by professional engineers as part of the service infrastructure.

4. PROJECT DESCRIPTION

4.1 Proposed Infrastructure

As previously outlined in Section 1.1, the proposed project involves the construction and operation of a renewable solar energy facility and battery energy storage system in the Trekkopje area of Erongo Region.

The key components of the proposed infrastructure are described below:

- Solar Photovoltaic ("PV") Module Array to produce up to 300MWp of installed capacity;
- The proposed facility will require numerous linked cells placed behind a protective glass sheet to form a module;
- The modules will be mounted on Single Array Trackers, with backtracking.
- Multiple PV modules will be electrically connected together to form the Solar PV Arrays;
- The Energy Output from the PV arrays will be collected and delivered to the Inverter Stations;
- From the Inverter Stations, the commercial energy will be collected by 33 kilovolts (kV) powerlines, and delivered to a Switching Station, where the voltage level will be stepped-up from 33kV (medium voltage level) to 220kV in order to connect the proposed facility to NamPower grid infrastructure via a 220kV overhead powerline.
- Battery Energy Storage System, which will make use of Lithium-Ion chemistries;
- The BESS containers will be centralised in one area;
- Temporary and Permanent Laydown Areas, Construction Compound (CC) Areas, and Access Roads;
- It is proposed that the temporary laydown area and the Construction Compound areas be used as the BESS footprint, post-construction phase.

See Table 4 below for the detailed description of the facility and Figure 3 for the schematic representation of the Solar Energy Facility and Battery Energy Storage System.

In order to tie-in the PV plant into the NamPower network as proposed above, the generation license holder would need to apply and enter into an agreement with NamPower Transmission section.

The complete PV power plant will be earthed as per local regulations. An earth grid will be laid earthing all structures within the plant to guarantee safe step and touch potentials. A lightning study will be conducted and lightning protection arrangements will be installed to comply with the local and specified regulations.

All civil works will be SANS compliant. The buildings and the foundations of the inverter stations will be reinforced, of adequate MPa rating and protected against vandalism. All AC cabling will be SANS compliant as per local regulations. The DC cabling will be as per equivalent international standards. All cables will be routed on their most efficient way finding the optimum between their lengths and the necessary trenching works resulting in a reduced cost and reduced environmental impact. All cables will be laid in backfilled trenches as per SANS regulations. An access road will be constructed giving access to the PV power plant. Internal roads of up to 15km will be constructed at up to 15m wide during the construction phase, and will be rehabilitated to 8m wide during the operational phase, they will connect all MVS's with the main building and the access gate. A fence will be constructed enclosing the complete plant with an access gate as per the proponent's Requirements.

Table 4: Detailed Description of the Facility

Facility's Installed Capacity	up to 300 MWp
Facility's Footprint	up to 1 000 hectares
Technology	Solar Photovoltaic
PV Models Nominal Power	550 – 600Wp
PV Module Mounting Structure	Include Trackers Single Array, with Backtracking
Number of Trackers	up to 900 units
Tracker Spacing	Up to 7 meters
Number of PV Modules	Up to 550 000 units
PV Modules Footprint	Up to 650 hectares
Number of Inverter Stations	Up to 300 units
Central Inverters Nominal Power	2.5 MWac
Medium Voltage	33kV
Length of MV Powerlines between Inverter Stations and Swithcing Station	Up to 3 km
Switching Station Transformation	220/33kV
Installed Transformer	Up to 350 MVA
Switching Station Footprint	Up to 20 hectares, which will include an office building, a parking area, and a permanent laydown area

Earmarked Point of Connection ("PoC")	Loop-in-Loop-out (LILO) on a 220kV Khan – Trekkopje 1 Line
Operation and Maintenance, and Auxiliary Building	up to 12 hectares
Construction Compound Area	up to 9 hectares, which will be converted to BESS Area post construction
BESS Technology	Lithium-Ion chemistries
BESS Capacity	up to 300MW
BESS Footprint	up to 9 hectares
Length of Internal Acess Roads	Up to 15km constructed at up to 15m wide (construction phase), rehabilitated to 8m wide (operational phase)

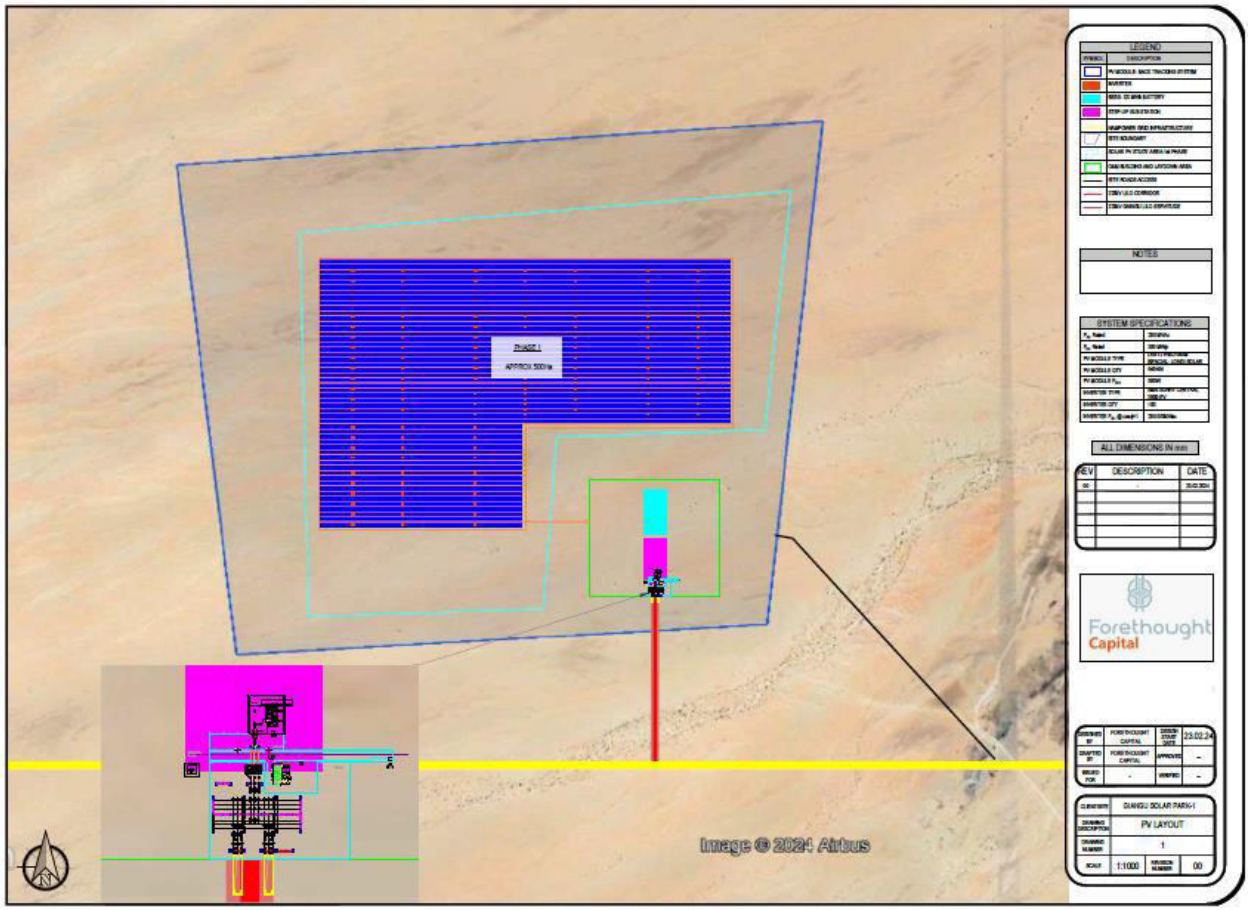

Figure 3 Solar Energy Facility and Battery Energy Storage System

4.2 Decision Factors

The following factors served as informants and were considered when preparing the layout designs for the proposed development:

- Optimum solar radiation levels.
- Topography.
- Character of the general area.
- Environmental sensitivity
- Proximity to supporting infrastructure.

4.3 No - Go Alternative

The no-go alternative would essentially entail maintaining the current situation, whereby sufficient local power generation, from a regional and national perspective, remains a challenge. The country will continue to be reliant on exports from other countries. In addition, no construction or operational jobs that come with the envisaged project will be created.

5. PUBLIC PARTICIPATION PROCESS

5.1 Public Consultation Process Phase 1

In terms of Section 21 of the EIA Regulations a call for public consultation with all I&APs during the EIA process is required. This entails consultation with members of the public and providing them an opportunity to comment on the proposed project. The Public Consultation Process does not only incorporate the requirements of Namibia's legislation, but also takes account of national and international best practises. Please see Table 5 below for the activities undertaken as part of the public participation process.

Table 5: Table of Public Consultation Activities

ACTIVITY	REMARKS
Placement of site notices/poster at Project Location	See **Annexure A**
Placing advertisements in two newspapers for two consecutive weeks, namely Confidente and Windhoek Observer	See **Annexure B**
Written notice to Interested and Affected Parties via Email	See **Annexure D**
Public meeting at Arandis Community Hall	04 April 2024

A public meeting was held on 04 April 2024 at Arandis Community Hall. The comment period of the initial public participation process commenced on 28 March 2024 and ended on 11 April 2024.

5.2 Public Consultation Process Phase 2

The second phase of the Public Consultation Process involved the lodging of the Draft Environmental Scoping Report (DESR) to all registered I&AP for comment. Registered and potential I&APs were informed of the availability of the DESR for public comment. I&APs were given time until 16 July 2024 to submit comments or raise any issues or concerns they may have with regard to the proposed project.

6. ASSSESSMENT METHODOLGY

Impact assessments depend on the nature and magnitude of the proposed activity, as well as the type of environmental control envisaged for the particular project. Given the nature of the proposed activity, i.e., a construction project, the identification and assessment of the potential impacts will be based on the type and scale of the various activities associated with the project.

Assessment of the predicted significance of impacts for a proposed development is by its nature, inherently uncertain. To deal with such uncertainty in a uniform manner, standardised and internationally recognised methodologies have been developed. One such accepted methodology is applied in this study to assess the significance of the potential environmental impacts of the proposed development, outlined as follows in Table 6.

Table 6: Impact Assessment Criteria

CRITERIA	CATEGORY
Impact	Description of the expected impact
Nature Describe type of effect	**Positive**: The activity will have a social / economical / environmental benefit. **Neutral**: The activity will have no effect **Negative**: The activity will have a social / economical / environmental harmful effect
Extent Describe the scale of the impact	**Site Specific:** Expanding only as far as the activity itself (onsite) **Small:** restricted to the site's immediate environment within 1 km of the site (limited) **Medium:** Within 5 km of the site (local) **Large:** Beyond 5 km of the site (regional)
Duration	**Temporary:** < 1 year (not including construction) **Short-term:** 1 – 5 years

CRITERIA	CATEGORY
Predicts the lifetime of the impact.	**Medium term:** 5 – 15 years **Long-term:** >15 years (Impact will stop after the operational or running life of the activity, either due to natural course or by human interference) **Permanent:** Impact will be where mitigation or moderation by natural course or by human interference will not occur in a particular means or in a particular time period that the impact can be considered temporary
Intensity Describe the magnitude (scale/size) of the Impact	**Zero:** Social and/or natural functions and/ or processes remain unaltered **Very low:** Affects the environment in such a way that natural and/or social functions/processes are not affected **Low:** Natural and/or social functions/processes are slightly altered **Medium:** Natural and/or social functions/processes are notably altered in a modified way **High:** Natural and/or social functions/processes are severely altered and may temporarily or permanently cease
Probability of occurrence Describe the probability of the Impact actually occurring	**Improbable:** Not at all likely **Probable:** Distinctive possibility **Highly probable:** Most likely to happen **Definite:** Impact will occur regardless of any prevention measures
Degree of Confidence in predictions State the degree of confidence in predictions based on availability of information and specialist knowledge	**Unsure/Low:** Little confidence regarding information available (<40%) **Probable/Med:** Moderate confidence regarding information available (40-80%) **Definite/High:** Great confidence regarding information available (>80%)
Significance Rating The impact on each component is determined by a combination of the above criteria.	**Neutral:** A potential concern which was found to have no impact when evaluated **Very low:** Impacts will be site specific and temporary with no mitigation necessary. **Low:** The impacts will have a minor influence on the proposed development and/or environment. These impacts require some thought to adjustment of the project design where achievable, or alternative mitigation measures **Medium:** Impacts will be experienced in the local and surrounding areas for the life span of the development and may result in long term changes. The impact can be lessened or improved by an amendment in the project design or implementation of effective mitigation measures. **High:** Impacts have a high magnitude and will be experienced regionally for at least the life span of the development, or will be irreversible. The impacts could have the no-go proposition on

CRITERIA	CATEGORY
	portions of the development in spite of any mitigation measures that could be implemented.

*NOTE: Where applicable, the magnitude of the impact has to be related to the relevant standard (threshold value specified and source referenced). The magnitude of impact is based on specialist knowledge of that particular field.

For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) are described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The decision as to which combination of alternatives and mitigation measures to apply lies with the proponent, and their acceptance and approval ultimately with the relevant environmental authority.

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. Such significance is also informed by the context of the impact, i.e. the character and identity of the receptor of the impact.

7. MITIGATION HIERACHY

The mitigation hierarchy is a widely used tool that guides users towards limiting as far as possible the negative impacts on biodiversity from development projects. It emphasises best-practice of avoiding and minimising any negative impacts, and then restoring sites no longer used by a project, before finally considering offsetting residual impacts.

Following the hierarchy is crucial for all development projects aiming to achieve no overall negative impact on biodiversity or on balance, a net gain – also referred to as no net loss and the net positive approach, respectively. It is based on a series of essential, sequential – but iterative – steps taken throughout the project's life cycle in order to limit any negative impacts on biodiversity.

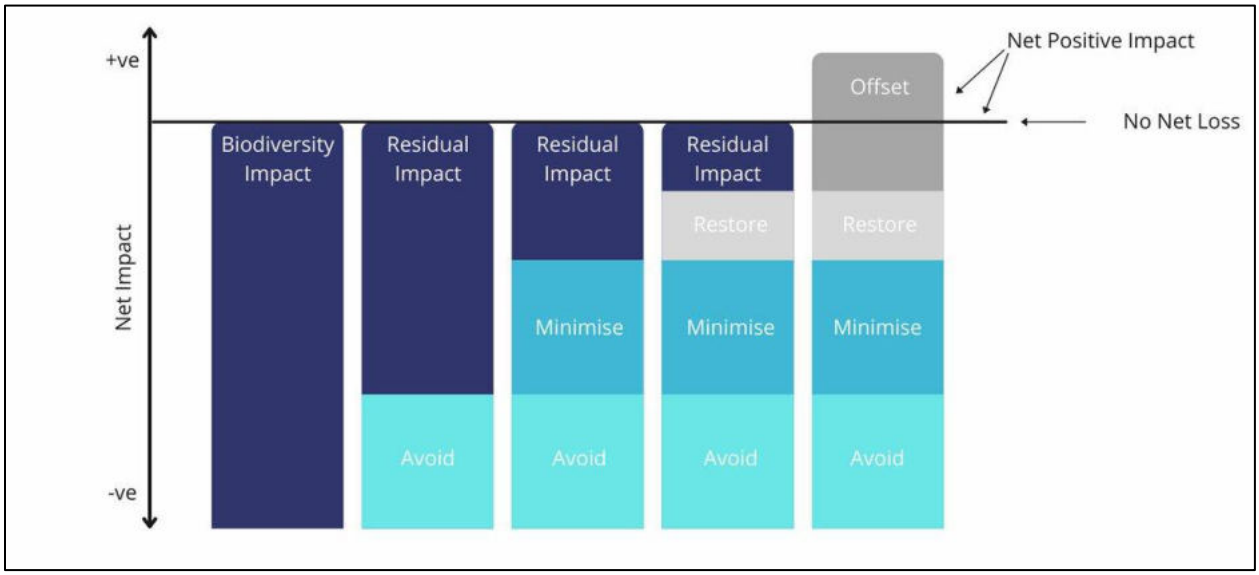

Figure 4: Mitigation Hierarchy

Sequential steps of the mitigation hierarchy

1. Avoidance: the first step of the mitigation hierarchy comprises measures taken to avoid creating impacts from the outset, such as careful spatial placement of infrastructure, or timing construction sensitively to avoid or disturbance. Examples include the placement of roads outside of rare habitats or key species' breeding grounds, or timing of seismic operations when

aggregations of whales are not present. Avoidance is often the easiest, cheapest and most effective way of reducing potential negative impacts, but it requires biodiversity to be considered in the early stages of a project.

2. Minimisation: these are measures taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided. Effective minimisation can eliminate some negative impacts, such as measures to reduce noise and pollution, designing powerlines to reduce the likelihood of bird electrocutions, or building wildlife crossings on roads.

3. Rehabilitation/restoration: The aim of this step is to improve degraded or removed ecosystems following exposure to impacts that cannot be completely avoided or minimised. Restoration tries to return an area to the original ecosystem that was present before impacts, whereas rehabilitation only aims to restore basic ecological functions and/or ecosystem services – such as through planting trees to stabilise bare soil. Rehabilitation and restoration are frequently needed towards the end of a project's life cycle but may be possible in some areas during operation.

Collectively, avoidance, minimisation and rehabilitation/restoration serve to reduce, as far as possible, the residual impacts that a project has on biodiversity. Typically, however, even after their effective application, additional steps will be required to achieve no overall negative impact or a net gain for biodiversity.

4. Offset: offsetting aims to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy. Biodiversity offsets are of two main types: 'restoration offsets' which aim to rehabilitate or restore degraded habitat, and 'averted loss offsets' which aim to reduce or stop biodiversity loss in areas where this is predicted. Offsets are often complex and expensive, so attention to earlier steps in the mitigation hierarchy is usually preferable.

Supporting Conservation Actions: measures taken which have positive – but difficult to quantify – effects on biodiversity. These qualitative outcomes do not fit easily into the mitigation hierarchy, but may provide crucial support to mitigation actions. For example, awareness activities may encourage changes in government policy that are necessary for implementation of novel mitigation, research on threatened species may be essential to designing effective minimisation measures, or capacity building might be necessary for local stakeholders to engage with biodiversity offset implementation

8. POTENTIAL IMPACTS

This Chapter describes the potential impacts on the biophysical and socio-economic environments, which may occur due to the proposed activities. These include potential impacts, which may arise during the planning and design phase, potential construction related impacts (i.e., short to medium term) as well as the operational impacts of the proposed development (i.e., long-term impacts).

The assessment of potential impacts will help to inform and confirm the selection of the preferred project plan and design to be submitted to MEFT: DEA for consideration. In turn, MEFT: DEA's decision on the environmental acceptability of the proposed project and the setting of conditions of authorisation (should the project be authorised) will be informed by this chapter, amongst other information contained in this Report.

The baseline and potential impacts that could result from the proposed development are described and assessed with mitigation measures recommended. Finally, comment is provided on the potential cumulative impacts which could result should this development, and others like it in the area, be approved.

8.1 Planning and Design Phase Impacts

During the planning and design phase consideration is given to aspects such as surface and groundwater; land use; fauna and flora; existing infrastructure; traffic; safety and security; visual and sense of place impacts.

8.1.1 Surface and Groundwater

Infrastructure development has the potential to put the surface and ground water resources in the area at risk of pollution. This is likely to happen in the absence of a well designed and constructed storm water drainage infrastructure. Poorly constructed and maintained service infrastructure in general may also lead to seepage of waste water into nearby waterways and water bodies. Uncontrolled solid waste management is another potential pollutant of the surface and ground water.

8.1.2 Land Use Change

The portion earmarked for the construction of the solar power plant is relatively undeveloped with a low cover of vegetation. Solar power plants require a large piece of land for setting up the modules and the related equipment such as inverters, this results in the land clearance and

disturbance which may result in species death and habitat loss, but also exacerbates other threatening processes, particularly in fragmented landscapes. The length of time needed for the land to recover from the effects of the development after decommissioning may also be a factor in determining the significance of impact on soil fertility for example. The type of support structures for the panels will have limited effect on the soil fertility as they are directly sunk into the ground. The Orano Mine and the existing Trekkopje Solar Plant are found between 8-10 kms southwest of the project site, therefore the proposed development ties in well with the existing land use.

8.1.3 Fauna and Flora (Biodiversity)

Construction activities could result in the alteration of the site's habitat and thus potentially disturb existing habitats (flora, fauna, and avifauna) and result in the displacement of exclusion of species particularly threatened, endemic, or endangered species which may be present within the project site and immediate surroundings.

The general area is sparsely populated with flora, and not much vegetation visible. The existing vegetation is more characteristic and typical of a desert environment but the proposed area is open with no vegetation visible. The overall impact on the local fauna and flora and associated habitat would be relatively small. While no obvious large animals could be observed on the development site, it could be expected that the area may also support species of smaller vertebrates such as reptiles, amphibians, mammals and birds.

Other potential impacts on the biodiversity at the site can emanate from improper management of the site, which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, disposal of hazardous waste to land, etc.).

A transmission line will be constructed from the solar power plant to feed into the NamPower grid. This is expected to have minimum impacts on the flora and fauna along the route to be used for this purpose, as the development is planned to follow the same route as the existing NamPower transmission lines in the area. This will minimize habitat fragmentation along this route corridors.

8.1.4 Existing Service Infrastructure Impacts

The engineering services such as water pipelines, access roads and electricity supply for the development will be designed and constructed to connect to and fully integrate with the existing supply networks in the vicinity. Other crucial infrastructures such as sewer reticulation and storm water management systems will also form part of the engineering designs of the project. The proponent will appoint the engineering company that will design and supervise the installation of the engineering services. It is important to note that the country in general

is constrained and faced with a crisis in terms of water and electricity availability; and an increased demand for these amenities will further add to the predicament.

The proposed development will make use of added infrastructure specifically regarding electricity and water. This additional demand is expected to be fairly Medium-Low. It is recommended that electricity demand for the operations be met with the same technology utilised in generation. The plant operations are not water intensive; however, a negligible amount of water may be required to wash the panels, estimated at only 6 – 24 m^3 per annum.

By applying a series of the mitigation measures as proposed for the development it is believed that any potential impacts can be significantly reduced. The water volumes and electrical demands for the project is not expected to have a significant negative impact on the infrastructure. It is critical that any service infrastructure be designed, and construction supervised by, a qualified and registered engineering professional.

8.1.5 Traffic Impacts

There will be movement of traffic during the operational phase of the project. Due to the nature of the development and the land use, vehicles that will frequent the area would mostly consist of vehicles used by workforce, and is not expected to be significant.

8.1.6 Visual and Sense of Place Impacts

The proposed site which is intended for the photovoltaic power plant development is currently vacant and undeveloped communal, which is away from the eyesight of the nearby road users and tourists in the area.

Site preparation activities will include the installation of arrays and the various project components, including transmission cables, access roads and internal road network, storage buildings, etc. These activities will result in land clearance, ground levelling, excavations, and grading. From the start of construction activities, visual changes will occur from the modified ground surface and the presence of construction equipment and machinery in the area (i.e. excavators, trucks, front end loaders, compactors, and others).

The nearby road users and individuals who frequent the area on a regular basis may experience a change in their sense of place of the area. The extent of this disturbance will depend on how high they valued the initial aesthetic quality of the site. Therefore, the aesthetics quality of the new structures has to be pleasing and designed to blend in with the natural surrounds.

8.2 Construction Phase Impacts

During the construction phase the following potential impacts have been identified: pressure on the existing infrastructure; surface and ground water; health, safety and security impacts; air quality; noise, traffic; solid waste management; hazardous substances; and social impact.

8.2.1 Pressure on existing infrastructure

During the construction phase there will be an additional demand for basic bulk services such as water, electricity and sewer. The services will be used for both human consumption and for construction purposes. These impacts will however only be limited to the construction phase and will thus have minimal short-term impact. The risk of wastage and pollution may occur if no proper management actions are implemented.

8.2.2 Surface and Ground Water Impacts

Surface and ground water impacts may be encountered during the construction phase, especially if construction takes place during the rainy season. The risk of contaminating such water sources can be increased by accidental spillage of oils and fuels and any other equipment used during construction; chemical contamination from construction materials such as cement, paint and mechanical fluids. This risk is minimized by the fact that the construction period will be a short-term activity.

8.2.3 Health, Safety and Security Impacts

Due to a high demand of construction workers during this phase of the project, the deployment of a temporary construction workforce to the area may be necessary. These types of projects, where construction workers have the opportunity to interact with the local community, create a significant risk for the development of social conditions and behaviors that contribute to the spread of HIV, AIDS and Covid-19. The Ministry of Environment, Forestry and Tourism has initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments. Safety and security aspects are a critical part of any construction activity and high standards have to be upheld for the duration of the construction period

8.2.4 Air Quality

During the construction phase fugitive dust and exhaust gases generated have a potential impact on the air quality of the area and its surroundings. Dust is a major component of air pollution and could negatively affect the health of nearby communities if not mitigated. These are however short-term impacts. Dust is generated mainly from the following activities:

- Land clearance, excavations and stockpiles during site clearance;

- Use of heavy vehicles, machinery and equipment;
- Procurement and transport of construction materials to the site.

The release of various other particulates at the site during the construction phase and exhaust fumes from vehicles and machinery related to the construction activities are also expected. The surrounding land use in the area is undeveloped. Dust impacts are therefore expected to be site specific and should not impact any neighbouring communities.

8.2.5 Noise Impacts

An increase of ambient noise levels at the construction site is expected due to the construction activities. These noise impacts will mainly be associated with construction machinery, equipment and vehicles; concrete and mixing; and excavation for foundations. The immediate surrounding land use to the project site is undeveloped, hence noise is not expected to interfere significantly with the nearby communities.

Excessive noise pollution has a negative impact on wildlife species by reducing habitat quality, increasing stress levels, and masking other sounds. Chronic noise exposure is especially disruptive for species that rely on sound for communication or hunting. Animals that use noise for hunting, such as bats and owls, and prey species that rely on noise to detect predators may have decreased patterns of foraging, reducing growth and survivability.

8.2.6 Traffic Impacts

Traffic is expected to increase during the construction phase of the project. A number of trucks and other heavy machinery will be required to deliver, handle and position construction materials as well as to remove spoil material. Not only will the increase in traffic result in associated noise impacts, it will also impact on the vehicular traffic in the area. The use of slow-moving heavy construction trucks has the potential to cause traffic jams.

8.2.7 Solid Waste Management

The construction activities will lead to the generation of significant amounts of solid waste mainly in the form of construction building rubble. This could have a negative environmental impact if not managed well. Therefore, sufficient waste bins and skip containers should be availed to manage the solid waste. All solid waste should be disposed of at the designated landfill site in the area.

8.2.8 Storage and Utilisation of Hazardous Substances

Hazardous substances are regarded by the Hazardous Substance Ordinance (No. 14 of 1974) as those substances which may cause injury or ill-health to or death of human beings by reason of

their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure in certain circumstances. It covers manufacture, sale, use, disposal and dumping as well as import and export. During the construction period, the use and storage of these types of hazardous substances, such as shutter oil, curing compounds, types of solvents, primers and adhesives and diesel, on-site, could have negative impact on the surrounding environment, if these substances spill and enter the environment.

8.2.9 Social Impacts

The project will result in long-term positive impacts as far as the social welfare of the nearby communities is concerned. There is potential of an influx of migrant workers into the project area. This would boost the local economic development of the area as a result of an increase in consumers of goods, and spending power. The local communities will benefit through preferential recruitment of local labour and procurement as far as possible.

8.3 Operational Phase Impacts

The operational phase impacts that have been identified are: environmental monitoring and evaluation; surface and ground water; air quality; noise; impact on human health; waste management; and social.

8.3.1 Environmental Monitoring and Evaluation

The Environmental Commissioner requires regular environmental monitoring and evaluations on environmental performance to be conducted on approved developments, as well as the setting and monitoring of targets for improvement. As part of this exercise bi-annual reports have to be submitted to the Office of the Environmental Commissioner for the duration of the environmental clearance certificate.

8.3.2 Surface and Ground Water Impacts

Surface and ground water impacts may be encountered during the operational phase, especially if the infrastructure is poorly constructed and maintained. The provision of properly designed and constructed bulk and support services, which are regularly monitored and maintained, to the development will minimise the potential pollution of water sources.

8.3.3 Air Quality

The air quality in the area is considered to be good; although impacts of dust and emissions may result from vehicles frequenting the site. These are however expected to have insignificant impacts when properly managed. The plant operation itself is not expected to generate dust or

emissions as compared to the fossil fuel-based electricity generation plants, which emit greenhouse gases and other noxious gases. The plant needs to be controlled and managed as required by the Public Health Act (Act No. 36 of 1919) and Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).

8.3.4 Noise Impacts

The sound emissions during the operational phase will be those caused by the inverters and transformers necessary for the operation of the solar plant. Sound emissions will only occur during daylight hours because the two sources emit sound while operating. The inverters are located inside cabins consisting of prefabricated concrete boxes. The boxes will be ventilated by aeration grilles. The level perceived at the receptor in this case (considering that the emissions mostly take place during the day) are less than 30dBA and can therefore be considered completely negligible (30 dB is the measurable sound level inside a silent room). The noise level by the vehicle movement is also negligible as it is not above the general noise level of normal traffic in the area.

By applying a series of the mitigation measures as proposed for general developments of this nature it is envisaged that any potential nuisance can be significantly reduced.

8.3.5 Impact on Human Health

Concerns about the effect of solar power plants on human health include electromagnetic radiation from the high voltage equipment used in the operations, for example the transformers and transmission lines. Others include the glare effect from the solar panels, and impacts on aesthetics and recreational opportunities.

In terms of the transformer cabins, staff must not remain within a certain distance from an electromagnetic source for more than four hours, in this case a distance of 2.62 m. Given that no prolonged human presence is anticipated in the area, the photovoltaic plant will not have a significant impact on the nearest receptors. As far as the glare effect is concerned, the major apprehension relates to air traffic controllers and pilots arriving at an airport on final approach; while the solar plant is situated far from any major airport, solar panels have been designed to absorb light rather than reflect it, in order to maximize electricity generation. The project area is also a safe distance away from farmhouses and community residences, and would therefore not interfere significantly on the inhabitants of the area.

8.3.6 Waste Management

Waste generated is likely to include empty storage containers and packaging, general litter, by-products of any vehicle maintenance (including petroleum products, coolants, degreasing

agents, sediment, rubber particles, detergents), and other hazardous materials. All waste should be disposed of in line with the national waste management directives.

8.3.7 Social Impact

The operation of the photovoltaic plant will have a positive impact on the socio-economic status of the local communities. This is due to the job opportunities that will be created both directly related to the plant operations and indirectly from supporting services; as well as the opportunities for skills development and on-site training. During the construction phase the required jobs will be higher but will scale down afterwards when operations commence and fewer people are needed on a permanent basis.

There will be a team employed permanently. They will be based on site fulfilling the following tasks:

- Security
- Site clearing (e.g. cutting of grass, etc.)
- Cleaning of solar panels and other equipment
- First level of technical maintenance

Furthermore, there will be one technician and one engineer in the central office with the following tasks:

- Monitoring of system performance (24/7)
- Preventive maintenance
- Trouble shooting in emergency cases
- High level of routine maintenance

The establishment of the solar PV plant will have a positive effect on the cost of energy in the area and region at large, although the direct cost benefits will only be determined by the off-take client.

9. SUMMARY OF POTENTIAL IMPACTS

A summary of the significance of the potential impacts from the proposed project assessed above is included in Table 7. The Tables 8 – 10 provide a summary of the mitigation measures proposed for the impacts.

Table 7: Overview of the significance of the potential impacts

Impacts	Negative		Positive		No Impact
	Short Term	Long Term	Short Term	Long Term	
Planning and Design Phase					
1. Surface and ground water	X				
2. Fauna and flora	X				
3. Existing infrastructure				X	
4. Traffic	X				
5. Visual	X				
Construction Phase					
6. Pressure on existing infrastructure	X				
7. Surface and groundwater	X				
8. Health, safety and security	X				
9. Air quality	X				
10. Noise	X				
11. Traffic	X				
12. Waste management	X				
13. Hazardous substances	X				
14. Social			X		

Impacts	Negative		Positive		No Impact
	Short Term	Long Term	Short Term	Long Term	
Operational Phase					
15. Environmental monitoring and evaluation		X			
16. Surface and ground water		X			
17. Air quality		X			
18. Noise		X			
19. Impact on human health		X			
20. Waste management		X			
21. Fire and Explosion Risks		X			
22. Infrastructure				X	
23. Quality of life				X	

Table 8: Proposed mitigation measures for the planning and design phase

PLANNING AND DESIGN PHASE IMPACTS	
Impact	**Mitigation Measures**
Surface and Ground Water	• Appoint professional engineers to develop a detailed storm water management design as part of the infrastructure service provision of the development. • The service infrastructure should be designed and constructed by suitably qualified engineering professionals. • Develop and implement a preventative maintenance plan for the service infrastructure. • No dumping of waste products of any kind in or in close proximity to any water bodies. • Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment. • Wastewater should not be discharged directly into the environment. • Disposal of waste from the development should be properly managed.
Land Use	• Do not use herbicides to manage plant growth. • Introduce additional vegetation and landscaping to supplement lost vegetation. • Clearly fence off the development to prevent unauthorised / unwanted movement of people and animals into the site.
Fauna and Flora	• Consult with the regional Forestry authority, to identify protected and important indigenous species. • Apply for a tree harvesting permit from the regional Forestry authority, where relevant. • The proponent should also consider participating in an “off-set” scheme where trees are planted elsewhere in lieu of those that have been removed and cannot be transplanted. • It is recommended that the proponent engages NamPower to allow them to follow the same route for their transmission line as the existing NamPower transmission infrastructure. This will minimize habitat degradation.
Service Infrastructure	• Ensure professional design and construction of service infrastructure from qualified and registered engineers. • Ensure consultation and compliance with relevant authorities responsible for services, such as the Erongo Regional Council, NamPower and NamWater. • It is recommended that electricity demand for the operations be met with the same technology utilised in generation.

PLANNING AND DESIGN PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy demand. • Water saving mechanisms should be incorporated within the proposed development's design and plans in order to further reduce water demands. • Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water. • Train employees on the importance of water and energy savings. • Adhere to water quality guidelines in terms of The Water Resource Management Act.
Traffic	• Ensure that provision is made for good sightlines at road junctions or intersections. • Where feasible, limit the type of vehicles to use the internal roads e.g., heavy trucks. • Adhere to the local and national speed limits. • Implement traffic control measures where necessary.

Table 9: Proposed mitigation measures for the construction phase

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
Fauna and flora	• Limit clearing of vegetation to areas within the footprint of the construction site and reduce the frequency of disturbance. • Ensure sustainable vegetation removal (harvesting) from site is conducted, in order to support the natural habitats and ecosystem. This should be guided by amongst others, the Forestry harvesting permit approval for the proposed development. • Transplant removed vegetation where possible, or plant new trees in lieu of those that have been removed.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• No vegetation should be removed outside the designated project site, and no disturbance of areas outside the designated working zones is allowed. • Prevent contractors from collecting wood, veld food, etc. during the construction phase
Pressure on existing infrastructure	• Educate workforce on water saving measures. • Ensure all potable water points are metered and regularly read. • Ensure that the workforce is provided with temporary toilets during the construction phase.
Surface and Ground Water	• It is recommended that construction takes place outside of the rainy season in order to limit flooding on site and to limit the risk of ground and surface water pollution. • No dumping of waste products of any kind in or in close proximity to any drainage lines and/or water bodies. • Prevent spillages of chemicals and petroleum products (i.e. oils, lubricants, petrol and diesel). Use drip trays or linings sheets when evidence of leaks is observed on vehicles or equipment. • All fuelling, storage and chemical handling should be conducted on containment surfaces provided for this purpose. • All materials at the construction site should be properly stored. • Disposal of waste from the site should be properly managed and removed off-site for final disposal at a suitable waste disposal site. • Adequate ablution facilities should be provided for at the construction site, with adequate containment systems for these facilities. • Maintain toilets in a hygienic state and remove waste to a designated waste disposal facility. • No major servicing and maintenance of vehicles and equipment should be conducted at the site, unless adequate containment systems are provided for this purpose. Removal of oil from machinery should be conducted on these surfaces. • Environmental awareness and remedial response training of operators must be conducted on a regular basis.
Health, Safety and Security	• Construction personnel should not overnight at the site, except for security personnel. • Ensure that all construction personnel are properly trained depending on the nature of their work. • Provide for first aid kit and properly trained personnel to apply first aid when necessary.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Enforce the use of appropriate Personal Protective Equipment (PPE) for the right task or duties at all times. • A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases and Covid-19. • Provide free condoms in the workplace throughout the construction phase. • Facilitate access to Antiretroviral medication for construction personnel. • Restrict unauthorized access to the site and implement access control measures. • Clearly demarcate the construction site boundaries along with signage of no unauthorized access. • Demarcate and barricade any areas which may pose a safety risk (including hazardous substances, deep trenches, excavations etc.) and no-go areas on site. • Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures. • The contractor(s) must comply with all applicable occupational health and safety requirements. • Sufficient lighting within and around the construction location should be erected, when visibility becomes an issue.
Air quality	• All loose material should be kept on site for the shortest possible time. • It is recommended that dust suppressants such as water or Dustex be applied to all the construction clearing activities to minimise dust. • Construction vehicles to only use designated roads. • Avoid excavation, handling and transport of materials which may generate dust under high wind conditions. • During high wind conditions the contractor may make the decision (where necessary) to cease works until the wind has calmed down. • Cover any stockpiles with relevant cover material to minimise windblown dust. • Ensure construction vehicles are well maintained to prevent excessive emission of smoke. • Encourage reduction of engine idling when vehicles and machinery are not in use.
Noise	• No amplified music should be allowed on site. • Inform neighbouring communities of construction activities to commence and provide for continuous communication between them and contractor.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Limit construction times to acceptable daylight hours. • Install technology such as silencers on construction machinery. • Do not allow the use of horns/hooters as a general communication tool, but use it only where necessary as a safety measure. • Provide protective equipment such as ear muffs and ear plugs to workers.
Traffic	• Limit and control the number of access points to the site. • Ensure that road junctions have good sightlines. • Construction vehicles' need to be in a road worthy condition and maintained throughout the construction phase. • Construction vehicles and machinery must be tagged with reflective signs or tapes to maximise visibility and avoid accidents • Transport the materials in the least number of trips as possible. • Adhere to the speed limit. • Implement traffic control measures where necessary. • Minimise the movement of heavy vehicles during peak time. • Construction vehicles should not be allowed to obstruct the road, hence no stopping in the road, wholly or partially, but rather pull off the road or park on the roadside.
Waste Management	• Sufficient number of waste bins should be placed around the site for the soft refuse. • Sufficient number of skip containers for the heavy waste and rubble should be provided for around the site. • The waste containers should be able to be closed to prevent birds and other animals from scavenging. • The Contractor shall institute a waste control and removal system for the site. • Solid waste must be disposed of at an appropriate local waste disposal facility, in consultation with the local authority. • Separate hazardous wastes from general waste, clearly marked, and stored in appropriate containers. The protocols associated with handling of such hazardous wastes shall be known by all relevant staff members.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Regular inspection and housekeeping procedure monitoring should be maintained at all times.
Hazardous Substances	• All chemicals and other hazardous substances must be stored and maintained in accordance with the Hazardous Substances Ordinance (No. 14 of 1974), with all relevant licences and permits to be obtained where applicable. • Given the potential harm to human health during handling and use of any of hazardous substances it is essential that all staff be trained with regards to the proper handling of these substances as well as First Aid in the case of spillage or intoxication. • Storage areas for all substances should be bunded and capable to hold 120% of the total volume of a given substance stored on site.
Social	• Ensure locals enjoy priority in terms of job opportunities, to the extent possible, for skills that are available locally. • Ensure local procurement where commodities are available locally.

Table 10: Proposed mitigation measures for the operational phase

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Environmental monitoring and Evaluation	• An Environmental Practitioner should monitor the implementation of the EMP, and recommend any changes to this document when necessary. • The Environmental Practitioner should inspect the site on a regular basis (preferably monthly or bi-monthly). • Biannual reports are to be submitted to the Environmental Commissioner.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Surface and Ground Water	• No dumping of waste products of any kind in or in close proximity to any drainage lines or water bodies. • Contaminated runoff from the various operational activities should be prevented from entering any drainage lines or water bodies. • Should it be necessary to wash equipment such as panels, wastewater should be properly managed to prevented contamination of ground or any surface water sources. • Ensure that surface water accumulating on-site are channelled and captured through a proper drainage water management system to be treated in an appropriate manner before disposal into the environment. • Wastewater should not be discharged directly into the environment. • Disposal of waste from the development should be properly managed and taken to the relevant disposal facilities. • Bi-annual monitoring of erosion especially in the vicinity of PV arrays should be conducted regularly to ensure erosion sites can be identified and remedied early enough. • Ensure that oil/ fuel spillages from vehicles and machinery are minimized and that where these occur, that they are appropriately dealt with. • Ensure regular inspections and maintenance of equipment. • All materials on the site should be properly stored. • Disposal of waste from the site should be properly managed and taken to an approved landfill site. • Ablution facilities at the site should not allow any possible contact with ground water resources. These facilities should be regularly serviced. • Site equipment should be refueled in paved areas with a collection point in case of any spillage. • The service infrastructure should be designed and constructed by suitably qualified engineering professionals. • Develop and implement a preventative maintenance plan for the service infrastructure.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Visual and Sense of Place	• It is recommended that more 'green' technologies be implemented within the architectural designs and building materials of the development where possible in order to minimise the visual prominence of such a development within the more natural surrounding landscape. • Natural colours and building materials such as wood and stone should be incorporated.
Noise	• Limit the types of activities that generate excessive noise. • All areas where noise levels are above 85 dB should be managed and controlled in accordance with the relevant guidelines. • Continuous monitoring of noise levels should be conducted to make sure the noise levels do not exceed acceptable limits. • Maintain equipment used during the operation and keep them in a good state such that they do not emit excessive noise. • No activity having a potential noise impact should be allowed after 18:00 if possible.
Impact on human health	• Prolonged exposure in the vicinity of transformers should not exceed 1 hour at a distance of not less than 2.62 m. • The prescribed servitudes to be observed.
Air quality	• The plant operation itself is not expected to give off dust or emissions as compared to the fossil fuel-based electricity generation plants, which emit greenhouse gases and other noxious gases. • Use appropriate dust suppression measures when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Waste management	• The proponent shall put in place a waste management plan aimed at minimizing the production of all wastes. • The area will be kept free of waste, except in designated waste storage areas. Any wastes distributed by winds will be regularly cleaned up. • A sufficient number of waste bins should be placed around the site for the soft refuse. • A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site. • Solid waste will be collected and disposed of at an appropriate local waste disposal site. • Place priority on waste reduction, waste reuse and waste recycling, in that order.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Fire and Explosion Risks	• Substations will have lighting protection to reduce fires caused by lighting by employing the latest technology. • In addition, the plant will deploy robust integrated forest fire management systems to prevent and manage fire outbreak and contain the spread thereof to neighbouring farms. • Plant to be monitored with a drone 8-10 times a day. Drone will see if solar panels are tempered with, removed, or broken, but also will see hotspots (infrared camera). That way fires (if any) can be detected at early stage. • Emergency response procedures should be in place so as to alert the employees on how to react to fire and explosions incidents. • Establish and maintain designated smoking areas at the site. • Avoid smoking in areas that are close to fire hazard areas and environments, such as areas of dry vegetation. • Ensure that sufficient fire-fighting equipment is available at the development. Firefighting equipment is to be suitably maintained. • Supply appropriate signage and relevant emergency contact details at the development and displayed outside the site building. • Do not allow informal cooking or warming fires at the development. • Appoint a fire officer who shall be responsible for coordinating emergency response in the event of a fire according to the Emergency Response Plan. • It is highly recommended that electrical wiring of the development be installed and approved by a qualified engineering professionals who will issue a Certificate of Compliance.
Quality of life	• Ensure locals enjoy priority in terms of job opportunities, for skills that are available locally, to the extent possible. • Ensure local procurement where commodities are available locally.
Infrastructure development	• Ensure that the infrastructure is designed and supervised by suitably qualified engineering professionals.

9.1 Decommissioning

In general, the impacts associated with this phase will be similar to that of the construction phase. The Environmental Management Plan for this phase must be reviewed at the time of decommissioning to cater for changes made to the development. At the end of its useful life, the plant will be completely dismantled so as to restore the area to *ante operam* conditions. Each production unit will be uninstalled; therefore, the following waste will be produced:

- Panels: aluminium, glass, cells and polymer waste;
- Electricity lines: copper and metallic elements;
- Pipes;
- Supporting structures: metallic elements;

Unless these materials are disposed of properly, they can cause irreversible damage to the environment (surface and underground water, vegetation and animals), as well as to human health due to pollution of aquifers for example, and the deterioration of environmental conditions.

A full decommissioning plan should be developed within the first 24 months of operation; however, the following management actions are recommended as a minimum:

- Reusable, recyclable and scrapable components will be selected.
- Disposal will consist of disassembling the modules and sending them to a suitable recycling platform which will carry out the following recovery work:
    - recovery of aluminium frames;
    - recovery of glass material;
    - recovery of cells;
    - decommissioning of the polymer material covering the cells.
- The electricity lines of all the systems such as lighting will be removed by carrying out only the absolute necessary excavation work.
- Copper from electricity cables and windings as well as other metallic parts will be sent to specialised centres for recovery and recycling.
- Appliances such as inverters, control panels and transformers will be disassembled and sent to specialised companies for disposal.
- Piping and electrical drawpits will be removed by excavating a set size excavation and the original situation will be restored using the excavated material.
- The exposed parts of the photovoltaic module supporting structures will be removed mechanically, whereas the foundation piles sunk into the ground will be extracted.

10. CONCLUSION AND RECOMMENDATIONS

10.1 Construction Phase Impacts

With reference to Table 9, most of the construction phase impacts were deemed to have a negative impact without mitigation. However, these were mostly short-term and can be significantly reduced with the mitigation measures proposed.

10.2 Operational Phase

During the operational phase the impacts of surface and ground water; air quality; noise; and solid waste were assessed to have a long-term negative effect without mitigation. The impacts will however be significantly reduced when the recommended mitigation measures in the scoping report and environmental management plan (EMP) are implemented.

The impacts on the quality of life of the local communities and on the infrastructure, development is deemed to be positive. This development is not only important to provide electricity to the Erongo region, but it also promotes local economic development.

10.3 Level of Confidence in Assessment

With reference to the information available at this stage, the confidence in the environmental assessment undertaken is regarded as being acceptable for decision-making, in terms of the environmental impacts and risks. The Environmental Assessment Practitioner believes that the information contained within this ESR is adequate to allow MEFT: DEA to determine the environmental viability of the proposed project.

It is acknowledged that the project details may evolve during the detailed design and construction phases. However, these are unlikely to change the overall environmental acceptability of the proposed project and any significant deviation from what was assessed in this ESR should be subject to further assessment. If this was to occur, an amendment to the Environmental Authorisation may be required in which case the prescribed process would be followed.

10.4 Mitigation Measures

With the implementation of the recommended mitigation measures in this report as well as in the EMP, the significance of the planning and design, construction and operational phase impacts is likely to be reduced to a ***Low (negative)***. It is further extremely important to include an Environmental Control Officer (ECO) on site during the construction phase of the proposed project to ensure that all the mitigation measures discussed in this report and the EMP are enforced.

It is strongly advised that the proponent appoint suitably qualified professionals to design and supervise the construction of the services and other infrastructure. It is also advised to develop and implement a preventative maintenance plan, which shall be monitored and evaluated regularly.

It is noted that where appropriate, these mitigation measures and any others identified by the EC could be enforced as Conditions of Approval in the Environmental Authorisation.

10.5 Opinion with respect to the Environmental Authorisation

Regulation 15(j) of the EMA, requires *that the EAP include an opinion as to whether the listed activity must be authorised and if the opinion is that it must be authorised, any condition that must be made in respect of that authorisation*.

Solar powered electricity generation is experiencing rapid growth. A major motivation for deploying solar power is to reduce emissions of carbon dioxide caused by traditional power generation (Turney & Fthenakis, 2011) for the same quantity of energy produced. Although the size of land required by the photovoltaic plant is usually more than fossil fuel plants, the emissions at fossil fuel plants are considerable (air, soil, noise, etc.). Emissions from solar energy are usually negligible to none. Photovoltaic power plant impacts are reversible in the short-term because after decommissioning, the area can be returned to its previous state and become available for other activities. In addition to producing clean energy the power plant can contribute to the promotion of biodiversity, by providing a refuge for plants and animals, in particular smaller animals such as invertebrates.

Another advantage of a photovoltaic power plant over the conventional power plant is that as the lifetime of the solar power plant gets longer, the land transformation per capacity does not change, even when considering the impacts on land use. All high priority impacts are in favour of solar power displacing traditional power generation while all the harmful impacts from solar power are of low priority (Turney & Fthenakis, 2011).

Based on the evidence produced during the assessment process, it is very unlikely that this project will have any significant negative impacts on the environment. It is therefore recommended that a clearance certificate be issued for the project.

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