ENVIRONMENTAL IMPACT ASSESSMENT

FOR THE FOR THE PROPOSED CONSTRUCTION AND OPERATION OF A 120 MW SOLAR PV PLANT AT GERUS FARM, OUTJO DISTRICT, OTJOZONDJUPA REGION - NAMIBIA

ENVIRONMENTAL SCOPING REPORT

FINAL

MAY 2023

Prepared by: Junior Baiano Industrial Consultants cc
Postal Address: PO Box 23537, Windhoek
Contact Person: Fredrich Nghiyolwa
Contact number: +264 (61) 219 773
Cell: +264 (0) 81 1472029
Email: juniorb200581@gmail.com

Prepared for: Gerus Solar One (Namibia) (PTY) Ltd
Postal Address: Po Box 23537, Windhoek
Contact Person: Ferdinand Nghiyolwa
Contact number: +264 (61) 259 056
Cell: +264 811 28 1980
Email: ferdi@ino-invest.com

DECLARATION

The Environmental and Social Impact Assessment for the Gerus Solar One (Namibia) (Pty) Ltd 120 MW Solar PV Plant at Gerus Farm, Outjo District, in Otjozondjupa Region was conducted by Junior Baiano Industrial Consultants cc. This was completed in line with the requirements of the Environmental Management Act, 2007 (Act No.7 of 2007) as well as applicable International Finance Corporation (IFC) Performance Standards as stated in the project Terms of Reference.

The content in this ESIA Scoping report reflects what was on the ground at the time of the assessments and is also based on the background technical studies data and information provided.

Where any party is of the view that there are changes to be made to the information and data in this document, written permission must be obtained from Junior Baiano Industrial Consultants. Junior Baiano Industrial Consultants has kept a master copy of this document to which alterations can be effected after consultation with the concerned parties.

Any report that is going to be submitted to any interested party shall be a representation of the contents in the master copy.

Signed for Junior Baiano Industrial Consultants cc

Fredrich Nghiyolwa

Project Manager/Director & Principal Environmental Consultant

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF IMAGES

EXECUTIVE SUMMARY

Junior Baiano Industrial Consultants (JBIC) cc has been engaged by **Gerus Solar One (Namibia) (Pty) Ltd** to conduct an Environmental Impact Assessment (ESIA) for the Construction and Operation of a 120 MW Merchant PV Solar Plant and Transmission Line at Gerus Farm in Outjo, Otjozondjupa Region – Namibia and to apply for an Environmental Clearance Certificate for the proposed project.

The proposed establishment triggered the application for an environmental clearance certificate as the following listed activity will be triggered by the proposed energy generation activities.

Project Area

The proposed project site is located on Farm Gerus about 34km east of Outjo Townlands, approximately. Outjo is a name derived from Otjiherero meaning small hills; the town consist of 8445 inhabitants (NSA 2013:39). Outjo town is located in the south east of Kunene region 70 km north-east of Otjiwarongo town and100 km south of Etosha National Park. According to Dieckmann 2007b, Outjo was declared as a municipal town in 1944 and it's known to be the commercial center for the surrounding farms.

Majority of the Outjo population hails from the following ethnic groups: Herero, Damara/Nama, Afrikaner, Owambo, and German and not limited to this are the Hai||om. Dieckmann 2007b reported that the major economic activities sustaining the town and Outjo District at whole are livestock, tourism, charcoal production and farming.

Energy Generation and Transmission Activities

The proposed solar farm entails the construction and operation of a 120 MW PV development, associated infrastructure and services for the provision of renewable electricity to the national power grid. The project entails the construction of facilities for -

a) The generation of electricity;
b) The transmission and supply of electricity;

It will mainly focus on the establishment of:

- PV Modules;
- Tracker structures Mount for Solar Module or PV Module;
- Administration Block;
- Storage room;
- Security Room; and
- Transmission line.

Environmental Impacts

- Generation of waste during construction and operation.
- Impacts on vegetation and biodiversity through clearing of land during construction.
- Health and safety impacts during construction and operation.
- Surface and groundwater impacts during construction.

Social and Economic Impacts

- Improved energy supply.
- Creation of much needed employment opportunities.
- Facilitation of local and national economic growth.
- Utilization of an energy source (solar) is renewable and low emission. This contrasts with conventional fossil fuels that contribute to pollution and climate change.
- Reduction in foreign energy expenditures.
- An EMP has been developed to mitigate any anticipated possible impacts of the project to the environment.

Public Participation Process

Interested and Affected Parties were notified of the project through site notices and newspaper adverts. All relevant information regarding consultation is covered in Chapter 5 of this document and attached in the Environmental Management Plan Appendix 1.

Recommendation

It is concluded that most of the impacts identified during this Environmental Assessment can be addressed through the recommended mitigation and management actions for both the construction and operation phases of the solar farm. Should the recommendations included in this report and the EMP be implemented the significance of the impacts can be reduced to reasonably acceptable standards and durations. All developments could proceed provided that general mitigation measures as set out are implemented as a minimum.

It is therefore recommended that the proposed solar farm get an approval receive Environmental Clearance, provided that the recommendations described above and the EMP are implemented.

1 INTRODUCTION

As envisioned for African nations in the African Union Continental Green Recovery Action Plan 2021-2027, Namibia is poised to combat climate change by developing a green economy that would fuel economic recovery. One of the priority areas of the recovery action plan is to support a just transition to renewable energy. In this respect, the country has ambitious aspirations to create green and blue economies, as stated under the Harambee Prosperity Plan's economic advancement pillar (Namibian Economist, 2022).

The feasibility of these plans is underscored by the abundant availability of sunlight throughout the year and proximity to billions of cubic meters of seawater and vast marine resources in the Atlantic Ocean. Namibia has the potential to capture around 10 hours of strong sunlight per day for 300 days per year. As a result, Namibia has some of the highest solar irradiance potential of any country in Africa, which is sufficient to provide power for the nation and its neighbours (WFC, 2021).

In response to the country's solar irradiance potential Gerus Solar One (Namibia) (Pty) Ltd intends to build a 120 MW PV and Transmission Line at Gerus Farm, Outjo District, in Otjozondjupa Region. The project will not only in result in improved energy supply but also in the development of the Otjozondjupa and Kunene Regions of Namibia as well as offer new opportunities in Outjo town and surrounding areas (farms).

The Environmental Management Act, 2007 (Act No.7 of 2007) and the regulations for Environmental Impact Assessment as set out in the Schedule of Government Notice No. 30 (2012) echoes the need of an Environmental Impact Assessment (EIA) for new projects (such as the proposed development) that are specified by the Act.

Non-compliance to legal obligations presents liabilities and it is in the wake of the need to attain sustainability that Gerus Solar One has opted to undertake an ESIA for its proposed solar power plant. ESIA is required to obtain an Environmental Clearance Certificate (ECC) from the Ministry of Environment and Tourism (MET) before the project can proceed. In this context the company has set out to conduct the Environmental Impact Assessment (ESIA) for its upgrade activities.

The ESIA is the official appraisal process to identify, predict, evaluate and justify the ecological, social and related biophysical impacts of the project on both the environment and, affected and interested stakeholders. It provides insight on alternatives and measures to be adopted to prevent or mitigate any impacts/risks that may ensue from the project and its associated activities.

As per the requirements of the Environmental Management Act No. 7 of 2007, Gerus Solar One has appointed JBIC to conduct the ESIA and develop an Environmental Management Plan (EMP) for the proposed project. In this respect, this document forms part of the application to be made to the DEA's office for an ECC for the proposed project, in accordance with the guidelines and statutes of the Environmental Management Act No.7 of 2007 and the environmental impacts regulations (GN 30 in GG 4878 of 6 February 2012).

Also noteworthy is the fact that in addition to applicable national legal requirements, the ESIA process also took into account IFC performance standard requirements as stated in the project Terms of Reference and communications with project personnel.

1.1 ESIA Project Objectives

The objectives of the ESIA process include to:

1) Satisfy the requirements of applicable legal requirements the Environmental Management Act (EMA) (No. 7, 2007) and the Environmental Impact Assessment (ESIA) regulations (GN 30 of 6 February 2012). The Government Notice 29 of 2008, *Section 1 Energy Generation, Transmission and Storage Activities* states the need for an ESIA for the construction of facilities for -
    a) The generation of electricity;
    b) The transmission and supply of electricity.
2) Ensure that requirements of applicable IFC performance standards (PS1- 8, 2012) are met.
3) Establish the current in-depth baseline environmental (biophysical, socio-economic and cultural impacts/risks) setting of the project. The baseline assessment is a standard against which changes due to the project may be monitored and will also

guide the environmental management programmes to be undertaken in order to achieve sustainability

4) Propose methods for the enhancement of positive impacts as well as prevention and mitigation of any impacts that may result due to the proposed project.

1.2 Scope and Terms of Reference

The ESIA was carried out as per Terms of Reference (ToR) provided to Junior Baiano Industrial Consultants (JBIC) cc by Gerus Solar One (Namibia) (Pty) Ltd. The summary of the terms of reference for the ESIA process include:

1) Description of the Environmental and Socio-economic Baseline Data taking into account surface and ground water systems; water management; biodiversity (i.e. terrestrial biodiversity, critical habitats, etc.); historical and cultural heritage; climate as well as climate change risks; socio-economic environment; community health safety and security; indigenous people; etc.
2) Provide full description of the project development.
3) Outline, review and assessment of applicable environmental management and socio-economic legal requirements.
4) Consideration of applicable and potentially applicable IFC performance standards requirements. These include:
    - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.
    - Performance Standard 2: Labour and Working Conditions.
    - Performance Standard 3: Resource Efficiency and Pollution Prevention.
    - Performance Standard 4: Community Health, Safety, and Security.
    - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
    - Performance Standard 7: Indigenous Peoples.
    - Performance Standard 8: Cultural Heritage.
5) Determination of the potential impacts of the projects.

6) Carrying out stakeholder consultation while considering the socio-economic and natural/cultural aspects the site.
7) Development of management plans to manage/mitigate potential project impacts. This will include the following management plans:
    - Social Impact Management Plan.
    - Biodiversity management plan.
    - Stakeholder management plan.
    - Grievance Redress and Engagement Management Plan.
    - GHG Assessment and Management Plan.
    - Emergency Preparedness and Response Plan.
    - Visual Impact Assessment Management Plan.
    - Traffic Impact Assessment and Management Plan.
    - Worker Health and Safety Management Plan.
    - Water Management Plan.
    - Storm water Management Plan.
    - Waste Management Plan.
    - Energy Management Plan.
    - Community Health Safety and Security Management Plan.
    - Indigenous Peoples Management Plan.
    - Natural and Cultural Heritage Management Plan.

1.3 ESIA Work and Consultants

Junior Baiano Industrial Consultants (JBIC) cc has highly qualified, experienced and competent consultants. For this project expertise comprising those of biodiversity, geology, engineering, environment, socio-economics, hydrology, archaeology, disaster management as well as safety and health were assembled to compile information related to the ESIA work.

Image 1-1: ESIA Team of Experts

Baseline data for the ESIA was generated using a combination of:

- Field Studies;
- Analysis of maps and plans;
- Review of reports and background documents;
- Structured Interviews;

- Laboratory analyses.

1.3.1 Stakeholder Consultation Process

It is important to reiterate that a stakeholder consultation process was conducted as part of the ESIA process. This is a fundamental principle of the ESIA process that involves capturing the views and concerns of affected and interested stakeholders, hence facilitating improved environmental planning, design, implementation, operation and management of the proposed construction project.

Image 1-2: Stakeholder Consultation with Local Community Leadership

The objectives of the public consultation process included to:

- Inform stakeholders about the proposed project and discussion of its likely impacts/risks.
- Obtain stakeholder views, concerns and inputs.

- Obtain local and traditional knowledge that may be useful in environmental planning and design of the mixed-use complex.
- Provide opportunity for stakeholders to influence project planning and design in a positive manner.
- Ensure that significant impacts/risks are not overlooked, and benefits are maximised.
- Reduce conflict through the early identification of contentious issues.

The table below gives a summary of the methods used in the public consultation process and the stakeholders consulted.

Table 1-1: Stakeholder Consultation Methods and Stakeholders

Public Consultation Methods	Stakeholders Consulted
• Press release. • Interviews. • Questionnaire/comments forms. • Group discussions.	• Local community. • Local authorities and government agencies. • Local business and service providers.

2 PROJECT DESCRIPTION

The proposed project is located approximately 48 km to the southeast of the town of Outjo, and approximately 35 km from the town of Otjiwarongo (Figure 2.1 and 2.2). The site is geographically located between 20°14'26.66"S to 20°18'43.41"S, and 16°27'34.59"E to 16°27'43.55"E (Long/Lat Coordinates) in the Gerus area and falls under the jurisdiction of Otjozondjupa.

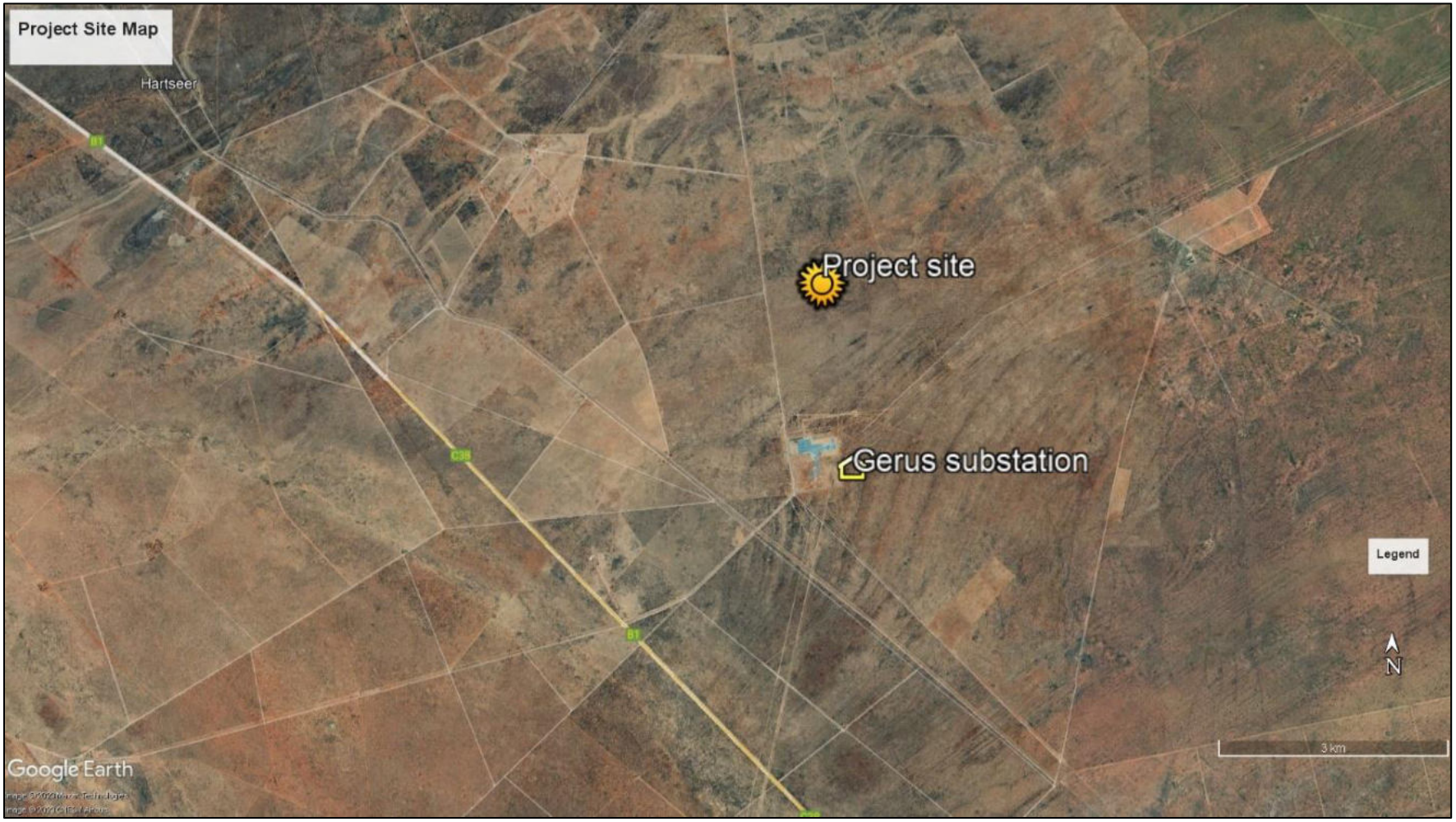
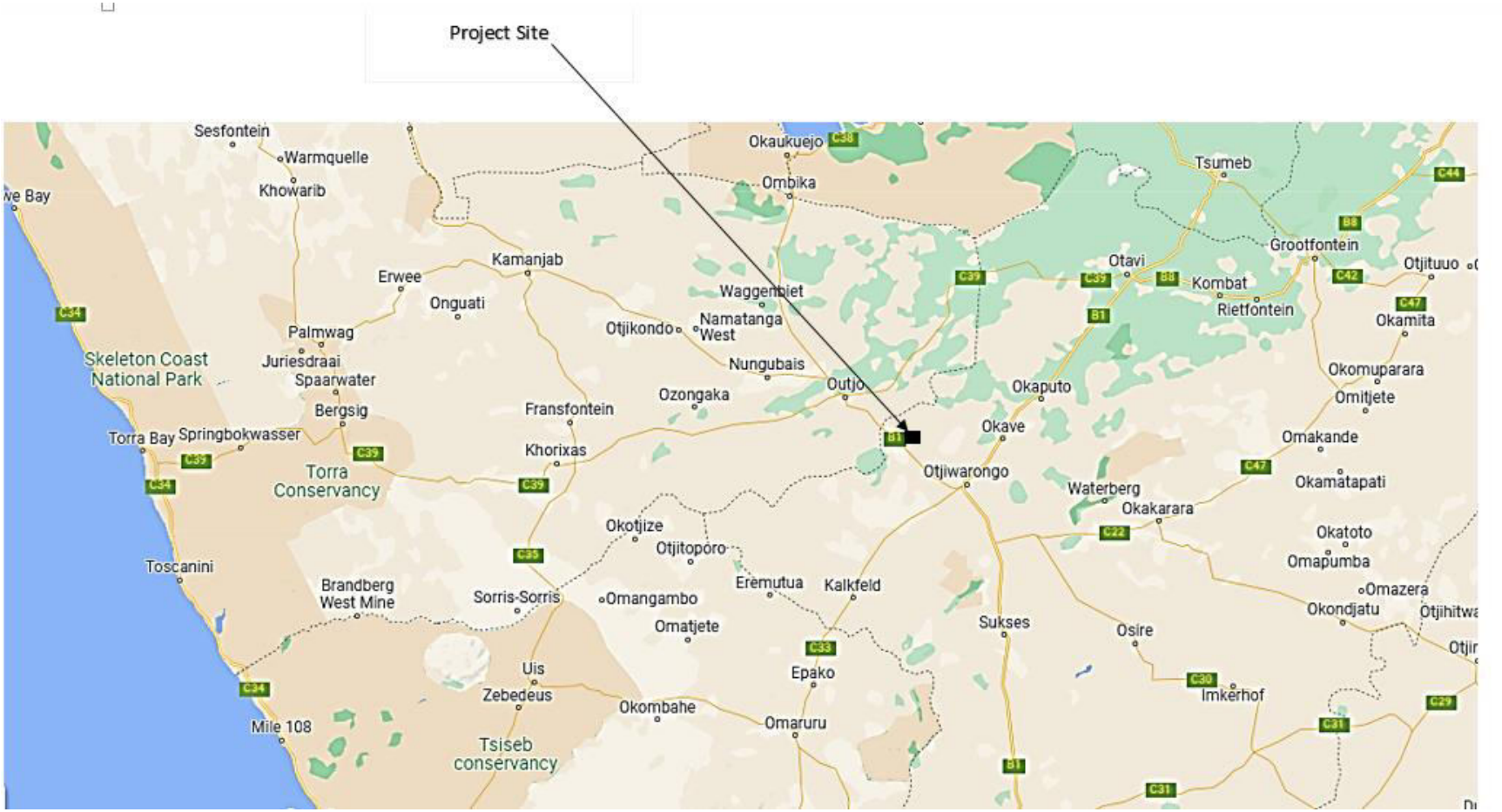


Figure 2-1: Outjo Solar Project site (Google Earth Image)


Project Site
Sesfontein
Warmquelle
Khowarib
Okaukuejo
Ombika
Tsumeb
Grootfontein
Otjituuo
Otavi
Kombat
Rietfontein
Okamita
Kamanjab
Erwee
Onguati
Waggenbiet
Namatanga West
Otjikondo
Palmwag
Juriesdraai
Spaarwater
Skeleton Coast National Park
Nungubais
Outjo
Okaputo
Okomuparara
Omitjete
Ozongaka
Bergsig
Fransfontein
Okave
Omakande
Torra Bay
Springbokwasser
Khorixas
Torra Conservancy
Otjiwarongo
Waterberg
Okamatapati
Okakarara
Okotjize
Okatoto
Otjitoporo
Omapumba
Toscanini
Brandberg West Mine
Sorris-Sorris
Omangambo
Eremutua
Kalkfeld
Omazera
Okondjatu
Omatjete
Sukses
Osire
Uis
Epako
Zebedeus
Okombahe
Imkerhof
Mile 108
Omaruru
Tsiseb conservancy

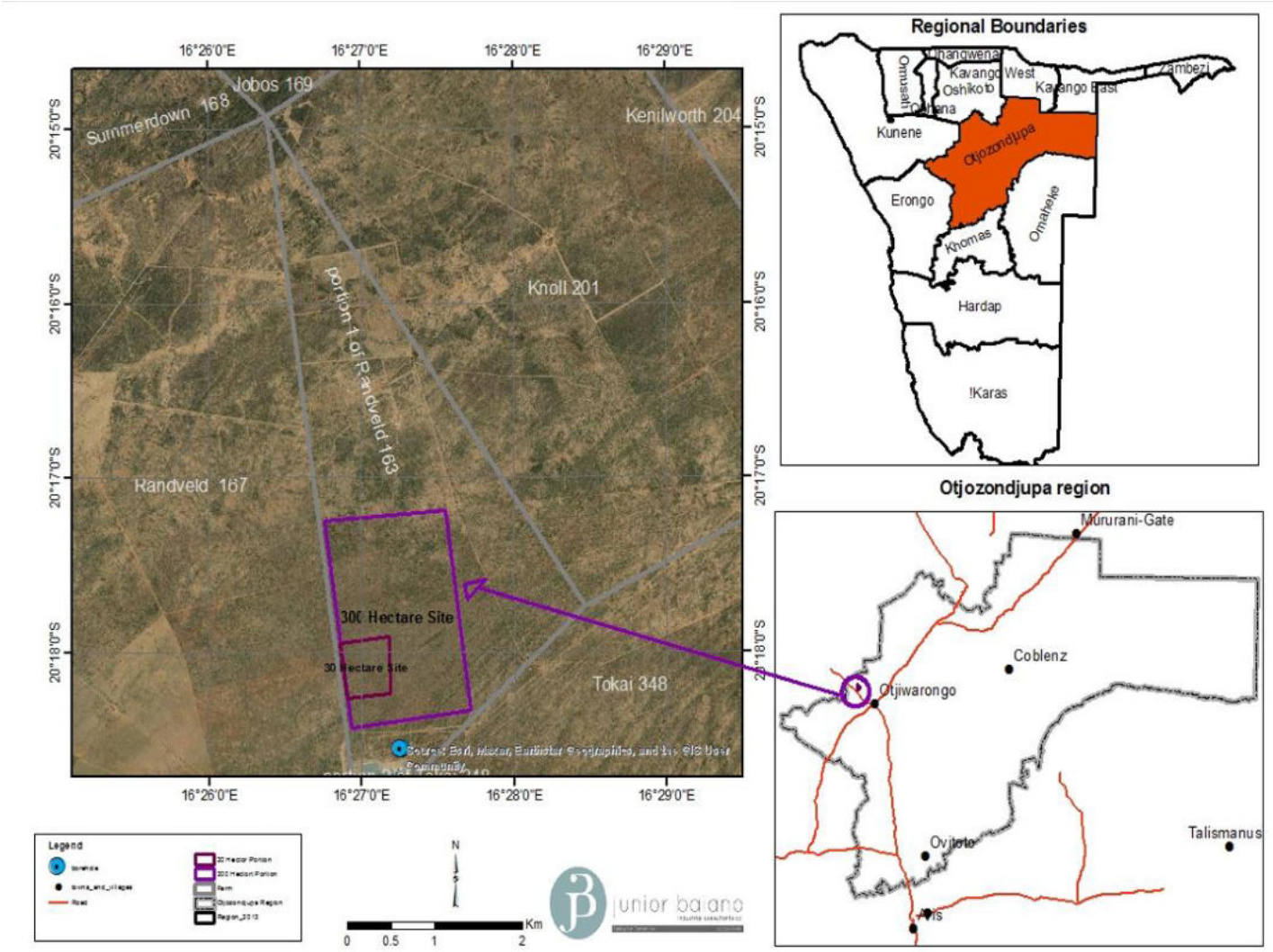


Figure 2-2: Locality Maps

2.1 Objectives of the Project

The key objective of the project is to contribute to addressing the current and likely future mismatch between energy supply and demand in the country. Namibia's domestic electricity supply is struggling to keep pace with rising demand, and the country generates less than half of the energy it consumes. The project is not only expected to alleviate this problem, but it is also anticipated to add value to the development of the local communities of Outjo and Otjiwarongo. The objectives of the project also include to:

- Create of much needed employment opportunities. The project will offer an alternative source of income to the local community through direct employment; and indirect employment from subsistence (petty) business supporting the main commercial businesses;
- Facilitate local and national economic growth e.g. tax revenues;
- Utilise an energy source (solar) which is renewable and low emission. This contrasts with conventional fossil fuels that contribute to pollution and climate change;
- Reduce foreign energy expenditure; and
- Contribute to the economic and social well-being of people and households of the immediate Outjo and Otjiwarongo areas.

2.2 Project Overview

Gerus Solar One (Namibia) (Pty) Ltd intends to construct and operate a Photovoltaic (PV) Solar Power Plant in Outjo, Namibia. The proposed solar farm entails the construction and operation of a 120 MW PV development, associated infrastructure and services for the provision of renewable electricity to the national power grid. The ancillary infrastructure in support of the power plant including water abstraction systems, waste management systems, power lines, roads, storage facilities, administration and operation buildings, construction laydown areas and temporary housing facilities.

2.2.1 PV Technology Specific Infrastructure

PV systems produce energy by converting solar irradiation into electricity. A PV system consists of PV modules module that encase the solar cells. Solar cells are solid-state

semiconductor devices that convert light into direct-current electricity. The top layer of the silicon portion of a solar module is made from a mixture of this silicon and a small amount of phosphorous, which gives it a negative charge. The inner layer, which constitutes the majority of the module, is a mix of silicon and a little bit of boron, giving it a positive charge.

The place where these two layers meet creates an electric field called a junction. When light (or photons) hits the solar cell, before it gets to the silicon crystal to make electricity it passes through a glass cover on the module and an anti-reflective coating, which stops photons from reflecting off of the module and being lost. The photons are absorbed into the junction, which pushes electrons in the silicon out of the way. If enough photons are absorbed, the electrons are pushed past the junction and flow freely to an external circuit.

In order to convert the Direct Current (DC) to Alternating Current (AC) an inverter will be used. The DC voltage is converted to 400 or 800V AC by inverters, the Voltage is stepped up by Transformer and transmitted over the transmission network. Voltage is then stepped down in stages for consumer consumption (230/400V). The AC energy can then be used to power anything that uses electricity.

The front surface of the solar module is generally made of toughened glass with an anti-reflective coating to maximise the light captured by the solar cells and reduce glare back towards the atmosphere. The PV modules are predominantly black in appearance – when viewed directly from the front; however, from close-up, a grid of silver contacts can sometimes be seen.

The PV plant will use bi-facial modules where the back solar PV modules will also have light absorbing capabilities increasing the efficiency of the overall plant.

The proposed 120MW solar energy facility would consist of the following:

- Photovoltaic component: numerous rows of PV modules and associated support infrastructure to generate electricity, one (1) 120 MW PV Developments of about 30ha;
- DC-AC power inverters;
- Step-up transformers;

- PV module generate DC current (12V, 24V, 48V)
- Transmission corridor: one overhead 66kV transmission line (500m) located within an existing transmission corridor will connect the proposed onsite substation to the existing main substation. This will make use of an existing powerline servitude in the area, to minimise impacts. An additional 220kV transmission line will also be established within a dedicated corridor.
- On-site substation: the on-site substation to collect the electricity produced on site and step it up to the correct voltage to transfer via the transmission line to the existing main central substation.
- Buildings: operation and maintenance buildings to house equipment and a guard cabin for security.
- One borehole will be drilled on site for both operational and domestic water uses. Boreholes are to be drilled on site in order to cater for the solar plant's water requirements. In general, all solar power technologies use a modest amount of water (approximately 2 litres per module per cleaning cycle).
- Additional infrastructure: includes a boundary fence for health, safety and security reasons; water supply infrastructure for groundwater abstraction and storm water infrastructure, if required.

The diagram and images below show the proposed circuit layout as well as PV structures to be established on site.

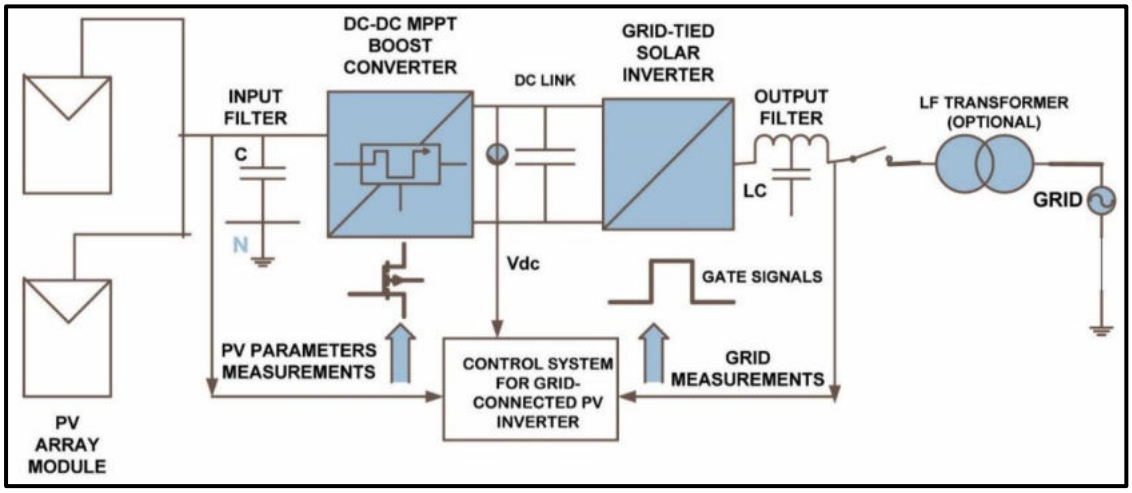


Figure 2-3: Circuit Layout

The project works involve the construction and operation of a solar PV plant which includes:

- Planning and Design of Project Work – this compasses land acquisition and registration; preliminary site investigations e.g. geotechnical and hydrogeological assessments and topographical surveys; permit applications; preparation of site plans/drawings and application of the appropriate approvals from the relevant regulatory authorities; assessment of baseline conditions to determine supply and demand for required project services; carry out the ESIA and obtain the appropriate approvals; contractor selection, negotiation and, following financial close, contractor mobilisation, etc.
- Site Preparation – this entails fencing, grading, landscaping, construction of internal access roads and siding of project areas in order to make the sites free of obstruction prior to construction. It would generally involve utilization of heavy machinery/equipment to fully prepare the landscape. This includes physically removing vegetation, any pre-existing concrete foundations, etc.
- Transportation, Logistics and Construction - site preparation complete, the next important step is preparing for transportation, logistics and construction of the solar plant, transmission lines and other associated infrastructure. This takes into account activities such as transportation of project materials (e.g. PV modules,

electrical and structural equipment, etc); planning for transporting heavy pieces of equipment such as drilling machines; execution and control of the procurement; movement and stationing of personnel, material and other resources; evaluating all site conditions to make sure they are conducive for the construction equipment/machinery; foundation laying for ground mounted structures; laying of internal electrical connections; construction site offices, temporary storage facilities, substation; installation of inverters and transformers; etc.

- Commissioning tests – once mechanical assembly of the plant is complete, In order to ensure that the solar plant is effectively functional, commissioning tests are necessary. This will entail carrying out standard electrical tests for established electrical infrastructure and the PV modules; as well as inspections and appropriate testing of civil structures. This is an integral step as it ensures a proper handoff to the operators of the solar power plant. It establishes the baseline operating levels of the system, checking that each part of the system is operating at the proper specifications. It is critical to the safe and effective operation of a solar power plant while confirming that it meets generation targets for the customer. This is a well-documented and controlled process to initiate the operation of a solar PV plant and record plant capability to meet the designed performance requirements.
- Operation of the solar power plant – the activities expected to take place mainly include the normal daily operation of the PV Plant and the routine maintenance activities of the PV Project (e.g. PV module cleaning, inverter servicing, checks on structural integrity, electrical infrastructure checks and repairs, storage and disposal of broken PV modules, etc.). This also includes monitoring, maintenance, inventory management, administration warranties, spare parts, safety equipment and storage, ensuring site security, implementation, and follow-up of the various management plans as stated in the ESIA.
- Possible decommissioning phase – the proposed development is anticipated to have a minimal operational life of 30 years. Corrective and preventive maintenance as well as PV solar plant upgrade activities is expected to ensure

that the life span of the plant goes beyond 30 years. However, provision has been made for a decommissioning phase if this unexpected event occurs. Decommissioning may involve the following dismantling of the PV Park including the disconnection of the different components of the Project (PV module, inverters, transformer stations, substation, etc.) for reuse, recycling or final disposal. The site will be restored to its original state or left in a state that is fit use by post operational phase land users. Site abandonment includes, among other things, the restoration of the internal road network and the removal of gates and fences.

2.2.2 Workforce

The table below gives a summary of the expected project workforce for the construction and operational phases.

Table 2-1: Anticipated Project Labour Complement

Workforce requirements	Skilled	Unskilled	Total	Comment
Construction phase	100	400	450	Approximately 450 to 600 people will be engaged during the construction phase. This phase is expected to last for about 12 months. It will consist of about 100 skilled workers (e.g. engineers, technicians, consultants, surveyors, etc.) and up to 400 unskilled workers (e.g. laborers, security personnel, etc.)
Operational phase	10	30	40	About 40 people will be employed during the operation phase. The operational phase will last for at least 30 years. Approximately 10 skilled workers (e.g. engineers, technicians, office staff, etc.) Will be engaged and 35 unskilled personnel (such as artisan assistants, security personnel, drivers, etc.).
Total	**60**	**130**	**190**	

2.2.3 Summary of Project Activities and Project Environmental Process Flow Charts

A summary of the activities that are to be carried out on site include the following:

- Obtaining permits, licenses and approvals
- Carrying out preliminary site investigations (geotechnical, hydrogeological, topographical studies)
- Vegetation clearance and soil stripping in order to facilitate establishment of site infrastructure/buildings.
- Formation of screening and topsoil bunds
- Transportation and logistics (for materials and work personnel)
- Construction of access roads, car parking area, process plant area ground works, site roads
- Installation of site fencing and associated security systems
- Installation of PV Solar Modules, mounting structures and Inverters
- Storage and use of fuels, lubricants, etc.
- Use and maintenance of heavy vehicles
- Construction of boreholes and associated pipe systems, pump stations and buried power supply cables
- Erection of potable water facilities
- Erection of areas for site personnel (office, canteen, ablutions)
- Construction of maintenance and stores buildings
- Construction of heavy vehicle workshop and fuel storage and metering facility
- Installation of sewerage disposal system
- Topsoil reclamation for the rehabilitation process i.e. for areas disturbed during the construction phase
- Movement of vehicles along access roads to and from the project site.
- Movement of vehicles in and around the project.

The diagrams in the following subsections show the summarized environmental flow charts the project i.e., construction and operational phases.

2.2.4 Construction Phase Environmental Process Flow Chart

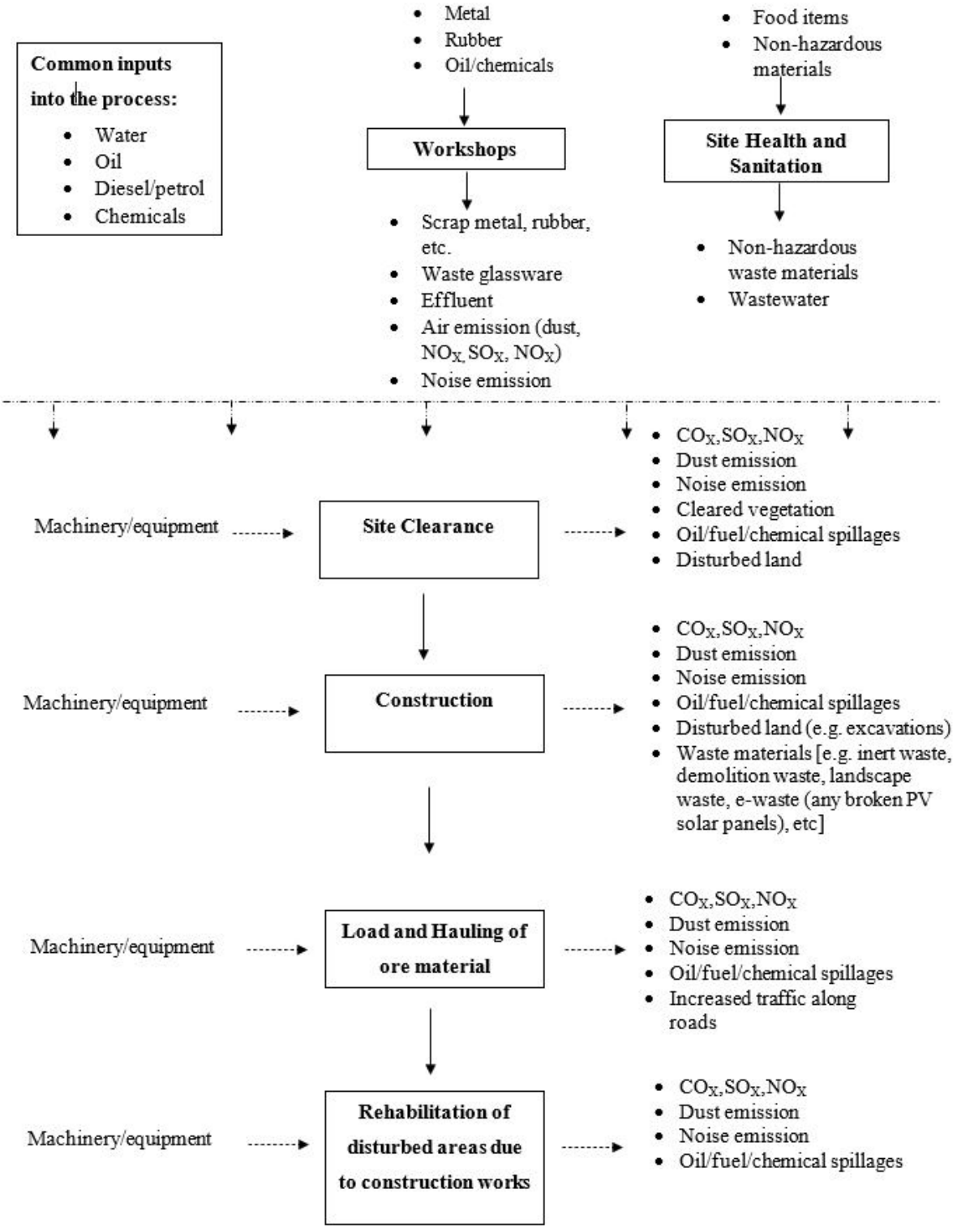


Figure 2-4: Construction Phase Environmental Flow Chart

2.2.5 Operational Phase Environmental Process Flow Chart

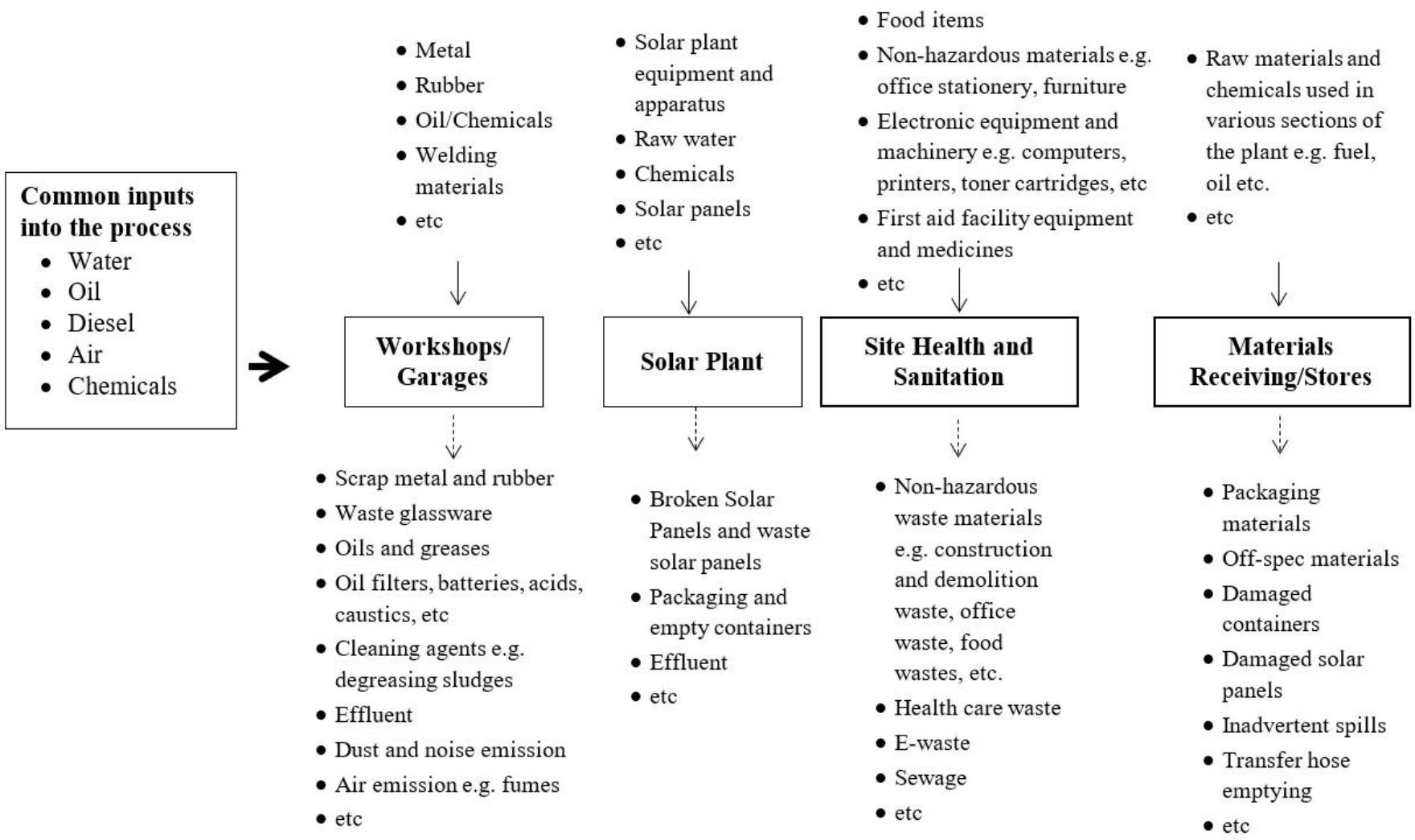


Figure 2-5: Operational Phase Environmental Flow Chart

2.3 Accessibility

The site is easily accessible from the highway connecting Outjo and Otjiwarongo.

Image 2-1: Outjo-Otjiwarongo Highway

Branching off the highway are well-maintained gravel roads (access tracks).

Image 2-2: Gravel roads in and around the project site

It is important to put provision for maintenance of the gravel roads. Gravel roads need to be periodically surfaced and rehabilitated as they may be difficult to use in wet weather which can lead to rutting, potholes, wash boarding, and absorption of water. Whilst cost effective, gravel roads deteriorate quickly and require routine maintenance especially after a wet period or increased traffic.

2.4 Infrastructure and Services

The proposed development will make use of groundwater for both domestic and operation uses. The ablution facilities will have a soakaway system, however while they are being built, temporary restrooms will be utilised until the soakaway system facilities are ready. There are various telecommunications service providers, and these include MTC, TN Mobile and satellite phones. If electrical power is needed before the solar power plant is built, it may be accessed via the nearby NamPower distribution facility or alternatively through temporary diesel generators.

2.5 Need and Desirability

With an average of ten hours of sunshine per day, Namibia is one of the world's sunniest countries. As shown in the graph below, it has enormous potential for solar energy yet, 60% of the country's energy is imported from neighbouring countries and 40% of its population is disconnected from the grid (Climate Partner, 2022).

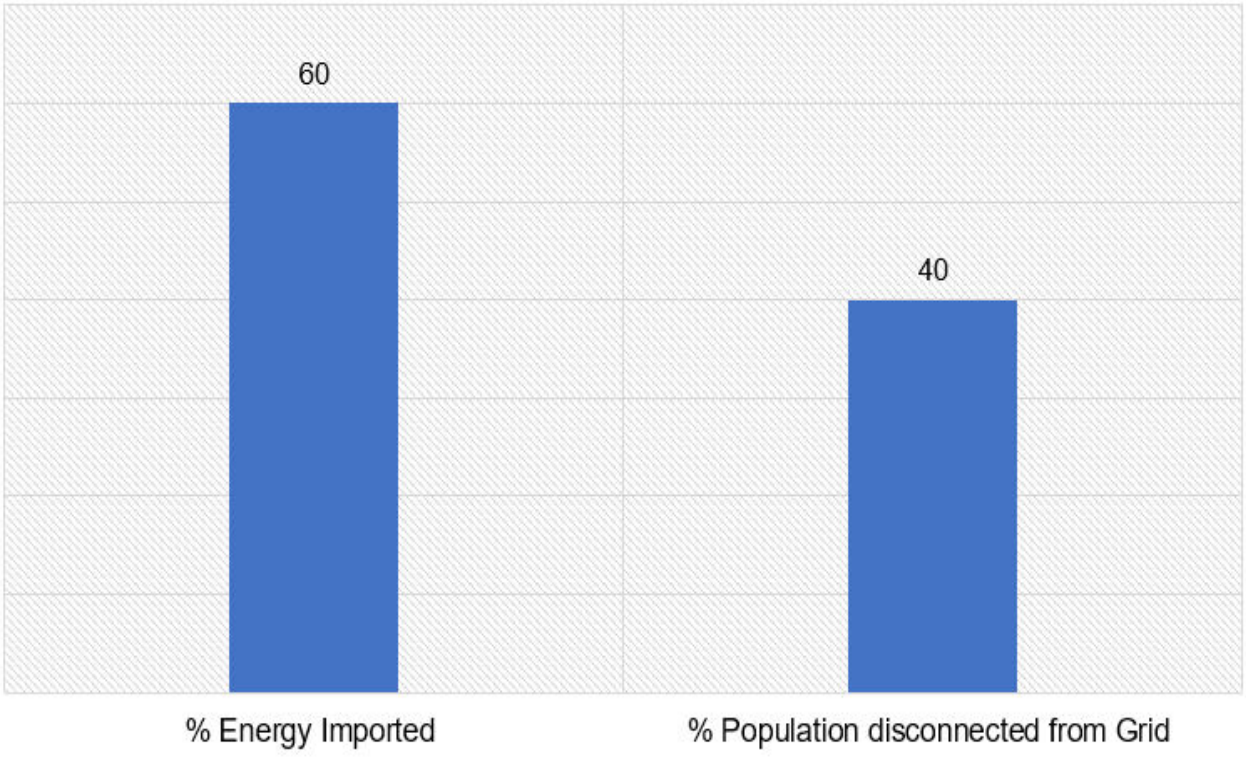


Figure 2-6: % of Energy Import and Disconnected Population

Namibia has long relied on imported power from South Africa (Eskom), but South Africa's own economy has put strains on its domestic electricity generation capability and thus its ability to export (ITA, 2022). Namibia's domestic electricity supply has failed to keep pace with rising demand, and Namibia generates less than half of the energy it consumes.

The illustration below shows that country's generation facilities do not produce enough to meet the nation's energy needs. Moreover, the power plants rarely if ever produce at full capacity. The peak demand is over 600 MW (ITA, 2022).

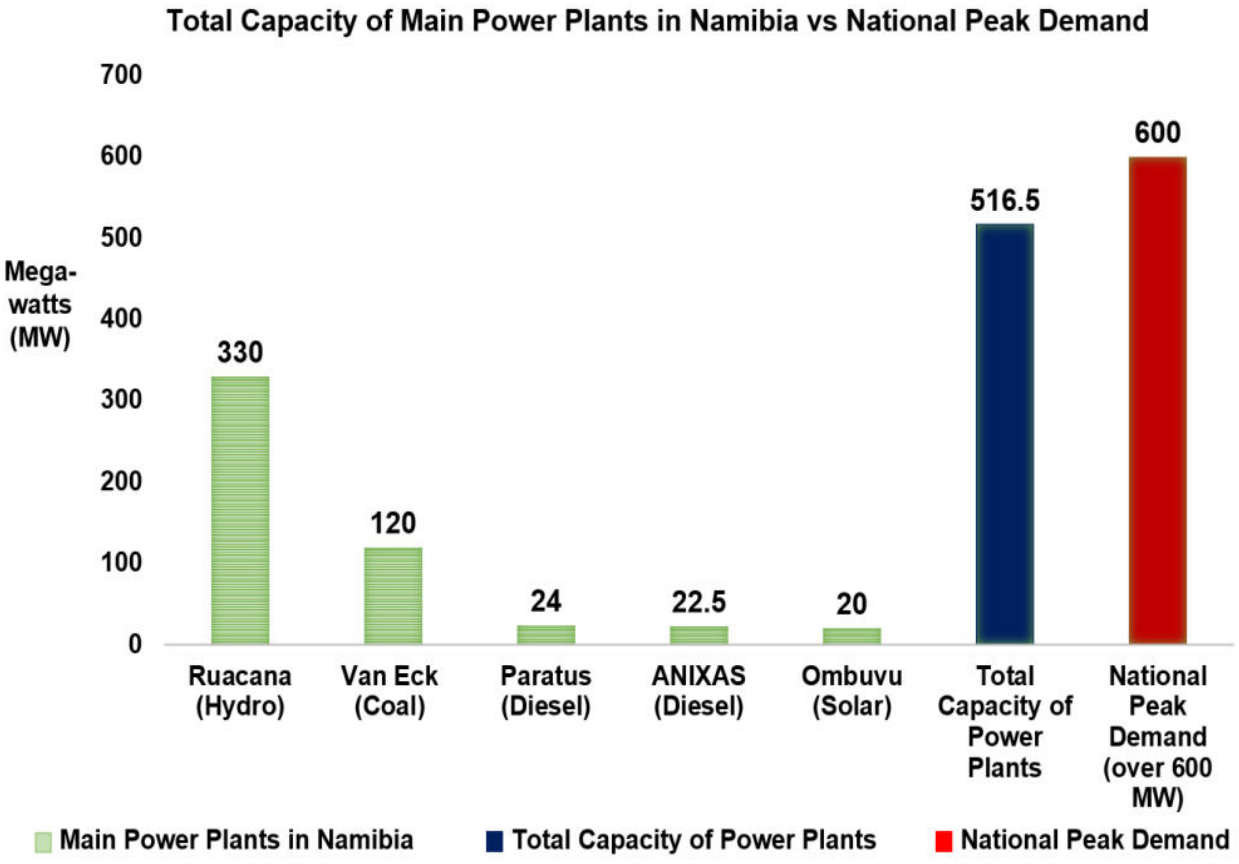


Image 2-3: Total Capacity of Power Plant vs National Peak Demand

Nonetheless, Namibia has ambitious goals. The Harambee Prosperity Plan (HPPII) articulates ambitious plans to develop green and blue economies in the country. Namibia is uniquely positioned to become the renewable energy hub of the continent and is determined to play a leading role in illustrating how environmentally sustainable business practices can be profitable and transformative undertakings. By 2030, Namibia aims to

produce 70% of its energy from renewable energy sources, with independent energy producers feeding renewable energy into its national grid (WEF, 2021).

The 120 MW Solar PV Plant is thus a major step in addressing energy deficit in Namibia as well as meeting the objectives of the developmental plans and targets of the Namibian government. Furthermore, the project will help increase the proportion of renewable energy sources in Namibia's energy mix and improve regional and national supply. As a renewable source of power, solar energy has an important role in reducing greenhouse gas emissions and mitigating climate change, which is critical to protecting humans, wildlife, and ecosystems. Solar energy can also improve air quality and reduce water use from energy production.

2.6 PROJECT ALTERNATIVES

2.6.1 Site Location Alternatives

An integrated site selection study was done in order to identify a suitable site for the proposed solar power plant. The proposed solar energy site is considered highly desirable due to the following considerations:

a) Solar resource: Analysis of available data from existing weather stations suggests that the site has sufficient solar resource to make a solar energy facility viable.
b) Site extent: Sufficient land was secured from the land owner to enable sufficient power supply and to allow for a number of PV trackers to make the project feasible.
c) Land suitability:
    i. Site that facilitates easy construction conditions (relatively flat land with few rock outcrops or waterbodies) were favoured during site selection.
    ii. The site is near a sub-station.
    iii. There are no obvious environmentally sensitive areas.

Consideration of the above criteria resulted in the selection of the preferred site. No further site location alternatives are considered in the ESIA process.

2.6.2 Site Layout Alternatives

The PV layout and project component design underwent a number of iterations based on technical aspects and the environmental and social considerations assessed during the

ESIA process. From a layout perspective, the position of the proposed site infrastructure was determined by the consideration of the favourable local topographical conditions.

2.6.3 Technology Alternatives

Two (2) Photovoltaic Power (PV) Systems technologies were considered for the proposed project. These are the most prominent technologies in use worldwide and described below.

2.6.3.1 Crystalline Technologies

By far, the most prevalent bulk material for solar cells is crystalline silicon (C-SI). Bulk silicon is separated into multiple categories according to crystallinity and crystal size in the resulting ingot, ribbon, or wafer.

Monocrystalline silicon (c-Si): often made using the Czochralski process. Single-crystal wafer cells tend to be expensive, and because they are sliced from cylindrical ingots, do not completely cover a square solar cell module without a substantial waste of refined silicon. Hence most c-Si modules have uncovered gaps at the four corners of the cells.

Poly- or Multicrystalline silicon (poly-Si or mc-Si): made from cast square ingots large blocks of molten silicon carefully cooled and solidified. Poly-Si cells are less expensive to produce than single crystal silicon cells, but are less efficient.

Ribbon silicon is a type of Multicrystalline silicon: it is formed by drawing fiat thin films from molten silicon and results in a multicrystalline structure. These cells have lower efficiencies than poly-Si, but save on production costs due to a great reduction in silicon waste, as this approach does not require sawing from ingots.

Solar cells are structured with a P-N junction, featuring a P-type crystalline silicon (c-Si) wafer with additional holes (positively charged) and an N-type c-Si wafer with additional electrons (negatively charged). The order for the P-type and the N-type wafer varies, with the upper and thinner layer being the emitter, and the lower and thicker layer being the bulk region.

P-type c-Si wafers are made by doping high-purity c-Si with boron, which is a material featuring fewer electrons, producing positively charged wafers. Similarly, an N-type c-Si

wafer is doped with phosphorous, which is a material featuring additional free electrons and therefore negatively charges the wafer. These layers placed one on top of another, create an internal electric field. More recently (2023), modules with N-Type TOPCON (Tunnel Oxide Passivated Contact) solar PV cells have been preferred to the more standard crystalline PERC types for large scale solar applications due to their improved efficiency [1].

2.6.3.2 Thin film Technologies

Thin-film technologies reduce the amount of material required in creating a solar cell. Though this reduces material cost, it also reduces energy conversion efficiency. Thin-film solar technologies have enjoyed large investment due to the success of First Solar and the promise of lower cost and flexibility compared to wafer silicon cells, but they have not become mainstream solar products due to their lower efficiency and corresponding larger area consumption per watt production. Cadmium telluride (CdTe), copper indium gallium selenide (CIGS) and amorphous silicon (A-Si) are three thin-film technologies often used as outdoor photovoltaic solar power production. In the last 2-3 years, most of thin-film modules produced have been deployed in rooftops applications.

2.6.4 NO-GO Alternative

a) The project will not be implemented if the No-Go option is selected. The no-project alternative would mean that the various potential impacts/risks emanating from the proposed project would not be experienced. Thus, the current uses and value and other potential land uses of the site are likely to be retained. In addition, there would be no increased pressure on resources such as water which are already under strain. There also would be no increased chances of pollution and other potential negative impacts that would emanate from project activities. If the project is implemented, it is anticipated that the project will have the following benefits:
    - Improved energy supply

[1] https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/conference-paper/28-eupvsec-2013/Feldmann.pdf

- Creation of much needed employment opportunities
- Facilitation of local and national economic growth
- Utilisation of an energy source (solar) is renewable and low emission. This contrasts with conventional fossil fuels that contribute to pollution and climate change.
- Reduction in foreign energy expenditures.

These benefits will not be realized if the project does not take place. With the current needs in green energy in the region and nation, it is imperative that the solar plant be established. The non-development of the proposed project will furthermore impede economic development and socio-economic progress.

b) An analysis of project alternatives also indicates that other options are restricted and/or not viable. The project site is the only piece of land that Gerus Solar One (Namibia) (Pty) Ltd has managed to secure for this development initiative. Additionally, Gerus Solar One (Namibia) (Pty) Ltd has already injected a substantial amount of time and financial resources into the preliminary stages of the project – this includes lease agreements, planning and design of project infrastructure, obtaining land use approvals by the relevant government departments, etc. Therefore, relocation and/or re-planning and re-design of the project will lead to loss of all the resources (time and money) that have already been invested. Any delays and rescheduling of the project also have the implication of denying beneficiaries of the anticipated positive impacts of the project.

c) The “no-project alternative” implies that the project is not implemented i.e. no development/construction activities will take place. This option is generally preferential in circumstances where proposed developments are in ecologically sensitive areas. However, the biodiversity assessment for the project, while not discounting the value of the ecological system that exits in the area, indicated there are no endangered/protected species and habitats that were identified in the project site. For that reason, the project is deemed to be in a stable environment and is not anticipated to have a significant negative impact on biodiversity. The biodiversity assessment also highlighted that negative impacts on the area’s ecological system

may be adequately mitigated if the project is undertaken in a sustainable manner as per the Environmental Management Plan developed in this ESIA report.

d) Bearing in mind that the project site is generally lying idle and is reported to be agricultural unproductive, from a socio-economic perspective the "no-project alternative" may also not be a favourable option because the area will remain underutilized and the numerous positive impacts of the project may not be realized at both local and national level. Stated below are some of the disadvantages of not having the development:

    i. Due to the current huge energy disparity in the nation's energy supply and demand, the "No project alternative" means that the current shortfall in energy needs remains as is. This development alternative entails that the proposed PV developments are not constructed on the project site, thus result in the site being left as is. With Namibia's new focus on renewable energy and the targets set the NO-GO option will result in a zero contribution to these targets and no alleviation with regards to the current demand pressures on electricity. The non-development of the proposed PV plant will furthermore impede economic development and socio-economic progress for Outjo Town.
    ii. The much-needed positive economic impact of employment creation will not be realised. In addition, local skills will remain underutilised or not utilised at all. Indirect employment and growth in other local area economic sectors such as those that supply or hire out construction equipment/machinery and materials will also not be realised.
    iii. The establishment of the project means further infrastructural development and economic growth of the local areas and the town at large; if the project is not implemented this benefit will not materialize.

Taking into cognisance the above factors, the "No project alternative" is not be deemed as the desirable course of action to take.

2.7 Conclusion

It is recommended that the project goes ahead, with the construction and operation of a 120 MW Solar PV Plant at Gerus Farm, Outjo District as a viable option as it is a cost

effective and sustainable land use option. The project will go ahead and will consider chrystalline PV module technology due to the mainstream availability for such technology and he fact that it has been successfully installed in similar PV plants in Namibia and wider region.

3 APPLICABLE REGULATORY FRAMEWORK AND STANDARDS

This ESIA report has been prepared with reference to identified Namibian laws and regulations that impinge on the project. Legislation is one of the most important instruments of government that ensures the following:

- Acceptable pollution control and waste management;
- Conservation and utilisation of resources;
- Sustainable land-use planning and regulation;
- Safe and healthy workplace environments; and
- Determination of, amongst other things, the rights and responsibilities of individuals and authorities to whom the legislation applies.

The international, regional and national laws, agreements and treaties that govern the social and environmental issues of the project are outlined in the following sub-sections. The sub-sections take into account brief summarises of selected legislation; they do not seek to provide comprehensive details of all legal obligations that apply to the project.

The pursuit of sustainability is guided by a sound legislative framework. In this section, relevant legal instruments as well as their relevant provisions have been surveyed. An explanation is provided regarding how these provisions apply to this project.

Table 3-1: Legal Compliance

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
The Constitution of the Republic of Namibia (1990)	The articles 91(c) and 95(i) commits the state to actively promote and sustain environmental welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives which include: • Guarding against overutilization of biological natural resources, • Limiting over-exploitation of non-renewable resources, • Ensuring ecosystem functionality, • Maintain biological diversity.	Through implementation of the environmental management plan (EMP) the proposed development will be in conformant to the constitution in terms of environmental management and sustainability, through bringing development in an environmentally sensitive way.
Vision 2030 and National Development Plans	Namibia's overall Development ambitions are articulated in the Nation's Vision 2030. At the operational level, five-yearly national development plans (NDP's) are prepared in extensive consultations led by the National Planning Commission in the Office of the President. Currently the Government has so far launched a 4th NDP which pursues three overarching goals for the Namibian nation: high and sustained economic growth; increased income equality; and employment creation.	The proposed energy generation project, is an important element in the industrialisation of the country as well as FDIs in Namibia.

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
Environmental Assessment Policy of Namibia 1994	The Environmental Assessment Policy of Namibia requires that all projects, policies, Programmes, and plans that have detrimental effect on the environment must be accompanied by an ESIA. The policy provides a definition to the term "Environment" broadly interpreted to include biophysical, social, economic, cultural, historical and political components and provides reference to the inclusion of alternatives in all projects, policies, programmes and plans.	The construction and operation of the solar farm and associated transmission lines will only commence after being awarded an environmental clearance certificate, thus by abiding to the requirements of the Environmental Assessment Policy of Namibia. The ESIA and EMP will cater for the sustainable management of biophysical environment.
Environmental Management Act No. 07 of 2007	The Act aims at • Promoting the sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment; • To provide for a process of assessment and control of projects which may have significant effects on the environment; The Act gives legislative effect to the Environmental Impact Assessment Policy. Moreover, the act also provides procedure for adequate public participation during the environmental assessment process.	This document is compiled in a nature that project implementation is in line with the objectives of the EMA. ESIA guiding procedures developed by MET were also used in the course of this project.

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
Electricity Act 4 of 2007	Requires that any generation and or distribution complies with laws relating to health, safety and environmental standards (s 18(4)(b) In the event that exemption from acquiring a license is granted, the Minister may impose conditions relating to public health safety or the protection of the environment.	Obliges the proponent to comply with all relevant provisions of the EMA and its regulations.
The Atomic Energy and Radiation Protection Act, Act 5 of 2005:	Provides for the adequate protection of the environment and of people against the harmful effects of radiation by controlling and regulating the production, processing, handling, use, holding, storage, transport and disposal of radiation sources and radioactive materials, and controlling and regulating prescribed non-ionising radiation sources according to the standards set out by the ICNIRP.	Justifies the need for assessing the impact of electromagnetic radiation from the power line, on the nearby residents.
"Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300GHz)" (April 1998 developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP))	Provides international standards and guidelines for limiting the adverse effects of non-ionising radiation on human health and well-being, and, where appropriate, provides scientifically based advice on non-ionising radiation protection including the provision of guidelines on limiting exposure.	Justifies the need for assessing the impact of electromagnetic radiation from the power lines, on the nearby residents.

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
Public Health Act (No. 36 of 1919)	Under this act, in section 119: "No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health."	• The project proponent will ensure that all legal requirements of the project in relation to protection of the health of their employees and surrounding residents is protected. • Personal protective equipment shall be provided for employees in construction. • The development shall follow requirements and specification in relation to water supply and sewerage handling so as not to threaten public health of future residents on this piece of land.
Soil Conservation Act 76 of 1969	The objectives of this Act are to: • Make provisions for the combating and prevention of soil erosion, • Promote the conservation, protection and improvement of the soil, vegetation, sources and resources of the Republic.	The project will have a rather localized impact on soils and on the soil through clearance for PV module stands, substation infrastructure and powerline poles. Soil protection measures will be employed and

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
		preservation of trees as much as possible.
Nature Conservation Ordinance 1996	To consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto.	The proposed project implementation is not located in any known or demarcated conservation area, national park or unique environments. The project site was selected with this ordinance in mind to ensure that Namibian nature is conserved.
Proposed Protected Areas and Wildlife Management Bill	This bill, when it comes into force, will replace the Nature Conservation Ordinance 4 of 1975. The bill recognizes that biological diversity must be maintained, and where necessary, rehabilitated and that essential ecological processes and life support systems be maintained. It protects all indigenous species and control the exploitation of all plants and wildlife.	Environmental recommendations and considerations on this project have ensured that the proposed activities will not fall within the boundaries of any protected area and that the project will not affect heavily endangered vegetation and animals on its site.
Forest Act, 2001 (Act No. 12 of 2001)	The Act gives provision for the protection of various plant species through the Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry).	• Land clearing of an extensive piece of land will be done upon approval from the Directorate of Forestry.

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
		• The proponent will also have to ensure that there is no indiscriminate cutting down of trees during construction and operation • The proposed site is sparsely vegetated with white thorn tree species, which are not threatened or protected.
National Rangeland Policy and Strategy, 2012	The policy aims at enabling resource users (farmers and managers) to manage their rangeland resources in a sustainable manner and sustainable in that they are economically viable, socially acceptable, environmentally friendly and politically conducive.	This proposed project will ensure that the local community benefits both economically and socially from the project, this in line with the recently declared Harambee Prosperity Plan and NDP 4&5.
National Biodiversity Strategy and Action Plan (NBSAP2)	The action plan was operationalised in a bid to make aware the critical importance of biodiversity conservation in Namibia putting together management of matters to do with ecosystems protection, biosafety, biosystematics protection on both terrestrial and aquatic systems.	• The project proponent has been advised by JBIC and recognises the need for ecosystems protection to manage the changing climatic environment. • This project is one of the drivers to reduce the rate of global environmental change given its contribution, to

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
		decreased use of burning fossil fuels for energy generation.
National Policy on Climate Change for Namibia, 2010	In harmony with the findings of the IPCC over time and the Earth Summits held annually, the policy seeks to outline a coherent, transparent and inclusive framework on climate risk management in accordance with Namibia's national development agenda, legal framework, and in recognition of environmental constraints and vulnerability. Furthermore, the policy pursues the strengthening of national capacities to reduce climate change risk and build resilience for any climate change shocks.	Solar energy harnessing technologies are a positive impact to fighting climate change, thus this development is a positive step towards climate smart energy generation and environmental sustainability.
Wetland Policy, 2004	The policy provides a platform for the conservation and wise use of wetlands, thus promoting inter-generational equity regarding wetland resource utilization. Furthermore, it facilitates the Nation's efforts to meet its commitments as a signatory to the International Convention on Wetlands (Ramsar) and other Multinational Environmental Agreements (MEA's).	• In compliance to this Policy, the development will ensure a standard environmental planning such that it does not affect any wetlands within its locale through recognition of wetlands to promote the conservation and wise utilization of wetlands resources. • There are no existing wetlands/peatlands within

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
		2km radius of the proposed project site.
Water Resources Management Act, 2013 (Act No. 11 of 2013)	This Act provides for the management, protection, development, use and conservation of water resources. This also forms the regulation and monitoring of water resources.	Water supply will be obtained from a nearby borehole, the water abstraction license is valid. Temporary holes will be used during the construction phase.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development.	During the project implementation as soon as objects of cultural and heritage interests are observed such as graves, artefacts and any other object believed to be older than 50 years, all measures will be taken to protect these objects until the National Heritage Council of Namibia have been informed, and approval to proceed with the operations granted accordingly by the Council.
National Monuments Act of Namibia (No. 28 of	"No person shall destroy, damage, excavate, alter, remove from its original site or export from Namibia:	The proposed site of development is not within any

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
1969) as amended until 1979	(a) any meteorite or fossil; or (b) any drawing or painting on stone or a petroglyph known or commonly believed to have been executed by any people who inhabited or visited Namibia before the year 1900 AD; or (c) any implement, ornament or structure known or commonly believed to have been used as a mace, used or erected by people referred to in paragraph (b); or (d) the anthropological or archaeological contents of graves, caves, rock shelters, maddens, shell mounds or other sites used by such people; or (e) Any other archaeological or palaeontological finds, material or object; except under the authority of and in accordance with a permit issued under this section.	known monument site both movable or immovable as specified in the Act, however in such an instance that any material or sites or archeologic importance are identified, it will be the responsibility of the developer to take the required route and notify the relevant commission.
Proposed Pollution Control and Waste Management Bill	-This bill has not come into force. Amongst others, the bill aims to “prevent and regulate the discharge of pollutants to the air, water and land” Of particular reference to the Project is: Section 21 “(1) Subject to sub-section (4) and section 22, no person shall cause or permit the discharge of pollutants or waste into any water or watercourse.” Section 55 “(1) No person may produce, collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that results in or	To control air, water and land pollution as agitated by the Act the project proponent will ensure that erven will have approved drainage on site as well as standard conservancy tanks that do not threaten public health, adding on an integrated pollution management strategy following the EMP provided herein.

LEGISLATION/POLICY/ GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
	creates a significant risk of harm to human health or the environment."	
Convection on Biological Diversity (CBD)	Namibia is a signatory of the Convention on Biological Diversity and thus is obliged to conserve its biodiversity.	The project will preserve tree species on as part of their plans for greed and sustainable development.
United Nations Convection to combat Desertification	Namibia is bound to prevent excessive land degradation that may threaten livelihoods.	It will be the responsibility of the proponent to conserve vegetation on and around the area, to avoid encroachment of the desert environs in the area.

3.1 IFC Performance Standards and Guidelines

In addition to applicable legal requirements, the ESIA for the project has also taken into account other compliance obligations that impinge on the project. Namely, IFC performance standards (IFC PS, 2012) and guidelines applicable to the project have been considered. As per Terms of Reference (ToR) provided by the proponent, the IFC performance standards that are applicable to project include:

- **Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts
- **Performance Standard 2:** Labour and Working Conditions
- **Performance Standard 3:** Resource Efficiency and Pollution Prevention
- **Performance Standard 4:** Community Health, Safety, and Security
- **Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources
- **Performance Standard 7:** Indigenous Peoples
- **Performance Standard 8:** Cultural Heritage

In order to address the requirements of the performance environmental management plans have been developed. The environmental management plans detailed in *section 7: Environmental Management Plan* of this report. The development of plans has also considered IFC guidelines that are relevant to the project such as *IFC Environmental Health and Safety General Guidelines* as well as *Environmental Health and Safety Guidelines for Electric Power Transmission and Distribution*.

4 ENVIRONMENTAL AND SOCIAL BASELINE

4.1 Socio-economic Environment

The proposed project site is located on Farm Gerus about 34km east of Outjo Townlands. Outjo is a name derived from Otjiherero meaning small hills; the town consist of 8,445 inhabitants (NSA 2013:39).

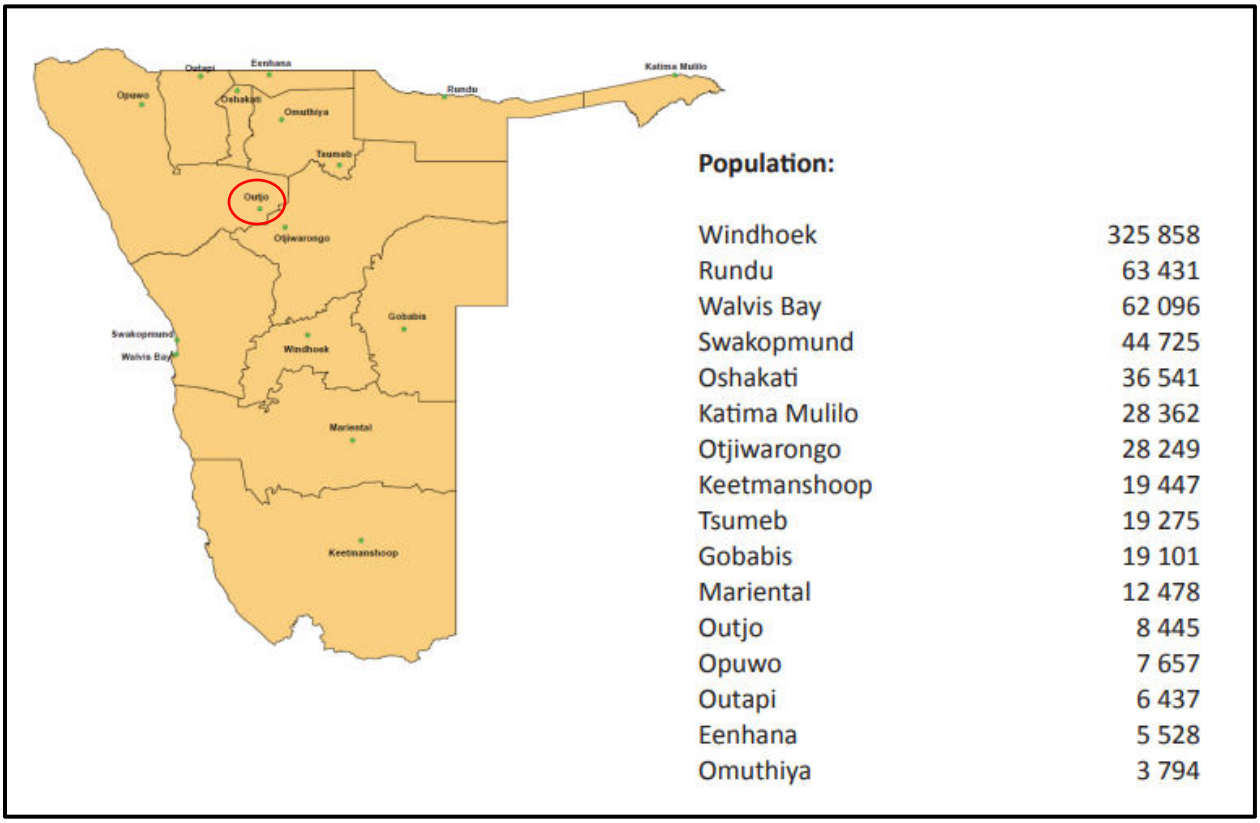


Figure 4-1: Selected Urban Localities in Namibia (Source: Namibia 2011 Population Census)

Outjo town is located in the southeast of Kunene region 70 km north-east of Otjiwarongo town and100 km south of Etosha National Park. According to Dieckmann 2007b, Outjo was declared as a municipal town in 1944 and it's known to be the commercial center for the surrounding farms.

The majority of the Outjo population hails from the following ethnic groups: Herero, Damara/Nama, Afrikaner, Owambo, and German and not limited to this are the Hai||om. Dieckmann 2007b reported that the major economic activities sustaining the town and Outjo District at whole are livestock, tourism, charcoal production and farming.

The table below shows Kunene region latest census indicators (year 2011 and 2001).

Table 4-1: Kunene Region Latest Census Indicators

	2011	2001			2011	2001
Population Size				Literacy rate, 15+ years, %	65	57
Total	86 856	68 735				
Females	43 253	34 237		Education, 15+ years, %		
Males	43 603	34 487		Never attended school	37	41
				Currently at school	9	9
Annual growth rate (%)	2.3	1.9		Left school	50	45
Percent in Urban/Rural areas				Labour force, 15+ years, %		
Urban	26	25		In labour force	67	56
Rural	74	75		Employed	64	77
				Unemployed	36	23
Sex ratio: Males per 100 females	101	101		Outside labour force	24	37
				Student	31	19
Population density				Homemaker	30	56
People per sq. km.	0.8	0.6		Retired, too old, etc.	31	25
Age composition, %				Housing conditions, %		
Under 5 years	17	15		Households with		
5 – 14 years	25	26		Safe water	67	73
15 – 59 years	51	48		No toilet facility	63	66
60+ years	7	7		Electricity for lighting	31	22
				Wood/charcoal for cooking	77	81
Marital status: 15+ years, %						
Never married	56	52		Main source of income, %		
Married with certificate	13	12		Household main income		
Married traditionally	18	17		Farming	32	35
Married consensually	8	12		Wages & Salaries	41	37
Divorced/Separated	2	2		Cash remittance	5	7
Widowed	3	4		Business, non-farming	8	7
				Pension	12	10
Citizenship, %						
Namibian	97	97		Fertility		
Non-Namibian	3	3		Average number of children per woman	4.9	4.7
Main language spoken at home,				Disability, %		
Percent of households				With disability	4	5
Otjiherero	47	42				
Nama/Damara	32	36				
Private households						
Number	18 495	12 489				
Average size	4.6	5.3				
Head of household, %						
Females	40	40				
Males	60	60				

4.1.1 Population

Outjo (Otjiherero: small hills) is a city of about 8,445 inhabitants according to the last census in the Kunene Region of Namibia (2011). It is the district capital of Outjo Constituency. Namibia has a relatively young population, with close to 37% of the whole population being less than 15 years of age. The share of young people below the age of 15 years in rural areas is higher than in urban (44% and 30%, respectively). Likewise, the proportion of elderly people (above the age of 60 years) in rural areas is more than double that in urban areas (9.1% compared to 4.3%). These characteristics are a consequence of migration by working age people to urban areas.

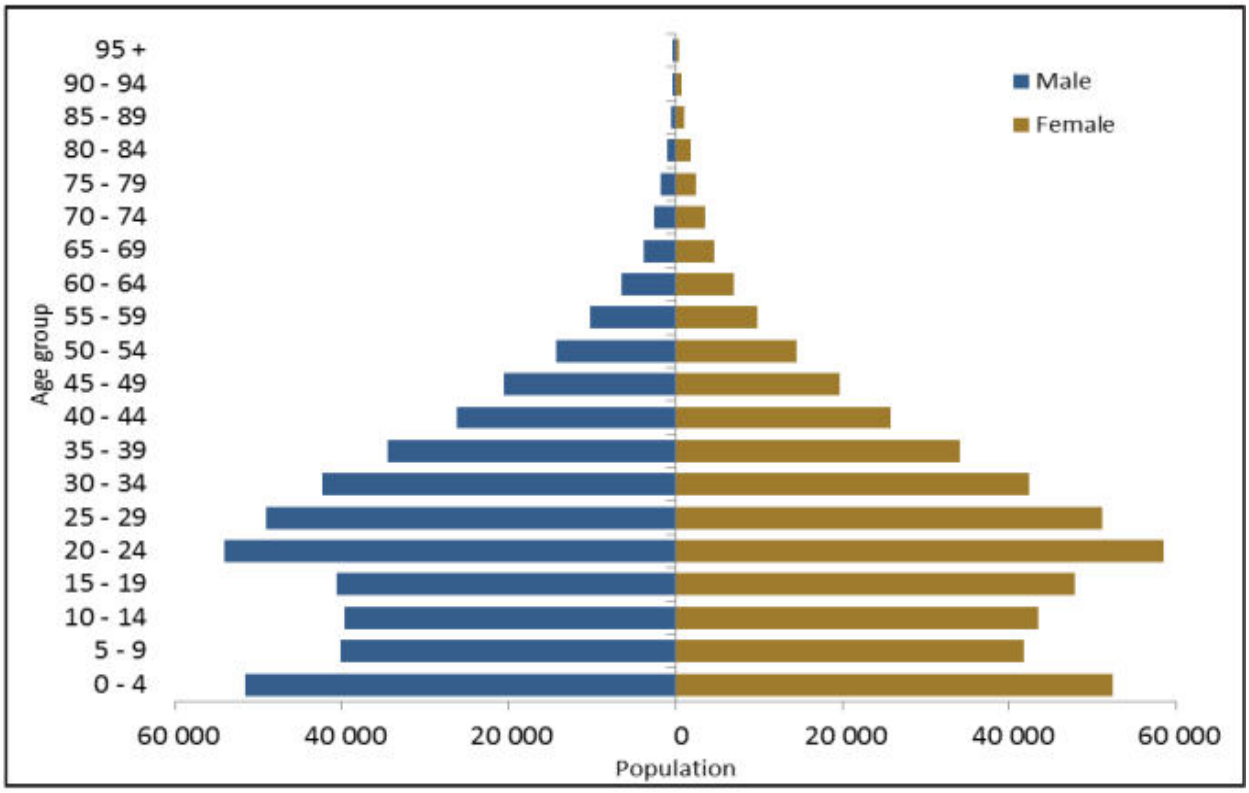


Figure 4-2: Representation of urban population typical of Outjo Constituency

4.1.2 Education

The level of education characteristically informs the employment and income potential of a population. Immediately in Outjo are three primary schools and two secondary schools. These include

- Jack Francis Primary School
- Maarssen Primary School
- Outjo Primary School
- Moria Private School
- Etoshapoort Junior Secondary School
- Outjo Secondary School

The following schools are located in the wider area:

- Otjikondo School Village & Primary School (about 85 kilometres northwest of the city).
- St. Michael Roman-Catholic Primary School (about 70 kilometres northwest of the city).

4.1.3 Infrastructure and Basic Services

4.1.3.1 Outjo Municipality

The Outjo local authority is undertaking construction of water and sewerage reticulation networks in the informal settlements. Once completed 600 households will be connected which will benefit about 2500 people.

A legacy centre is being constructed in the informal settlement of Outjo municipality, the centre will house:

- Clinic
- Police Station
- Library/Small Study hall
- Municipal Office
- Ablution block

The purpose for the construction of the centre is to bring services closer to the people in the informal settlement and is being funded by local businesses and individuals with up to 20 volunteers doing the actual work. 20 houses were constructed under the Mass Housing Development Programme and 18 have been allocated and NHE is in the process of finalizing the allocation of the remaining 2 houses.

4.1.3.2 Roads and transportation

Economic activities cannot take place without a proper road infrastructure, it provides economic and social opportunities and benefits that result in positive multiplier effects such as better accessibility to markets, employment, and additional investments. Roads connect communities and serve as economic arteries, considering our regional geographical characteristics and distance between locations, the transport industry plays a pivotal role in connecting businesses to markets, driving trade, creating employment and uniting humanity. The road network in Kunene region comprises of about 4,899.93 km, of which 515.5 km bitumen road, 2,642.0 km gravel road, 1,521.0 km earth track, 25 km salt road and 196.4 km are proclaimed.

4.1.3.3 Communication

Information communication technology plays an important role, notably by contributing to rapid technological progress and productivity growth. The project site is connected with MTC, TN Mobile and satellite phones.

4.1.3.4 Health Care

Access to comprehensive health service is important for promoting and maintaining health, preventing and managing disease, reducing unnecessary disability and premature death, and achieving health equity for all Namibians. Outjo Hospital services the area proximal to the Project site.

4.1.3.5 Energy

Electricity is one of the catalysts of development. We can only accelerate social and economic prosperity when we grant our people access to electricity. The Government recognizes the importance of developing the country's energy sector in order to fuel the targeted economic growth and the transformation of Namibia to an industrialized nation. Availability of reliable electricity service is central to the development of all sectors of the economy, as well as to achieve the country's economic and social development goals. Namibia continues to face electricity shortages. The shortfall between peak demand and peak supply in Namibia continues to be supplemented by imports from the neighbouring countries in the Southern Africa Power Pool (SAPP) system. This represents an

untenable dependence on imports that must be addressed in the near term in order to ensure Namibia's energy supply security.

4.1.3.6 Electricity Transmission and Production

CENORED has continued to make its presence known in the Region. CENORED invested approximately N$ 3,000,000.00 in operating and maintaining the electricity networks in Outjo, Khorixas, Fransfontein, Kamanjab, Palmwag, Anker and all the lines that interconnect these towns including settlements.

The operating and maintenance efforts are key to ensure reliable and secure supply to the inhabitants of the Region and sustaining of government operations and the doing of business activities in the Region.

In terms of new electrical infrastructure developments and house connections, CENORED developed a new dedicated power line from Gerus Transmission Station near Otjiwarongo in the Otjozondjupa Region to Outjo town in the Kunene Region. This investment, which costed N$ 11,000,000.00 was necessary in order to firm the power supply to the growing town of Outjo and ensure redundant and reliable power supply to the inhabitants and the surroundings of Outjo. In addition to the bulk upgrade, CENORED connected a total of 22 households in the town of Outjo at a cost of just below N$ 500,000.00, an initiative that benefited over 100 inhabitants in that town.

NamPower also has a number of transmission lines in the area (66kV, 220kv and 350kV DC link from Zambia) all linking the existing Gerus substation to the wider area.

4.1.3.7 Rural Development

Most of Kunene region's population is scattered within the boundaries of the region, which makes service delivery a challenge. Despite this challenge and other obstacles that hinder the delivery of services and the construction of economic infrastructure the Kunene Regional Council has relentlessly been implementing the rural development budget to ensure the rural population has access to socioeconomic development.

4.1.3.8 Agriculture

Economically the inhabitants of the region depend heavily on subsistence agriculture as the preferred point of intervention in raising living standards, improving livelihoods and mitigating poverty This method of farming is very vulnerable to climate change/variability as these farmers are highly dependent on weather patterns and suffer the consequences of climate change which in turn exacerbate poverty and hunger levels.

4.1.3.9 Water and Sanitation

Safe drinking water and adequate sanitation is necessity for good health, as households without safe drinking water and adequate sanitation systems are more vulnerable to water borne diseases. Proximal to the Project site, 30m away, is a borehole that will serve as a water source. Temporary holes will be used during the construction phase.

4.1.4 Summary of the Socio-Economic Baseline Profile

The table below gives a summary of socio-economic baseline profile of the project area.

Table 4-2: Summary of Socio-economic Profile

Socio-Economic Attribute	Supporting Data	Relevance to the Project
Opportunities and Benefits		
Regional and local development plans are in place	Kunene region developmental plans	Opportunity for the Project to align future socio-economic development programs or projects within existing development plans in the project area. This will increase sustainability and relevance of initiatives.
Large potential labour force	The youth comprise the largest cohort in the study area, high unemployment, especially among rural	Proponent and appointed contractors can likely meet local recruitment targets, especially for semi-unskilled positions.

Socio-Economic Attribute	Supporting Data	Relevance to the Project
	households; although most people have a relatively low skill level.	
General backlog of basic service delivery infrastructure (water, sanitation, electricity and tarred roads)	State of the Region Address 2020 • Rural households within the local study area mostly rely on community water sources and pit toilets • Considerable hosing backlog	Provides opportunities to cover the gap in service delivery
Gender disparity in employment rates-financial vulnerability among females	Namibia Labour Force Survey 2018 Unemployment amongst females is significantly higher than males. Furthermore, when women do generate income, it is likely to be less than males.	The project could contribute to gender equity by implementing higher female employment targets for contractors- tis requirement if feasible, could be formalized by incorporating it into the contractors' conditions of contract.

Socio-Economic Attribute	Supporting Data	Relevance to the Project
Constraints or Challenges		
Substantial housing shortage	State of the Region Address 2020 – growth in the percentage of informal settlements	Any project –induced influx may place additional pressure on limited housing.
Current land use on the project site	Site visits and inspection of aerial imagery	The project will likely bring value addition in the area

4.2 Climate

The climate in the project region is characterized by a semi-arid climate that has little rainfall throughout the year, that ranges between 400-450 mm. June to August are the driest months, with an average rainfall of 0 mm. January, on the other hand, is the wettest month with more than 125mm of rain on average. October through March are the hottest months of the year. Temperatures during this time of year might have highs that range from 35 ºC to 45 ºC. Winter generally runs from June until August. During this season, the minimum temperatures may range between 4 ºC and 8 ºC.

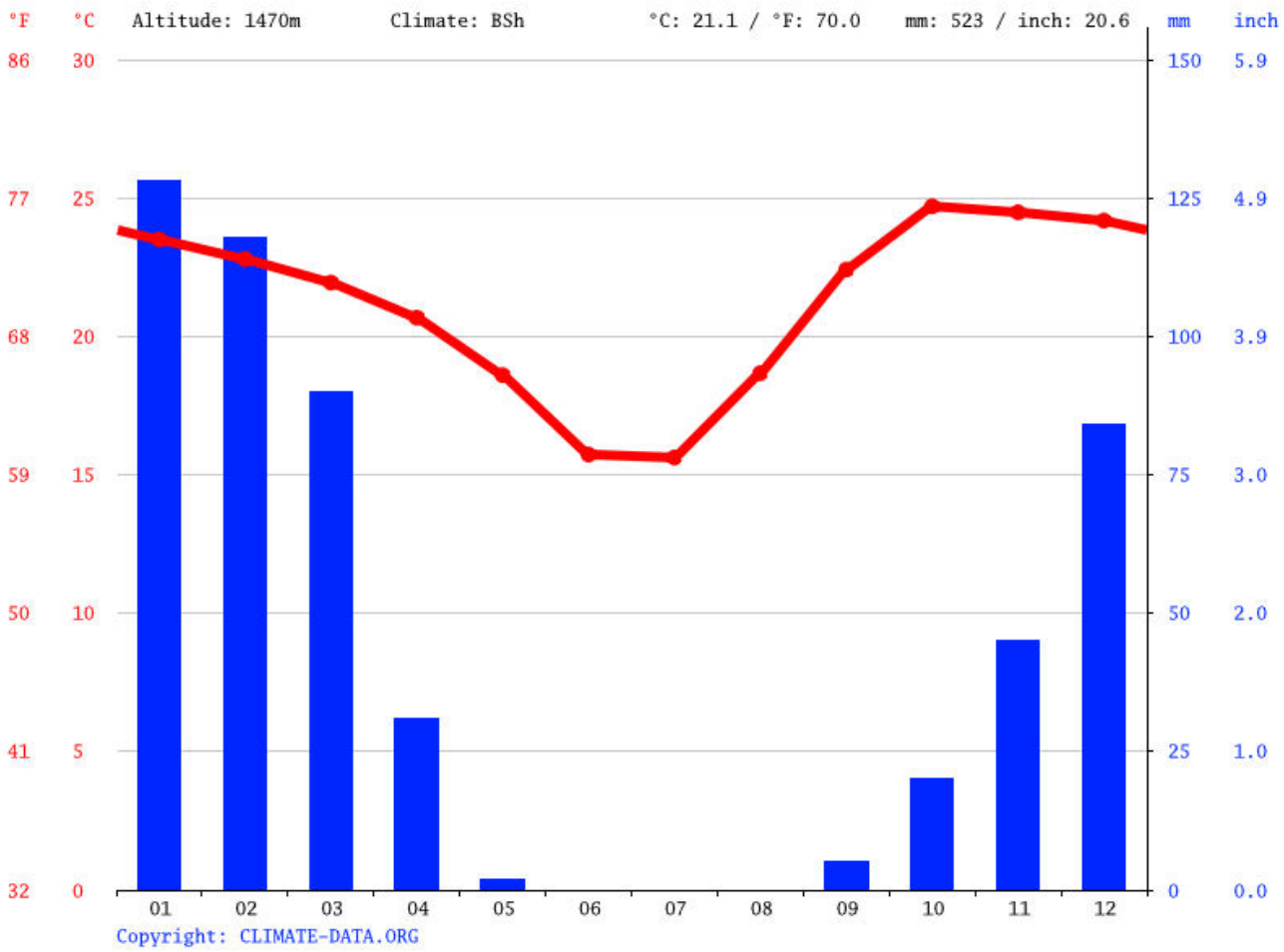


Figure 4-3: Outjo Climatic Graph (Source: Climate-data.org, 2022)

Taking into account the climate conditions of the project area there is need for appropriate planning and preparation both in the establishment of the project and its operation. The area is susceptible to droughts and extended dry periods. The type of impacts/risks that may occur under these conditions include:

- Inadequate water supply
- Possible conflicts with local community and other businesses regarding the utilization of shared water sources.

High temperatures during summer can also affect project workers. The major impact associated with high temperatures and exposure to the sun is heat stress. Heat stress impacts may affect workers' health (through heat related illnesses), safety (inhibiting

abilities to perform tasks in already hazardous environments), productivity (thermally stressful conditions may result in decreased pace of work) and morale.

4.3 Hydrogeology

4.3.1 Topography and Landscape

The topography of the study area is flat with many of rock out crops. The farm is demarcated into a number of camps for livestock. The recorded elevations are provided in figure 1 below. In the south-west are some limestone and dolomitic mountain while in the north-west are oldest rock complex. There is number of rock out crops in the area. The area is dominantly covered by acacia bushes and a lot of termite mounts. There is a substation and connecting power lines along the fields where the site is located.

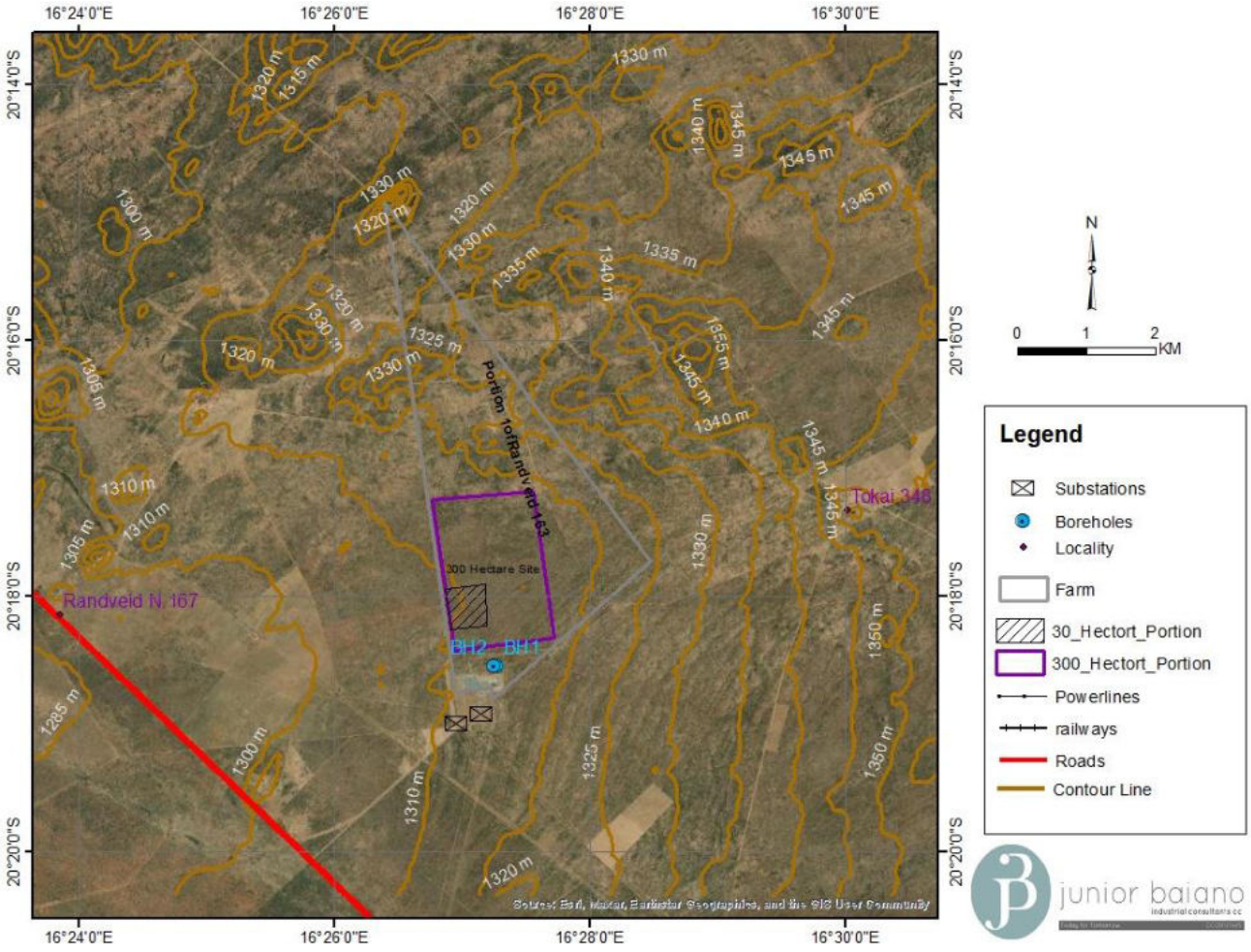


Figure 4-4: Google map image showing the topographic map of the study area

4.3.2 Soil type

The soil in this area is red clayey sand possible deposited through fluvial activities or as a result of rock weathering, there are many rock out crops. This soil corresponds to the following soil type (MAWLR, 2022):

(a) Chromic Cambisols: Cambisols are characterized by the absence of a layer of accumulated clay, humus, soluble salts, or iron and aluminium oxides (Encyclopedia Britannica, 2022).

(b) Eutric Regosols: Regosols are taxonomic rest group of soils in unconsolidated mineral material of some depth, excluding coarse textured materials and materials with flu Vic properties, and have no diagnostic horizons other than an ochric horizon (REGOSOLS, 2022).

(c) Petric Calcisols: Akça (2018) define Calcisols as soils with substantial accumulation of secondary lime and the name of Calcisols derives from the Latin calyx which means lime. Moreover, these soils are described as “Soils having a calcic or petro calcic horizon within 100 cm of the surface and no diagnostic horizons other than an ochric or cambric horizon, an argic horizon which is calcareous, a vertic horizon, or a gypsic horizon underlying a petro calcic horizon.”

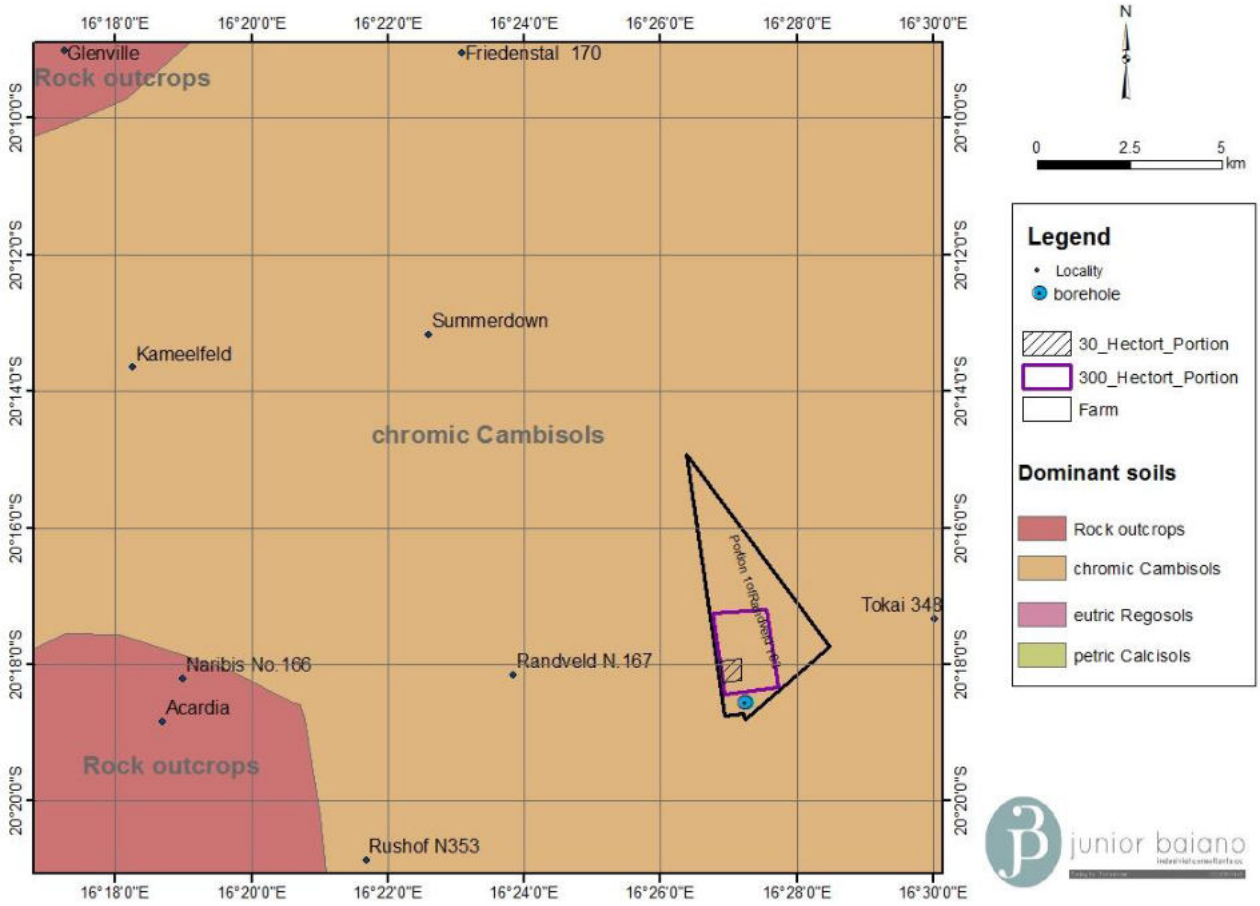


Figure 4-5: Soil types of the study area

4.3.3 Hydrology

JBIC indicates that surface water in the area is determined by rainfall, evapotranspiration and the amount of water that recharge the aquifer. Furthermore, in the proximity of the area (about 20km away) is the Omatjenne dam and Omatjenne River which flows northwest from the higher plains near Otjiwarongo, and drains into Ugab River to the north (Kirsten Petersen and Justin Werfel, 2022). The Omatjenne dam was recorded dry with 0% in 2018/2019 (Kirsten Petersen and Justin Werfel, 2022). The catchment area around the study area is illustrated in figure 3 (Kirsten Petersen and Justin Werfel, 2022).

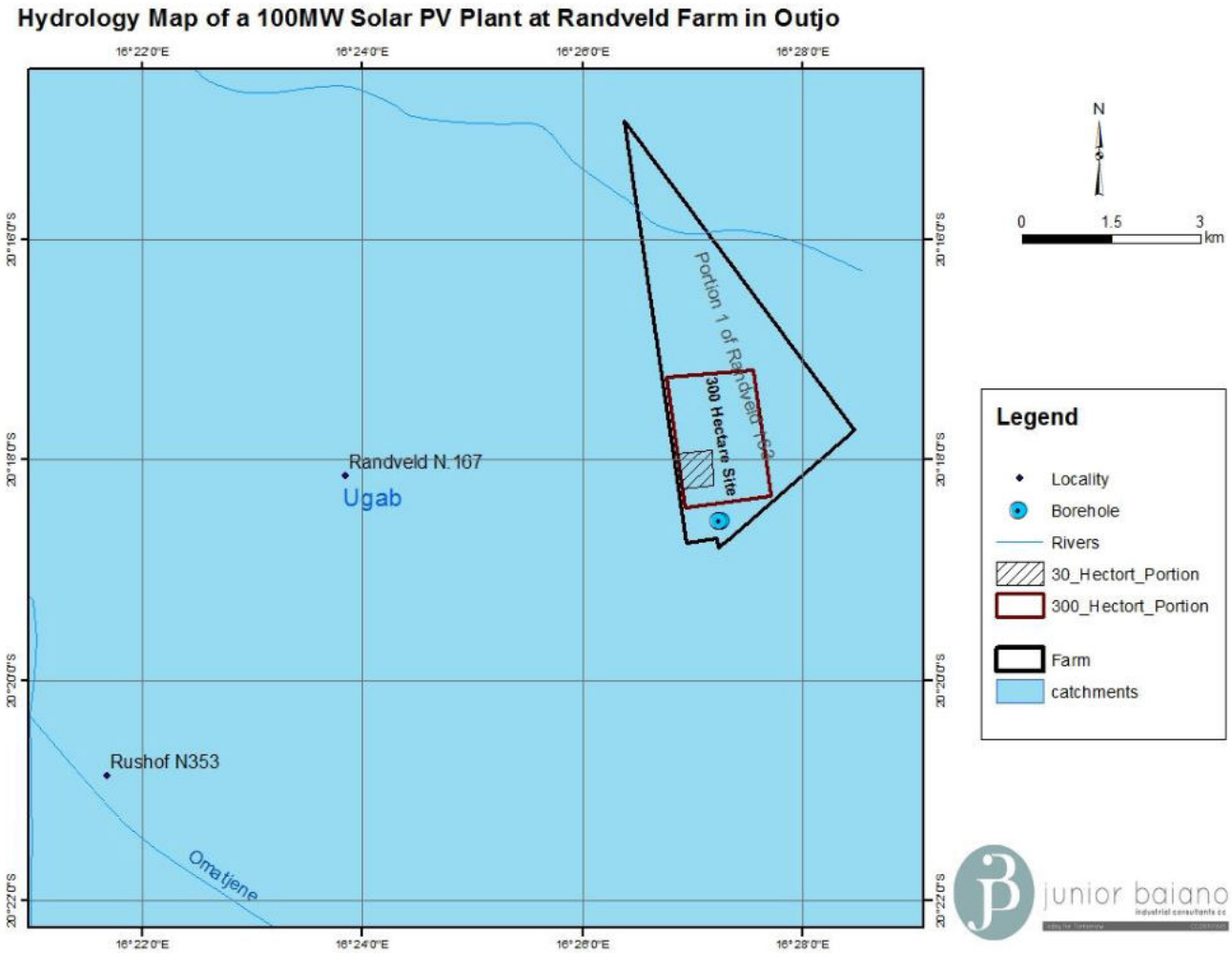


Figure 4-6: Hydrological map of the study area

4.3.4 Geology

Christelis and Struck Meier, (2001) describes that the rock types of the Damara Sequence fall within the Neoproterozoic age and range from the Namibian (N) to early Cambrian time frame. The author further indicate that a large part of north-western and central Namibia is underlain by a variety of carbonate and meta-sedimentary rocks of the Damara Sequence. The Damara Sequence has been divided into a Northern and Southern Fancies (Christelis and Struck Meier, 2001):

a) **Northern Fancies –** typical deposition of platform carbonate rocks.

b) **Southern Fancies –** variety of meta-sedimentary rocks (schist and quartzite) with interbedded marble bands. Variable depositional conditions.

The northern and southern fancies of the Damara Sequence are divided into three Groups:

(a) **Mulden Group (Nm) –** at the top; phyllite, quartzite, schist, (conglomerate also in north facies)
(b) **Swakop Group –** Southern Facies ; **Otavi Group –** Northern Facies
(c) **Nosib Group (Nn) –** at the bottom; consisting of meta-volcano-sedimentary rocks

Christelis and Struck Meier (2001) went on stating that changes to the Northern Facies are often marked with prominent thrust faulting and older basement rocks (particularly the Huab Metamorphic Complex and Fransfontein Granites around Fransfontein, Otjikondo and Kamanjab). The extent of this change can be roughly followed from Grootfontein (in the east), through Outjo and Khorixas, from where it turns to the north through Sesfontein up to the Kunene River (Christelis and Struck Meier, 2001).

The Northern Facies is distinguished from the Southern Facies by having the predominant dolomite and limestone of the Otavi Group sandwiched between the Nosib and Mulden Groups Christelis and Struck Meier, 2001). The stratigraphic succession of the Otavi Moutainland (Northern Facies) is illustrated below.

Table 4-3: Stratigraphic succession of the Otavi Moutainland or Northern Facies (Christelis and Struck Meier, 2001)

System	Sequence	Group	Subgroup	Formation	Lithology	Average thickness [m]	Hydrogeological significance	
Quaternary, Tertiary	Kalahari (< 65 Ma)			**Karst Phase IV (34 000 to 14 000 a BP)**				
				Recent, Andoni	Aeolian sand, calcrete	20	Not considered	
				Disconformity (130-65 Ma), Karst Phase III				
Cretaceous, Jurassic, Triassic,	Karoo (300-130 Ma)			Rundu (Kalkrand)	Dolerite dykes in TKA	n/a	Vertical Conduit	
				Etjo	Aeolian sandstone	not pres.	n/a	
Permian, Carboniferous, Devonian, Silurian, Ordovician, Cambrian				Omingonde	Conglomerate, grit, mudstone	not present	n/a	
	Disconformity (550-300 Ma), Karst Phase II							
Namibian	Damara	Mulden (570-550 Ma)		Owambo	Marl, sandst., siltst., shale, limest., dolomite	not present	Aquitard MGA	
				Kombat	Phylitte, dolomite, conglomerate, shale	> 500		
				Tschudi	Arkose, grit, conglomerate, argillite	> 700		
		Disconformity (760-570 Ma), Karstic Phase I						
		Otavi (830-760 Ma)	Tsumeb	Hüttenberg	Dolomite, shale, chert	840	Aquifer	ODA
				Elandshoek	Dolomite	> 1200		
				Maieberg	Dolomite	180		
					Limestone, shale beds	700	Aquitard	
				Chuos	Quartzite, tillite, shale	200		
			Disconformity					
			Abenab	Auros	Dolomite, limestone	200	Aquifer	ODA
					Marl, shale	50	Aquitard	
				Gauss	Dolomite	750	Aquifer	
				Berg Aukas	Dolomite, limestone, shale	550		
		Disconformity (840-830 Ma)						
		Nosib (950-840 Ma)		Varianto (Ghaub)	Mixtite, quartzite	1200	Aquitard	
				Askevold	Phyllite, agglomerate			
				Nabis	Quartzite, arkose, conglom., schist, phyllite			
Mokolian		**Disconformity (1500-950 Ma)**						
		Grootfontein Basement Complex (Metamorphic Complex) (1580 Ma)			Granite, gneiss, shist, meta-gabbro (Grootfontein, Berg Aukas)	n/a	Aquiclude / Aquitard at shallow depth	

According to figure 2 below, the Damara Super group and Gariep Complex are comprised of schists, dolomites and calcrete. The Damara Igneous Province is comprised of some limestone and sandstones.

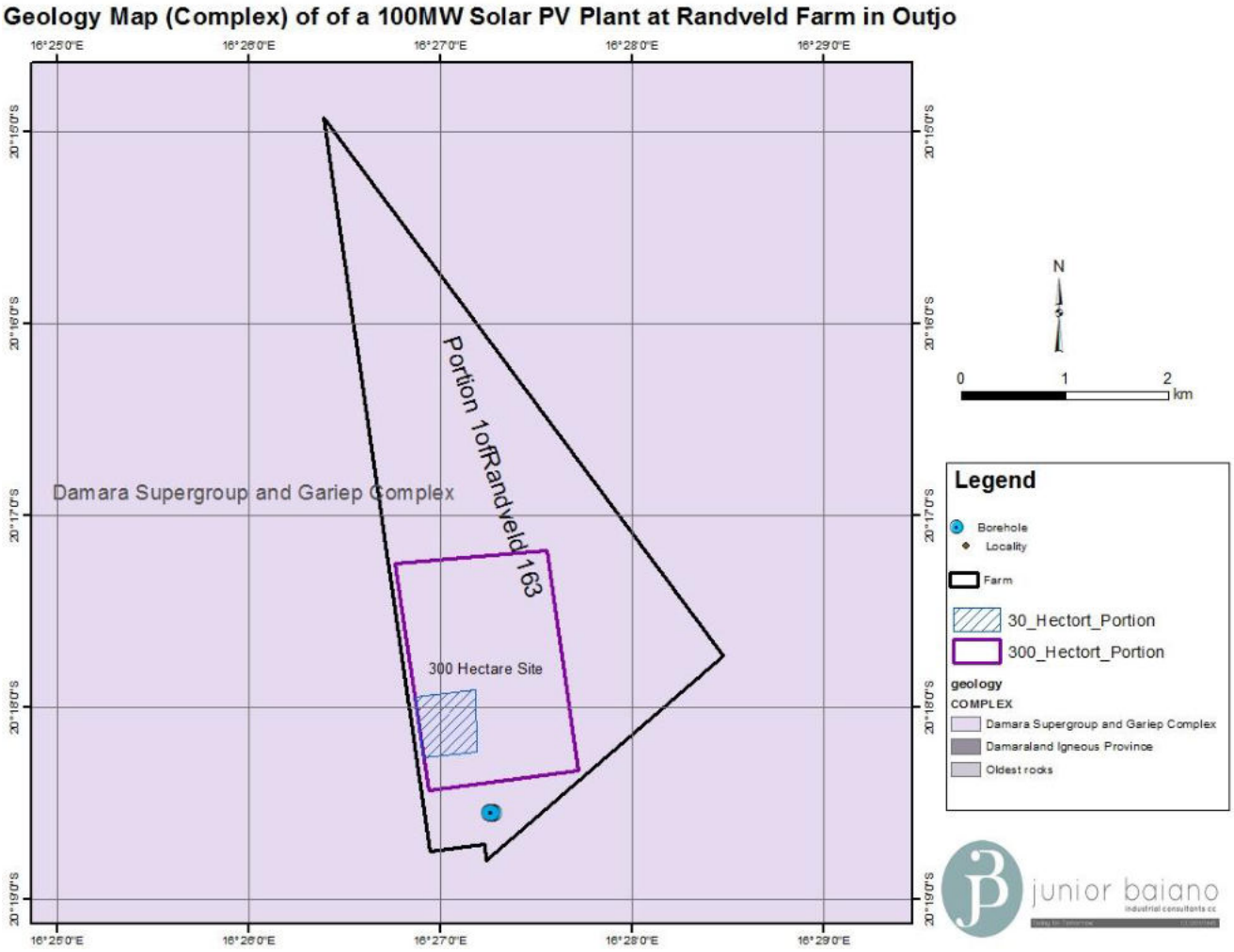


Figure 4-7: Geology of the study area

4.3.5 Hydrogeology

Because of the metamorphism and recrystallization of minerals within the rocks, primary porosity in most of the rocks of the Damara Sequence has been obliterated. However, the folding and faulting, which has occurred, has caused fracturing, particularly in the quartzite, which can present favourable secondary porosity and aquifers. Marble bands in the Swakop Group are often certified in places to present solution cavities that contain

fair amounts of groundwater, e.g. the Otjiwarongo Marble Aquifers. By far the most important aquifers of the Damara Sequence are the Karst Aquifers in the Otavi Group. However, the geology of the site is mainly schist which is characterized as groundwater potential of rock body which is generally low potential, and locally moderate potential (Christelis and Struck Meier, 2001). Table 4-4 shows the aquifers, aquitards, and aquiclude in the study area.

Table 4-4: Aquifers, aquitards and aquiclude in the study area (Christelis and Struckmeier, 2001)

Name of aquifers and aquitards character	**Maximum thickness [m]**	**Lithology**		**Formation, Subgroup, Group**	**Groundwater quality and vulnerability**
Mulden Group Aquitards, MGA (fractured, partly confined)	4200	Sandstone, quartzite, limestone, dolomite	Siltstone, shale	Owambo, Kombat, Tschud	Saline (depth: 430 to 670 m) to slightly brackish (at shallow depth, Okaukuejo)
Otavi Dolomite Aquifer, ODA (fractured, partly karstic, partly confined)	4000	Dolomite, limestone	Shale, clay, schist	Tsumeb Subgroup	Fresh
	2000			Abenab Subgroup	Fresh (Otjuvasandu)
Nosib Group Aquitards	1200	n/a	Mixtite, sandstone, quartzite, conglomerate	Varianto, Nabis	n/a
Basement Aquiclude, (aquitards at shallow depth)	n/a	n/a	Granite, gneiss, meta-sediments, meta-volcanic	Fransfontein Granitic Suite, Khoabendus Gr.	Poor quality at Otjuvasandu

4.3.6 Depth, Rest Water Level (RWL), and yield for boreholes in the proximity of the site

The boreholes in the 5km radius around the site have a depth ranging from 49 to 159m, the RWL was established from 38 to 46m, five boreholes do not have RWL records, and the yield for all boreholes range from 0 to 41m^3/h with WW89047 borehole recorded a

highest yield of 41m^3/h and is regarded as being very productive (Table 4-5). The rest of the boreholes have recorded a yield of 0 to 3.6m^3/h, the yield of 0 to 1 is considered as very poor yields.

Table 4-5: Depth, Rest Water Level (RWL), and yield for boreholes in the 5 km radius around the study area (Arc Information Coverage for DWALR, 2022)

Borehole Number	Latitude	Longitude	Depth (m)	RWL (m)	Yield (m^3/h)
WW89047	-20.3584	16.4313	67	n/a	41.
WW80513	-20.3206	16.4748	93.7	n/a	0.3
WW80526	-20.3246	16.502	49	38	0.6
WW69170	-20.3272	16.5137	76	46	0.4
WW69169	-20.2881	16.501	60	n/a	3.3
WW24129	-20.2772	16.4702	91.5	45.8	3.6
WW80521	-20.2602	16.4702	159	n/a	1.5
WW80519	-20.2964	16.4256	n/a	n/a	1
WW80517	-20.2915	16.4035	85	46	0

4.4 Biodiversity and Ecosystem Services

4.4.1 Biodiversity Assessment Methodology and Approach

The impact on the proposed construction and operation of 120 MW Merchant Solar Photovoltaic plant on Gerus Farm, within the district of Outjo in Kunene region was undertaken during the site visit, which included ground trothing, field reconnaissance and mapping of the proposed area which were conducted in early December 2022 and a thorough botanical assessment was carried out within the proposed area by means of field observations, recording and collecting specimens where it deems necessary.

The assessment was further augmented with the use of a species lists of plants occurring within the quarter degree squares (2116AD) which was extracted from the database, Botanical Research and Herbarium Management System (BRAHMS) housed at the National Botanical Research Institute (NBRI) in Windhoek. The protection status and conservation categories of the plants were extracted from A Checklist of Namibian

Indigenous and Naturalized Plants, Occasional Contribution No. 5, field guide by Mannheimer, C. & Curtis, B. A. (eds) 2009; Le Roux and Müllers Field Guide to Trees and Shrubs of Namibia.

4.4.2 Impacts on flora

The proposed construction and operation of the Solar PV plant will take place at Farm Gerus about 30 Km west of Otjiwarongo and approximately 30 Km east of Outjo in Otjozondjupa Region. Access to the proposed Solar PV project will be gained from the existing track which branch out from the B1 main into the Farm. The proposed area is falling under the tree and shrub vegetation type and more specifically in Thornbush Savanna as shown in the vegetation map below.

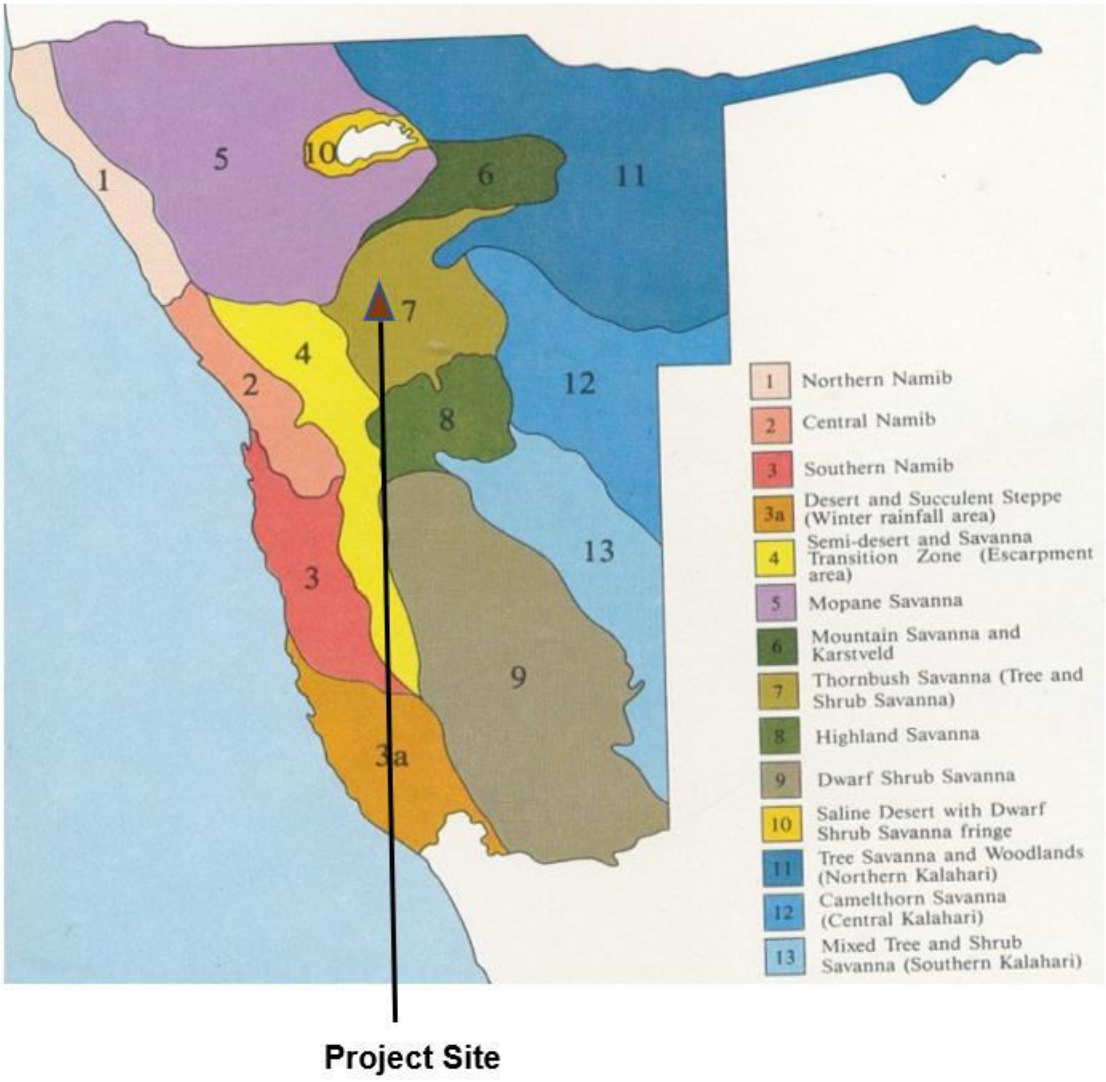


Figure 4-8: The proposed 120MW Photovoltaic Solar Plant falls within the Thornbush Savanna (Tree and Shrub Savanna) vegetation type (Giess 1971).

The area is typically predominated by species such as

- *Acacia mellifera* (*Senegalia mellifera*),
- *Acacia tortilis (Vachellia tortilis),*
- *Acacia erioloba (Vachellia erioloba),*
- *Boscia albitrunca,*
- *Catophractes alexandri*,
- *Dichrostachys cinerea*,

- *Zizphus mucronata, Acacia erioloba,*
- *Acacia hebeclada subsp. hebeclada,*
- *Lycium bosciifolium,*
- *Pechuel-Loeschea leubuitziae* and
- *Laggera decurrens*.

This is not a key habitat as this is the common landscape vegetation in the area with the main species occurring in abundance.

Table 4-6: Indigenous plant species encountered during the botanical assessment; augmented with a plant list extracted from the WIND Herbarium database in Windhoek.

Species	Occurrences	Protection Status	Conservation Categories
Acacia hebeclada subsp. hebeclada	√	-	-
Ziziphus mucronata	√	-	F
Acacia erioloba	√	-	F
Acacia mellifera subsp. detinens	√	LC	-
Acacia tortilis subsp. heteracantha	√	-	-
Catophractes alexandri	√	-	-
Dichrostachys cinerea	√	-	-
Lycium bosciifolium	√	-	-
Pechuel-Loeschea leubuitziae	√	-	-
Laggera decurrens	√	-	-
Boscia albitrunca	√	-	F
Rhigozum brevispinosum	√	-	-
Dipcadi longifolium	√	-	-
Tapinanthus oleifolius	√	LC	-
Persicaria limbata	√	-	-

Species	Occurrences	Protection Status	Conservation Categories
Pupalia lappacea var. lappacea	√	-	-
Commicarpus decipiens	√	LC	E
Hypertelis bowkeriana	√	LC	-
Aizoon virgatum	√	-	-
Talinum caffrum	√	-	-
Lepidium africanum subsp. divaricatum	√	-	-
Antizoma angustifolia	√	LC	-
Cleome angustifolia subsp. petersiana	√	-	-
Cleome rubella	√	-	-
Crassula lanceolata subsp. transvaalensis	√	-	-
Montinia caryophyllacea	√	-	-
Tylosema esculentum	√	-	-
Elephantorrhiza suffruticosa	√	-	-
Crotalaria argyraea	√	-	-
Indigofera rautanenii	√	NE	L
Requienia sphaerosperma	√	-	-
Hermannia modesta	√	-	-
Melhania damarana	√	-	-
Ozoroa paniculosa var. salicina	√	-	-

KEY: LC – Least Concern; **E**- Endemic; **NE**- Near - Endemic; **P**-Protected, **F** – Forestry; protected under Forestry Act (Act 12 of 2001).

The area is well-vegetated and has a relatively high species diversity. The Acacia species are quite conspicuous in the area and have been frequently recorded on the Farm and

surrounding area. Some of the species such as *Boscia albitrunca, Acacia erioloba* and *Ziziphus mucronata* are protected under the Forest Act 12 of 2001, therefore if these are found, were possible, any damage or removal of such species should be avoided by all means. Any removals of the protected species should be subjected to a permit from Directorate of Forestry in the Ministry of Environment, Forestry and Tourism (MEFT).

Image 4-1: General area for the proposed 120 MW Merchant Solar Photovoltaic plant dominated by Acacia species (HEEC, Dry season December 2022)

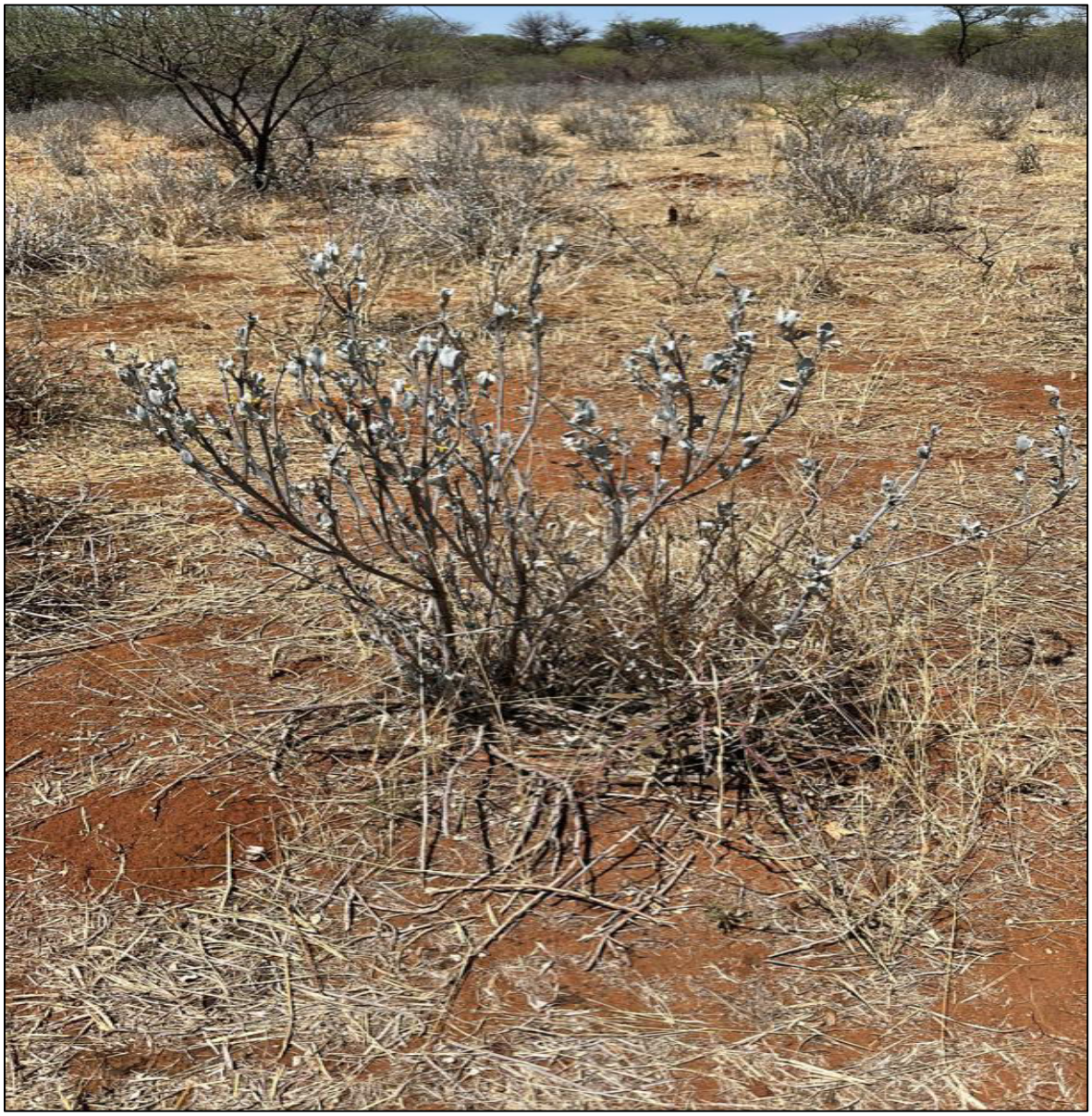


Image 4-2: Catophractes alexandri (dominant shrub) recorded in the area (HEEC, Dry season December 2022).

Some of the species recorded in the area are useful in a sense that they are used as medicinal plant and fodder for animals. Species such as *Ziziphus mucronata* recorded in the area have some medicinal properties. According to Hedimbi & Chinsembu (2012), this species is known to have some therapeutic potential, as it can cure gonorrhea. The dried fruits of *Ziziphus mucronata* can be used to produce a common distilled alcoholic beverage which is sold at the informal market (Nantanga *et al.* 2018). Precautionary

measures should be taken to circumvent the removal of useful indigenous and protected plants in the area.

Image 4-3:Ledebouria revoluta sprouting in abundance in the proposed area after the recent rainfalls (HEEC CC, wet season January 2023)

Laggera decurrens is quite abundant in the project area. Traditionally the plants in the genus *Laggera* are imperative resources for the treatment of various illness which entails serious or acute diseases. These genera have species which possess distinct pharmacological and biological activity (Getahun *et al*. 2019). Therefore, this species should be considered significant in the livelihood of the local people, although it is abundant in the vicinity, it should be preserved and highlighted in the vegetation management of the area.

Ledebouria revoluta (common African hyacinth), recorded as being the most widely distributed species in South Africa and probably in the world. The species is recorded to

occur in the following countries: Angola, Botswana, Chad, Eritrea, Ethiopia, India, Kenya, Malawi, Namibia, Socotra, Somalia, Sri Lanka, Sudan, Swaziland, Tanzania, Uganda and Yemen. The species is common in many different vegetation types and is most commonly found in South Africa in savanna and grassland.

The genus *Ledebouria* has been cited as having been used medicinally for purposes including pregnancy, diarrhoea, influenza, backache, skin irritations, wound treatment as well as lumbago. The genus is also reported as being poisonous, although it is also reported that bushmen ate the bulbs of certain species, including *L. revoluta* and *L. apertiflora*. However, these may have been cooked or prepared in some manner to destroy the toxins, which is not specifically documented. Despite the fact that some large ungulates do browse the leaves, the entire genus should be regarded as being poisonous. (https://pza.sanbi.org/ledebouria-revoluta , accessed January 2023).

Image 4-4:Hermbstaedtia odorata (Burch) T. Cooke in flower and abundant in the proposed area of the 120 MW Merchant Plant at Farm Gerus (HEEC CC, wet season January 2023)

Hermbstaedtia odorata (Burch) T. Cooke (cat's tail) is of least concern since it is widespread, common and not in danger of extinction. The native range of this species is S. Tropical & S. Africa. It is a tuberous geophyte and grows primarily in the seasonally dry tropical biome.

4.4.2.1 Mitigation

The impact on vegetation will be insignificant because it will be localized. Most of the vegetation occurring in the project area have no conservation concern and have a wide-ranging distribution around the country, however, they ecological value should not be undermined. Therefore, with appropriate vegetation management as outlined in the EMP, negative impacts on vegetation will be avoided. Special conservation measures should be undertaken to preserve the protected plants species. All the protected plants and endemic species in the surrounding area proposed construction and operation of 120 MW

Merchant Solar Photovoltaic plant should be identified and avoided during construction phase and beyond. A sound vegetation management plan should be formulated and local nurseries in the town of Otjiwarong and Outjo, should be approached to source indigenous plants in order to compensate for the lost vegetation.

4.4.2.2 Monitoring

Stringent vegetation monitoring during the construction and operation of 120 MW Merchant Solar Photovoltaic plant should be implemented to ensure that protected and endemic species are not destroyed. The proponent should commission a long-term vegetation monitoring to determine the impacts on vegetation as a result of construction and operation of 120 MW Merchant Solar Photovoltaic plant.

4.4.2.3 Value of plant resources on the project site

The value of plants found in the study area is rated as poor or low and this is based on a scale of the relative plant species abundance of resources in Namibia. There are basically three measures of value of plant resources used:

- Relative abundance of hardwoods used for timber and firewood,
- Grazing for livestock and wildlife
- Browse for livestock and wildlife

The overall decision was made based on the location of the proposed 120 MW Merchant Solar Photovoltaic plant location which will have vegetation loss limited only to the construction phase. They are specified land parcels or paddocks that are dedicated for grazing or browsing of livestock and wildlife on Farm Gerus.

4.4.3 Alien Plants Assessments

The alien plants were taken into consideration during the botanical assessment and there were not any records of alien species.

4.4.3.1 Mitigation

The proponent should implement an alien plants awareness campaign to educate and sensitize the employees and the local community on the menace of planting alien

vegetation in the area. Educational materials should be disseminated and made available to all the schools in Otjiwarongo and Outjo.

4.4.3.2 Monitoring

There should be an unremitted monitoring program of the alien plants in the area. The proponent should adopt and support the implementation of an annual alien plants clearing campaign. If possible, the proponent and the local community should establish an alien plant task force to ensure that there are no alien plants species invading the area.

4.4.4 Fauna Diversity

The area has different animals such as Kudu, Springbok, and other small antelopes. The presences of wild animals such as Kudu can induce employees to engage in illegal hunting, therefore rigorous measures should be in place to dismay such practices. The likelihood of the baboons being present in the area can potentially cause threat to workers during operation.

Image 4-5: Scats from the antelope roaming the area (HEEC 2022)

4.4.4.1 Mitigation

Illegal hunting of game animals such as Kudu is a criminal offence which can results in imprisonment, hence any crime related to illegal hunting should be reported to the law-enforcement unit in the area and legal action should be taken against the perpetrators. The proponent should ensure that there is no left-over food at the site to avoid stray dogs and baboon to scavenge for food.

4.4.4.2 Monitoring

The proponent in conjunction with the line ministry will should implement a well-coordinated research program to authenticate the wild animals present in the area and explore scientific measures that best suits the co-existence of construction and operation of green energy infrastructures such as 120 MW Merchant Solar Photovoltaic plant and wildlife management.

4.4.5 Avian Diversity

It is projected that about 676 species of birds have been recorded in Namibia; which make up about 30% of bird population in Africa and 6% of the global avian fauna. The following are the birds that were observed or encountered in the area during the field reconnaissance survey in August 2020. This was amplified with the use of Kenneth Newman, 2000. Newmans Birds by Colour, Southern Africa Common Birds. Arranged by Colour, Struik New Holland Publishing (Pty) Ltd 2000. Since birds have no trans-boundaries, this list is not exhaustive;

4.4.6 Avifauna interactions

Solar plants are relatively new in Namibia and their effects on biodiversity have been scarcely documented on a local scale, impacts are associated with the habitat transformation and wildlife mortality (Lovich and Ennen 2011 ; Hernandez et al. 2014 Avian mortalities at a 10 MW concentrating solar thermal power plant in California, USA averaged 1.9–2.2 individuals per week, and were mainly caused by collision with site infrastructure (81 %), particularly with heliostats, and to a lesser degree, burning when heliostats were oriented towards standby points (19 %), especially for aerial foraging species (McCrary et al. 1986). However, such incidences have not been reported locally

(2116AD) and in any case not with Solar PV installations and it is mainly due to differences in the types of technology since heliostats are used in CSP plants while the proposed project will utilize a tracker mounted photovoltaic system.

The direct contact of birds with project structure has occasionally been documented at solar projects of all technology types. The birds may not be killed but injured and eventually succumb to predation because of its compromised physical state.

Another extremely rare but potentially related problem is the so-called “lake effect” i.e., it seems possible that reflections from solar facilities' infrastructure, particularly large sheets of dark blue photovoltaic modules, may attract birds in flight across the open desert, who mistake the broad reflective surfaces for water (Kagan et al. 2014).

Table 4-7: Birds recorded in the vicinity.

Scientific name	Common name	Namibia Status
Agapornis roseicollis	Rosy-faced Lovebird	Endemic
Apus bradfieldi	Bradfield’s Swift	-
Cypsiurus parvus	African Palm Swift	-
Streptopelia senegalensis	Laughing Dove	-
Oena capensis	Namaqua Dove	-
Pterocles namaqua	Namaqua Sandgrouse	-
Falco rupicolus	Rock Kestrel	-
Falco chicquera	Red-necked Falcon	-
Corvus albus	Pied Crow	-
Hirundu albigularis	White-throated Swallow	-
Hirundo dimidiata	Pearl-breasted Swallow	-
Hirundo cucullata	Greater Stiped Swallow	-
Hirundo semirufa	Red-breasted Swallow	-
Pycnonotus nigricans	African Red-eyed Bulbul	-
Eremomela icteropygialis	Yellow-bellied Eremomela	-
Prinia flavicans	Black-chested Prinia	-
Mirafra passerina	Monotonous Lark	-
Mirafra africana	Rufous-naped Lark	-
Mirafra fasciolata	Eastern Clapper Lark	-
Mirafra sabota	Sabota Lark	-
Calendulauda africanoides	Fawn-coloured Lark	-
Chersomanes albofasciata	Spike-heeled Lark	-
Certhilauda benguelensis	Benguela Long-billed Lark	-

Scientific name	Common name	Namibia Status
Eremopterix leucotis	Chestnut-backed Sparrowlark	-
Eremopterix verticalis	Grey-backed Sparrowlark	-
Calandrella cinerea	Red-capped Lark	-
Alauda starki	Stark's Lark	-
Bradornis infuscatus	Chat Flycatcher	-
Namibornis herero	Herero Chat	-
Nectarinia fusca	Dusky Sunbird	-
Bualornis niger	Red-billed Buffalo-Weaver	-
Philetairus socius	Sociable Weaver	-
Ploceus rubiginosus	Chestnut Weaver	-
Quelea quelea	Red-billed Quelea	-
Estrilda astrild	Common Waxbill	-
Vidua paradisaea	Long-tailed Paradise - Whydah	-
Vidua regia	Shaft-tailed Whydah	-
Passer domesticus	House Sparrow	-
Passer motitensis	Great Sparrow	-
Passer melanurus	Cape Sparrow	-
Passer griseus	Southern Grey-headed Sparrow	-
Anthus similes	Long-billed Pipit	-
Serinus alario	Black-headed Canary	-
Crithagra atrogulariis	Black-throated Canary	-
Serinus flaviventris	Yellow Canary	-
Serinus albogularis	White-throated Canary	-
Emberiza capensis	Cape Bunting	
Emberiza flaviventris	Golden-breasted Bunting	-

One of the bird species known to occur in the area; *Agapornis roseicollis* (Rosy-faced Lovebird) which is an endemic species to Namibia. The reminders of the bird species known to occur in the area have no conservation concerns. The proposed project will have minimal impact on the bird's life; provided that there is no clearing of vegetation in the area. The likely negative impacts associated with this project towards the birds is presumably the disturbance on their daily activities due to noise emitted by equipment's and machineries during the construction phase.

The proposed land parcel is in an open ground and no bats were encountered during the site visit as this is not a suitable bat habitat.

4.4.6.1 Likely impacts and key impacts identified

Indirect impacts (Physical disturbances of birds and destruction of bird habitats) - There will be limited disturbances to birds habitats during construction and operation of the 120 MW Merchant Solar Photovoltaic plant, on condition that the proponent only focus on the targeted area and avoid the destruction of vegetation considered to be the breeding and resting habitat for birds. The birds occurring in the proposed areas will be exposed to interference while carrying out their daily activities for instance feeding, roosting, nesting and even breeding due to excessive noise emitted by equipment.

4.4.6.2 Mitigation

There should be limited movement of machineries and equipment in the area to avoid interference on the daily activities of the birds. The machineries and equipment which emits excessive noise should be limited and restricted to certain hours only and should not be performed throughout the day. No operation of any kind should be allowed after dusk. The environmental control officer should be actively on-site to avoid accidental and thoughtful interruption on the daily activities of birds.

4.4.6.3 Monitoring

Any bird mortality should be recorded by the environmental control officer (s) on-site or the project manager. If possible, encountered bird kills and nest removal should be registered in a biodiversity database and information should be made available to the general public.

4.4.7 Reptile Diversity

According to Griffin (1998a), about 261 species of reptiles are known to occur in Namibia. The proposed area and its surrounding have a relatively diverse species of reptile and some of the species are endemic to the country. The following are the reptiles likely to occur in the general area.

Table 4-8: Reptiles known to occur in the area.

Scientific name	Common name	Occurrence (√)	Conservation Status
Snakes			
Rhinotyphlops schlegelii	Schlegel's Beaked Blind Snake	√	-
Leptotyphlops scutifrons	Peters Thread Snake	√	-
Python natalensis	Southern African Python	√	Vulnerable
Atractaspis bibronii	Southern or Bibron's Burrowing Asp	√	-
Amblyodipsas ventrimaculata	Kalahari Purple-glossed snake	√	-
Xenocalanus bicolor	Bicoloured Quill-snouted Snake	√	-
Xenocalanus mechowii	Elongate quill-snouted snake	√	-
Lamprohis fuliginosus	Brown House Snake	√	-
Lycophidion capense	Cape Wolf Snake	√	-
Pseudaspis cana	Mole Snake	√	-
Prosymna bivittata	Two-striped Shovel-snout	√	-
Prosymna frontalis	South-western Shovel-snout	√	-
Dipsina multimaculata	Dwarf Beaked Snake	√	-
Psammophylax tritaeniatus	Striped Skaapsteker	√	-
Psammophis notostictus	Karoo sand Snake or Whip Snake	√	-
Psammophis leightoni trinasalis	Fork-marked sand snakes	√	-
Psammophis leopardinus	Leopard Grass Snakes	√	Endemic
Philothamnus semivariegatus	Spotted Bush snake	√	-
Dasypeltis scabra	Common or Rhombic Egg Eater	√	-
Telescopus polystictus	Eastern Tiger Snake	√	Endemic
Dispholidus typus	Boomslang	√	-
Aspidelaps lubricus infuscatus	Coral Snake	√	Endemic
Aspidelaps scutatus	Shield-nose Snake	√	-
Elapsoidea sunderwallii	Sundevall's Garter Snake	√	Endemic

Scientific name	Common name	Occurrence (√)	Conservation Status
Naja annulifera/anchietae	Snouted Cobra	√	-
Naya nigricincta	Black-necked Spitting Cobra	√	Endemic
Dendroaspis polylepis	Black Mambas	√	-
Bitis arietans	Puff Adder	√	-
Bitis caudalis	Horned Adder	√	-
Tortoises (Geochelone)			
Geochelone paradalis	Leopard Tortoise	√	-
Psammobates oculiferus	Serrated or Kalahari Tortoise	√	-
Lizards			
Zygaspis quadradrifrons	Kalahari Round-headed Worn Lizard	√	-
Monopeltis infuscata	Dusky Spade-snouted Worm Lizard	√	-
Heliobolus lugubris	Bushveld Lizards	√	-
Ichnotropis squamulosa	Common rough-scaled lizards	√	-
Nucras intertexta	Spotted Sandveld Lizard	√	-
Pedioplanis lineoocellata	Spotted Sand Lizard	√	-
Pedioplanis namaquensis	Namaqua Sand Lizard	√	-
Gerrhosaurus validus	Giant Plated Lizard	√	Endemic
Skinks (Scincidae)			
Acontias percivali	Percival's legless skink	√	-
Lygosoma sunderalli	Sundevall's Writhing Skink	√	-
Trachylepis capensis	Cape Skink	√	-
Mabuya occidentalis	Western Three-striped Skink	√	-
Mabuya spilogaster	Kalahari Tree Skink	√	-
Mabuya striata wahlbergii	Striped Skink	√	-
Mabuya sulcata	Westen Rock Skink	√	-
Mabuya variegata	Variegated Skink		

Scientific name	Common name	Occurrence (√)	Conservation Status
Monitors (Varanidae)			
Varanus albigularis	Rock or White-throated monitor	√	-
Agamas (Agamidae)			
Agama aculeata	Ground Agama	√	-
Agama anchietae	Anchietae Agama	√	
Agama planiceps	Namibian Rock Agama	√	Endemic
Chameleons (Chamaeleonidae)			
Chamaeleo dilepis	Flap-neck Chameleon	√	-
Geckos (Gekkonidae)			
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	√	Near-Endemic
Pachydactylus bicolor	Velvety Thick-toed Gecko	√	Endemic
Pachydactylus capensis	Cape Thick-toed Gecko	√	-
Pachydactylus turneri	Turner's Thick-toed Gecko	√	-
Pachydactylus punctatus	Speckled Thick-toed Gecko	√	-
Pachydactylus rugosus rugosus	Rough Thick-toed Gecko	√	-
Ptenopus garrulus garrulus	Common Barking Gecko	√	-

The general area of Farm Gerus, where the proposed project will take place have a relatively high species diversity of reptiles due to the availability of appropriate habitats in the area. Although the proposed project will take place on piece of land considered to be less ecologically sensitive, the impact on reptiles is likely to transpire. The possibility of vibration caused by the movement of equipment's that will be used during stripping and excavation process will be detrimental to reptile in the proposed area. Some of the reptile species occurring in the general area of the photovoltaic plant includes; *Python natalensis*, which is vulnerable, and it should be noteworthy that its non-venoms and only kills by constricting and coiling prey. A significant number of species known to occur in

the area are endemic to Namibia. Only one species is near-endemic, while the rest of the species occurring in the general area have no conservation concern.

4.5 Natural and Cultural Heritage

This section gives summary of the natural and cultural heritage study findings that was conducted for the proposed project. A detailed natural and cultural heritage study for the site was undertaken and this is attached in the Environmental Management Plan Appendix 3.

4.5.1 Overview of Baseline Environment

A general description of the area under study in terms of physical geology is that it is predominantly flat with little or no rock outcrops. Rock outcrops according to Kinahan (2012) are indicative of archaeological resources mainly rock art. Never the less as a consequence these flat plains might have been used as ancient hunting grounds even though the absence of natural hunting blinds might have made it difficult to remain incognito from prey. Absence of rock outcrops for shelter and habitation does preclude the possibility of this locality as attractive to settlement of ancient hunter gatherers. The colonial times saw these flat plains within Outjo district being settled by European colonial settlers, these were not only attractive for grazing livestock but also cultivation. The surrounding mountains create microclimate that makes rainfall around the plains above the regional average which idle for crop cultivation.

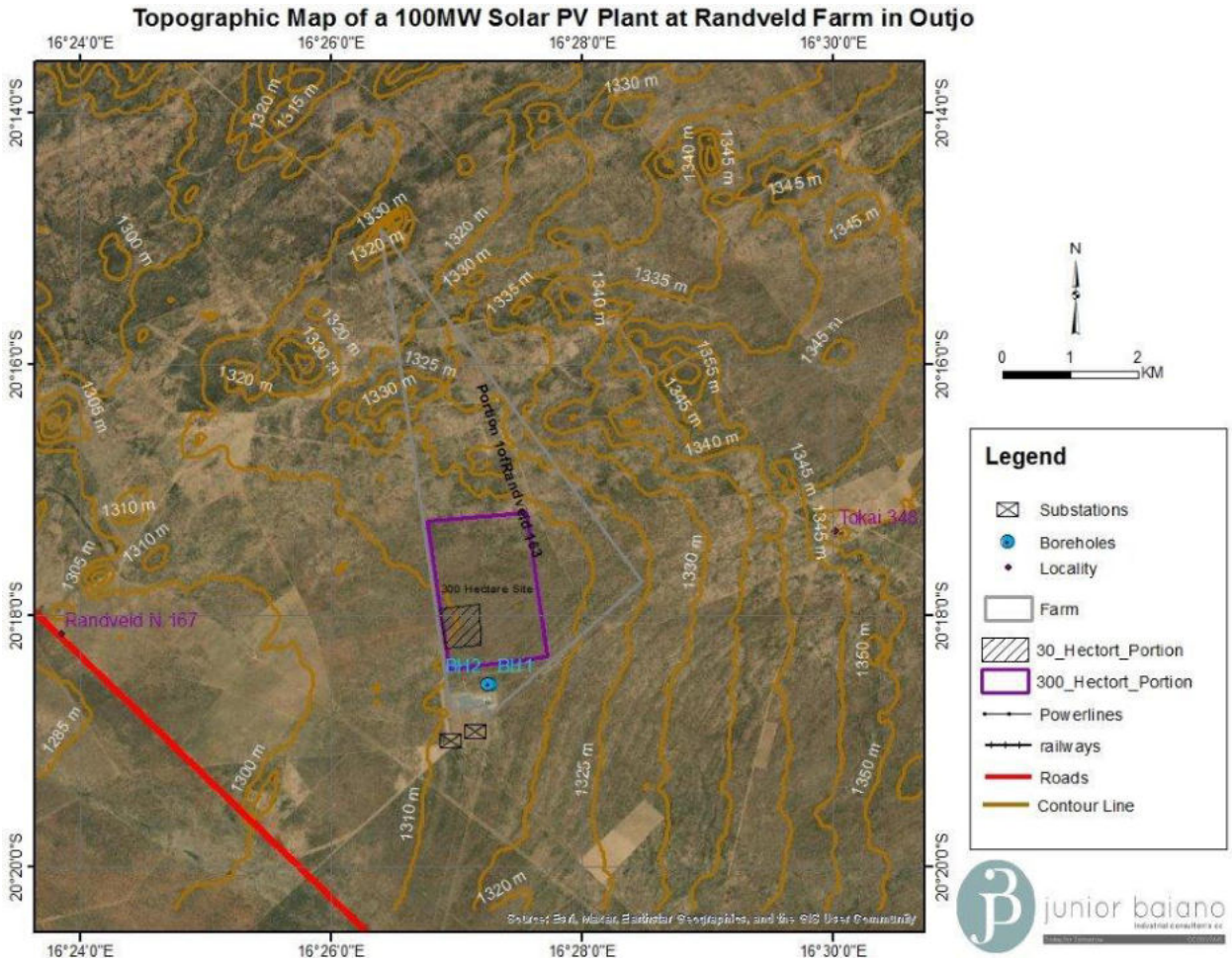


Figure 4-9: Topographical layout of the area, note the flat area is highlighted with spaced contours

Desktop study yield the fact that a considerable part of the Kunene region remains archaeologically undocumented because research has concentrated mostly on key major granite landforms which helped establish the sequence of human occupations and determined the relationship between archaeological sites and the particular types of terrain across the landscape. Archaeological surveys from mining and infrastructure-related developmental projects were also useful but were mainly restricted to specific project areas and therefore do not reflect the wider archaeology of the area (Kinahan 2020). Nevertheless, the region's archaeological wealth is evidenced in a substantial number of prehistoric human settlements dating from the Early through Middle to Late Stone Age periods.

The earliest evidence of human activity in Central Namibia is traced back to 800,000 years Before the Present (BP) according to Kinahan (2011). Multiple sources further attest that an abundance of significant archaeological sites has been recorded within the last 10,000 to 12,000 years, during the Holocene period which coincides with the onset of warmer and moist conditions after the retreat of the last Ice Age period which led to the sudden expansion of human occupation as aridity intensified in the entire central Namib Desert and hinterland (Stout *et al*. 2000; Kinahan 2020; 2021; Nakala 2007; Messengers 2007).

4.5.2 Findings at the Proposed Project Site

The natural and cultural heritage findings at the proposed project area are summarised in the table below.

Table 4-9: Findings at the Proposed Project Site

Heritage resources	**Status/findings**	**Level of impact by proposed constructions**
Buildings, structures, and places of cultural significance	None	None
Areas to which oral tradions are attached or which are associated with intangible heritage	None	None
Historical buildings	None	None
Landscapes and natural features of cultural significance	None	None
Archaeological and paleontological sites	None	None
Graves and burial grounds	None	None
Movable objects	None	None

4.5.3 Summary of Chance Find Procedure

In situations where unpredicted impacts occur, construction activities must be stopped and the heritage authority should be notified immediately. Where remedial action is

warranted, minimize disruption in construction scheduling while recovering archaeological data. Where necessary, implement emergency measures to mitigate.

Where burial sites are accidentally disturbed during construction, the affected area should be demarcated as no-go zone by use of fencing during construction, and access thereto by the construction team must be denied. Accidentally discovered burials in development context should be collected and rescued to safe sites as may be directed by relevant heritage authority. The heritage officer responsible should secure relevant heritage and health authorities' permits for possible relocation of affected graves accidentally encountered during construction work.

The detailed proposed chance find procedure for the project is attached in the Natural and Cultural Heritage report attached in the Environmental Management Plan Appendix 3.

4.5.4 Conclusion and Recommendations

The desktop assessment and subsequent field investigation highlighted in this report yielded no heritage resources. The following are recommended to be carried in the course of project operations.

- As part of the standard heritage guidelines, as regulated by the National Heritage Council; during the construction of the proposed solar plant, the proponent to strictly adhere and follow the Chance Finds Procedure.
- All project development be confined to the 300 Hector zone of the farm boundaries.
- The proponent is to utilize the existing access road, to avoid construction of new roads that would encroach on land outside the scope of this heritage assessment reported herein.

4.6 Indigenous People

4.6.1 National Overview

The Indigenous Peoples of Namibia include the San, the Ovatue and Ovatjimba, and potentially a number of other peoples including the Damara and Nama. Taken together,

the Indigenous Peoples of Namibia represent some 8% of the total population of the country (IWGIA, 2022).

Image 4-6: The San

Image 4-7: The Himba

The San (Bushmen) number between 28,000 and 35,000 and account for between 1.045% and 1.33% of the national population. They include the Khwe, the Hai||om, the Ju|'hoansi, the !Kung, the !Xun, the Khwe, the Naro, and the !Xóõ. Each of the San groups speaks its own language and has distinct customs, traditions, and histories. The San were mainly hunter-gatherers in the past but, today, many have diversified livelihoods. Over 80% of the San have been dispossessed of their ancestral lands and resources, and they are now some of the poorest and most marginalised peoples in the country.

The Ovatjimba and Ovatue (Ovatuwa) are largely pastoral people, formerly also relying on hunting and gathering, and who reside in the semi-arid and mountainous north-west of Namibia (Kunene Region). Together, they number some 27,810, representing 1.03% of Namibia's total population (IWGIA, 2022).

The Namibian government prefers to use the term "marginalised communities" when referring to the San, Otavue and Ovatjimba, support for whom falls under the Office of the President in the Division of Marginalised Communities (DMC). The Constitution of Namibia prohibits discrimination on the grounds of ethnic or tribal affiliation but does not specifically recognise the rights of Indigenous Peoples. Namibia voted in favour of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) when it was adopted in 2007 but has not ratified ILO Convention No. 169.

Namibia is a signatory to several other binding international agreements that affirm the norms represented in UNDRIP, such as the African Charter on Human and Peoples' Rights (ACHPR), the Convention on the Rights of the Child (CRC), the International Convention on the Elimination of All Forms of Racial Discrimination (ICERD), and the International Covenant on Civil and Political Rights (ICCPR). Namibia provided a mid-term report to the Human Rights Council's Universal Periodic Review of Namibia in 2021 (IWGIA, 2022).

4.6.2 The Project Area and Indigenous Peoples

Review of project documentation and stakeholder consultation revealed that the area and around the project does not have indigenous people. The map below shows the project site in relation to areas in Namibia where the indigenous peoples dwell. The project is

situated in private farmland. The closest indigenous people (the Himbas and Dhembas) are reported to be about 200km away from the project area. They are said to be in areas such as Kamanjab, Opuwo and Sessfontein.

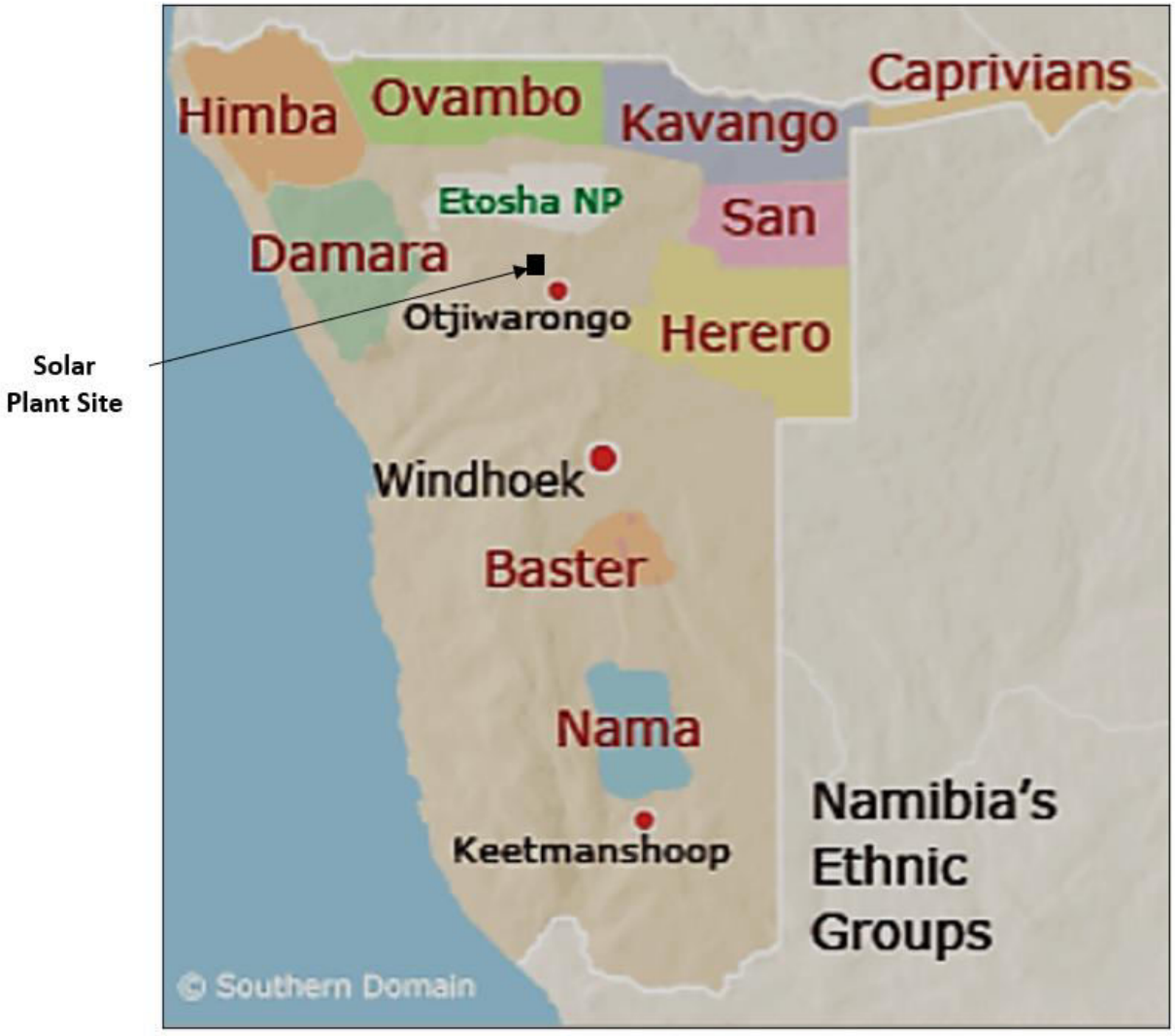


Image 4-8: Namibia Ethic Groups (Source: Hippo Adventure Tours, 15 Oct. 2018)

5 STAKEHOLDER ENGAGEMENT AND CONSULTATION

The public consultation process forms an important component of the Environmental Assessment process. It is defined in the ESIA Regulations (2012), as a "*process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters*" (S1). Section 21 of the Regulations details steps to

be taken during a given public consultation process and these have been used in guiding our process.

Formal public involvement has taken place via public consultations and focal meetings, newspaper announcements to inform the public that such a large-scale project is under consideration. The public consultation process has been guided by the requirements of Environmental Management Act (EMA) No. 7 of 2007 and the process has been conducted in terms of regulation 7(1) as well as in terms of the EMA Regulations of GN 30 of 6 February 2012 and the World Bank ESIA standards and project ToR.

Its overriding goals have been to ensure transparency in decision making and to.

- ✓ Ensure stakeholder concerns are incorporated in project design and planning.
- ✓ Increase public awareness and understanding of the project.
- ✓ Enhance positive development initiatives through the direct involvement of affected people.

5.1 Objectives of the Public Consultation

The overall objective of the public participation is to build credibility through instilling integrity and of conducting the ESIA, Educate the stakeholders on the process to be undertaken and opportunities for their involvement and build stakeholders by establishing an agreed framework accordingly. This requires accessible, fair, transparent and constructive participation at every stage of process. Inform stakeholders on the proposed project and associate issues, impacts and mitigation and using the most effective manner to disseminate information.

Specific objectives of the public consultation process are to:

- Inform stakeholders about the proposed project and obtain stakeholder views, concerns and input.
- Obtain local and traditional knowledge that may be useful in environmental planning and design of the project.

- Provide opportunity for stakeholders to influence project planning and design in a positive manner; and discuss the likely impacts/risks (both positive and negative) of the project.
- Reduce conflict through the early identification of antagonistic issues.

5.2 Public Consultation Methods

The consultation was facilitated through the following means:

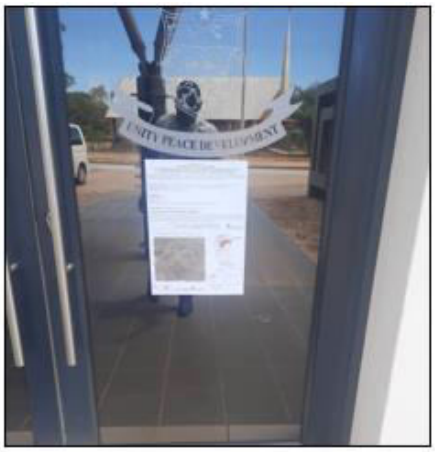
- ❖ A Background Information Document (BID) containing the project description, the ESIA process and an invitation to participate was shared with stakeholders and community members.
- ❖ Invitation to participate notices were published in the local newspapers (New Era and Confidante) as shown in Table 5.1 below and the Environmental Management Plan Appendix 1.
- ❖ Announcement of ESIA process verbally in the common public meeting points.
- ❖ Placement of a public notice at the project site and town centre.

Table 5-1: Details of public notification of the ESIA study

Method	Area of Distribution	Language	Date Placed
The Confidante	Country Wide	English	12 December 2022
Site notices	Project site	English	10 January 2023
	Notice Boards	English	10 January 2023
Public Meeting	Nexus Head Office	English,	22 January 2023

The photos below show the public consultation notice that was placed for project. Also shown are photos that were taken during the site visits as well as the public meeting.

Image 5-1: Public Consultation Meeting held on the 22nd of January 2023



Notices at Otjozondjupa Regional Council in Otjiwarongo

Notices at Woermann, Brock & Co in Outjo

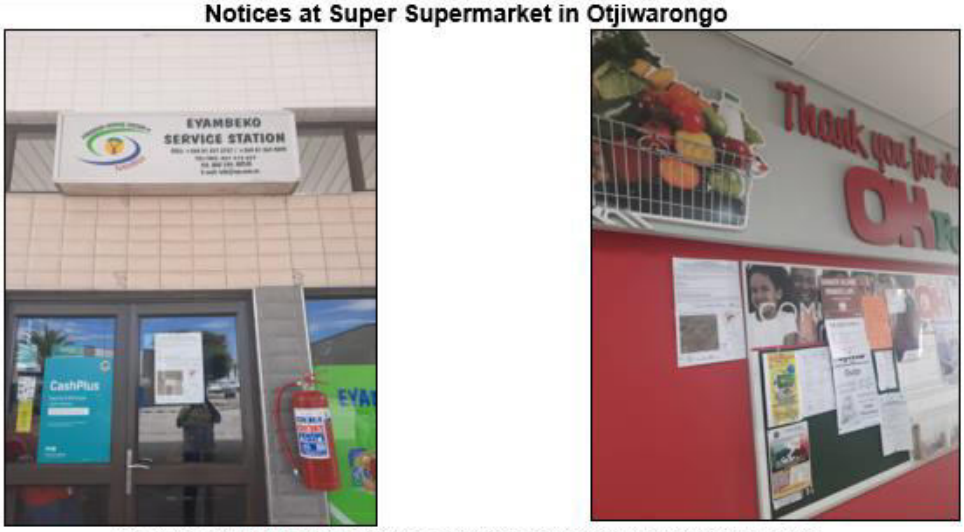
Notices Spar Supermarket in Outjo

Notices at Project the Site

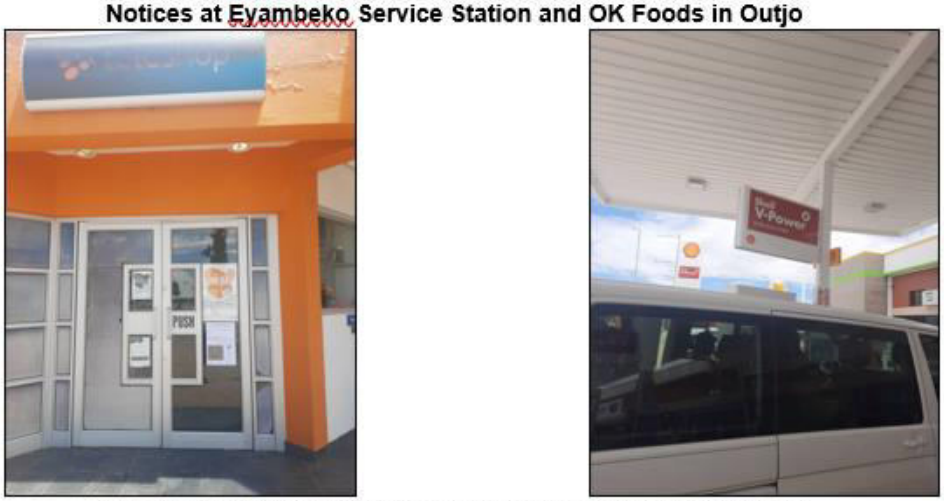
Notices at CENORED in Otjiwarongo

Notices at Midway in Otjiwarongo

Notices at Super Supermarket in Otjiwarongo



Notices at Eyambeko Service Station and OK Foods in Outjo



Notices at Teleshop and Shell Service Station in Otjiwarongo

Image 5-2: Some places where Public Meeting Notices were placed

5.3 Summary of Public Consultation Findings

In this section of the report, the results of consultations with various classes of stakeholders are summarized. The results of consultations with other stakeholders and community members who took part in this ESIA are attached in the Environmental Management Plan Appendix 1.

SUMMARY OF ISSUES	
THEME	**ISSUE**
Economic	• The development is a welcome as it will alleviate energy challenges the nation is facing and improve energy security in local areas i.e., Outjo and Otjiwarongo. • First preference for employment must be given local community members. Otjiwarongo. Due to the high number of local school-leaving students without jobs, this issue requires special attention. • The company must make the social responsibility initiatives in the local community.
Health and Safety	• Waste management concerns including both solid waste and wastewater. Appropriate waste management facilities must be put in place. • The company must ensure that project employees have adequate health care services.
Ecological	• Resources such as air and water should not be polluted during operations because communities, wild animals and livestock rely on these resources.
Communication	• Clear communication needs to be promoted between relevant authorities and the local community particularly with traditional authorities in the area such as those of the Damara, Hoi-llom tribe and Ovashimbas.

6 IMPACT ASSESSMENT METHODOLOGY

6.1 Overview

Gerus Solar One (Namibia) (Pty) Ltd has committed to sustainability and environmental compliance through coming up with a management action plan for all anticipated environmental impacts associated with the proposed project. This is also in line with the Namibian Environmental Management legislation and International best practices on energy generation, transmission and linear infrastructure.

As stated in earlier sections of the report, the ESIA process has been carried out in line IFC performance standards. The performance standards are directed towards developers and stakeholders, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities (WBG, 2012). As a result, the proponent will adopt the following environmental management plans in order to prevent, minimize, and mitigate potential adverse impacts, in accordance with the criteria of the performance standards.

- Biodiversity management plan.
- Stakeholder management plan.
- Grievance Redress and Engagement Management Plan.
- GHG Assessment and Management Plan.
- Emergency Preparedness and Response Plan.
- Visual Impact Assessment Management Plan.
- Traffic Impact Assessment and Management Plan.
- Worker Health and Safety Management Plan.
- Water Management Plan.
- Storm water Management Plan.
- Waste Management Plan.
- Community Health Safety and Security Management Plan.
- Indigenous Peoples Management Plan.

- Natural and Cultural Heritage Management Plan.

The management plans have been developed to address all the identified expected impacts. The plans will be monitored and updated on a continuous basis with aim for continual improvement to addressing impacts.

6.2 Assessment of Impacts

The risk assessment below sets out the overall approach that was adopted to assess significance of identified potential environmental and social impacts associated with the project. Significance then becomes a limiting criterion in formulating mitigation measures and environmental management plan. To fully understand the significance of each of the potential impacts each impact must be evaluated and assessed. The definitions and explanations for each criterion are set out below.

	CONSEQUENCE
5	Could kill, permanently disable, or cause very serious damage/Environmental impacts are expected to be permanent and non- reversible on a national scale and/or have international significance or result in a legislative non-compliance
4	Could cause serious injury (major lost time injury), illness or major damage/Environmental impacts are long term, but reversible and/or have regional significance
3	Could cause injury or illness requiring a visit to the doctor, lost time injury or moderate damage/Environmental impacts are considered short term, reversible and/or localized in extent.
2	Could cause first aid injury, minor illness, or minor damage
1	Could not cause injury, illness, or damage

LIKELIHOOD / PROBABILITY	
5	ALMOST CERTAIN to happen
4	LIKELY to happen at some point
3	POSSIBLE, it might happen
2	UNLIKELY not likely to happen
1	RARE practically impossible

LIKELIHOOD	CONSEQUENCE					
	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

16 - 25	CRITICAL RISK	CR
10 – 15	HIGH RISK	HR
5 - 9	MODERATE RISK	MR
1 – 4	LOW RISK	LR

Figure 6-1: Risk Assessment Matrix