SCOPING REPORT

40 MW – 200 MW UNIKA I WIND FARM

Katete, Eastern Province, Zambia

Prepared for: Mphepo Power Limited

MPHEPO POWER

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BASIS OF REPORT

EXECUTIVE SUMMARY

Mphepo Power Limited ("Mphepo") proposes to develop a wind farm facility near Katete, Eastern Province, Zambia. The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid.

Mphepo Power Limited is a registered company in Zambia consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People).

Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the Zambia Electricity Supply Corporation Limited (ZESCO) and grid connection. Phase 1 ("Unika I") will include the development of a 40 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW. It is also proposed to build an on-site substation for Phase 1, and power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site.

Once ZESCO's electricity supply needs increase, and there is further appetite for more power procurement then Phases 2 and 3 will be developed.

The Environmental and Social Impact Assessment (ESIA) process seeks to obtain approval from ZEMA for Phase 1 of the Unika Wind Farm (referred to as the "Unika I Wind Farm").

As part of the ESIA process the entire Project Site will be assessed for baseline conditions. The baseline environmental and social data gathered during this ESIA process will also serve to inform the turbine and associated infrastructure locations.

ZESCO has an objective to provide affordable and stable power to the Zambian people. As Zambia's energy generation has historically been dominated by hydropower, the Government is looking to diversify and incorporate other resources, including wind energy.

Once the wind farm is completed and becomes operational, it is expected to have a minimum life span of 25 - 30 years (for each Phase).

The existing environmental and social conditions, project activities and potential environmental and social impacts are discussed in this Scoping Report

The key potential environmental and social impacts associated with the Project include the following:

- Social and socio-economic impacts (negative and positive), including impacts affecting land-use, local economy, livelihoods (particularly areas affected by the turbine locations, access roads, powerline transmission route and ancillary Project infrastructure) and impacts relating to community safety;
- Impacts relating to occupational health and safety of the workforce;
- Potential impacts on birds and bats, including impacts associated with the collisions with wind turbines and the power transmission line.
- Potential impacts on terrestrial and aquatic ecology, including impacts associated with vegetation clearing, erosion, fire, waste management, hazardous materials management, general construction activities and placement of Project infrastructure;
- Potential impacts on the visual landscape as result of the construction of new access roads and the wind turbines (once erected);
- Potential impacts on ambient noise as a result of general construction activities and the noise emanating from the operational wind turbines; and
- Potential impacts on cultural heritage as a result of general construction activities (including the presence of the workforce) and placement of infrastructure.

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1. INTRODUCTION

Mphepo Power Limited ("Mphepo") proposes to develop a wind farm facility near Katete, Eastern Province, Zambia. The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid.

Mphepo Power Limited is a Special Purpose Vehicle (SPV) consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People).

Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the Zambia Electricity Supply Corporation Limited (ZESCO) and grid connection. Phase 1 ("Unika I") will include the development of a 40 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW. It is also proposed to build an on-site substation for Phase 1, and power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site.

Once ZESCO's electricity supply needs increase, and there is further appetite for more power procurement then Phases 2 and 3 will be developed.

It is also proposed to build an on-site substation and a 132 kV power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site (as shown in Figure 2). The current preferred route for the power transmission line runs mainly along the existing road leading from the Project Site to the Msoro substation

The Environmental and Social Impact Assessment (ESIA) process seeks to obtain approval from ZEMA for Phase 1 of the Unika I Wind Farm.

In terms of the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997 the Scoping Report precedes the preparation of an "Environmental Impact Statement" (EIS). As this process is required to follow local as well as international standards in order to access funding, the EIS will be referred to as an "Environmental and Social Impact Assessment" (ESIA) and be aligned with local legislation as well as the International Finance Corporation (IFC) Performance Standards (PSs).

2. PROJECT BACKGROUND

2.1 HISTORY OF THE PROJECT

During 2017 Mphepo Power Limited (Mphepo) initiated pre-feasibility investigations to identify suitable wind power sites in Zambia, and identified a number of sites in the Eastern Province of Zambia. This Project Site is the first planned site targeted for development.

Prior to the pre-feasibility study a team reached out to Chewa King, Kalonga Gawa Undi, to request permission and support for the Project. Mphepo then secured the rights to the land and brought the Chewa Development Trust (CDT) into Mphepo. Various traditional leaders that would be affected by the Project were consulted prior to the conclusion of any agreements, under the guidance of Kalonga Gawa Undi.

After this process Mphepo received permission from the Ministry of Energy to proceed with the feasibility study. The current ESIA process is part of the feasibility stage of the Project. Once the feasibility study is completed an implementation agreement will be concluded with the Ministry of Energy.

A Memorandum of Understanding has been secured with ZESCO which commits ZESCO to provide the necessary case files for the completion of the Grid Impact Study.

Mphepo plans to construct other similar sized wind farm projects elsewhere in Eastern Province after successful completion of this Project, which is referred to as the Unika I Wind Farm.

Current timelines for other studies informing the feasibility study are as follows:

- Wind measurement campaign: June 2019 – June 2020.
- Grid Impact Study: July 2019 – December 2019.
- Energy Analysis and Final Design Work: July 2020 – September 2020.
- ESIA submission expected: July 2020.
- Engineering, Procurement and Design: October 2020.

2.2 PARTIES INVOLVED

Mphepo is a Zambian renewable energy company, focussed on the development of wind power in Eastern Province, Zambia. Mphepo is a Special Purpose Vehicle (SPV) consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People) as shown in Figure 1 below.

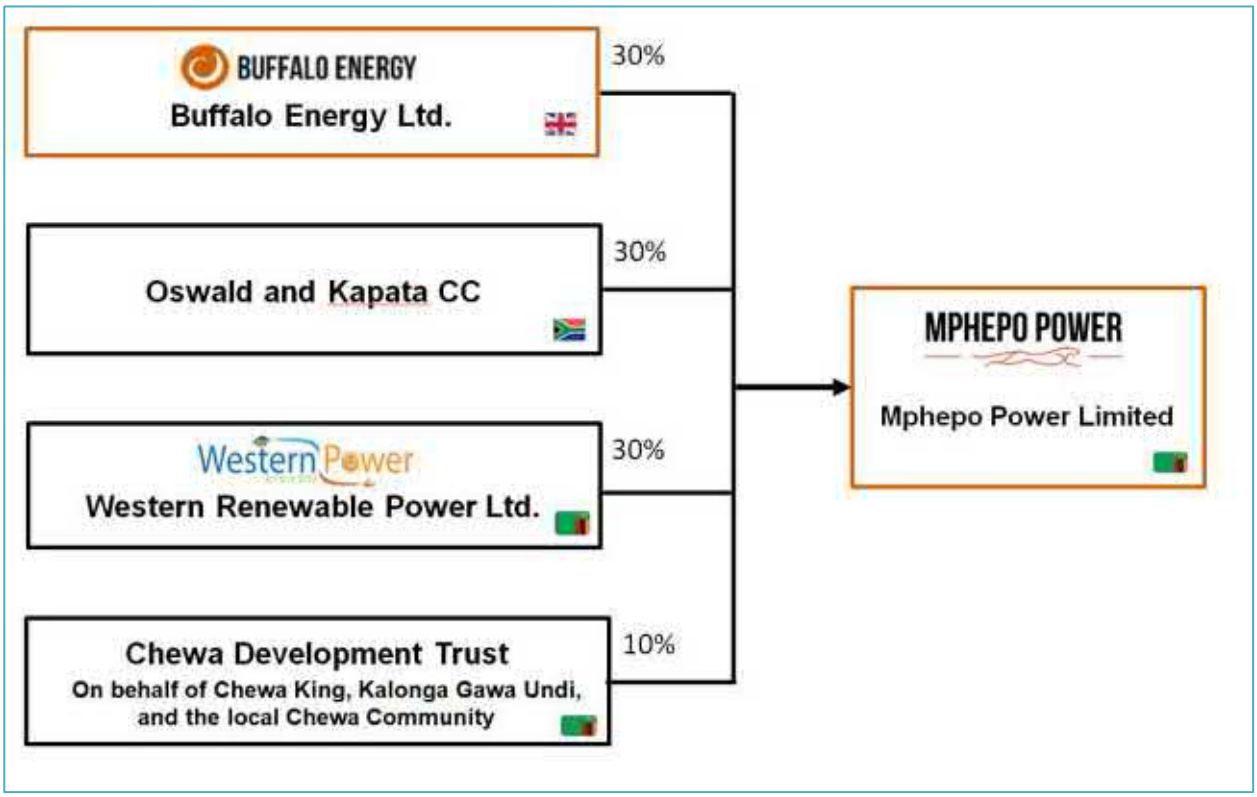

Figure 1: The structure of Mphepo Power Limited

SLR Consulting (Africa) Pty Ltd (SLR) in collaboration with DH Engineers Consultants, based in Zambia, have been appointed by Mphepo to undertake an Environmental & Social Impact Assessment (ESIA) for the Project. As part of the ESIA process a number of specialists have been appointed by SLR/DH to conduct investigations and provide input into the process as follows:

- Bats: Arcus Consultancy Services South Africa (Pty) Limited (with assistance from Ms. Helen Taylor)
- Birds: WildSkies Ecological Services
- Terrestrial ecology: Scientific Terrestrial Services CC (with assistance from Ms. Catherine Ernest)
- Aquatic ecology: Scientific Aquatic Services CC
- Social: Nomad Socio-Economic Management and Consulting
- Heritage: Envirodynamics Consulting Limited
- Visual: Visual Resource Management Africa cc
- Noise: Enviro Acoustic Research

In addition, a research permit was issued to Mphepo by the Department of National Parks and Wildlife for the research field work conducted to inform baseline investigations. This permit requires supervision by an Area Ecologist during research fieldwork. All research field work to date has been supervised by Area Ecologists from the South Luangwa Area Management Unit.

2.3 PROJECT JUSTIFICATION

The need to meet the growing energy demand from Zambia's growing economy and the large number of un-electrified households (especially in rural areas) has been the major driver towards the introduction of renewable energy technology in the country. The Zambia National Energy Policy (2008) (NEP) sets out a number of policy measures for electricity and renewable energy. The overall objective of the NEP is '*to ensure availability of dependable, affordable energy to support poverty reduction and sustained economic growth in an environmentally sound manner by encouraging the economically efficient supply and consumption of energy*'. Policy measures to address energy and environmental

issues include increasing the utilisation of renewable energy sources. The policy recognises that accessibility to electricity by the majority of the Zambians remains low and increasing access is a priority, and that renewable energy represents one of the best sources of electricity supply. Policy measures to address energy and environmental issue include increasing the utilisation of renewable energy sources

Wind power has become one of the most cost effective renewable energy technologies around the world, and is widely used in both the developing and developed world.

Wind power generation does not rely on fossil fuels as with coal/gas fired power plants, and therefore emit significantly less greenhouse gases or pollutants when compared to conventional thermal power technologies. In most cases, renewable energy technologies require less overall maintenance than generators that use traditional fuel sources.

Unlike other power generation technologies, people in the area can continue their daily lives on the Project Site once construction is finished.

All the power produced is intended to be delivered to the national grid, for the benefit of all Zambians. As an investment, the Projects would be transformative to the Katete region mainly through job creation and providing opportunities for local businesses. The upgrading of existing roads and construction of some new access roads would be beneficial to the people moving around in the Project Site as the current road network is very limited and generally in poor condition, particularly as a result of heavy rains and lack of regular maintenance.

The Project would provide significant support to the Chewa Development Trust as infrastructure in the area is limited and the Eastern Province currently contributes less than 5 % to the GDP. The Project could also contribute to stabilising the power grid, reduce losses and provide power in provinces within Zambia that currently do not have significant generation capacity. The Project would also assist in power supply during periods when hydroelectric resources are low (particularly during the drier season).

2.4 PROJECT DESCRIPTION

2.4.1 Location of the Project

The Project Site is located directly north of Katete (Eastern Province, Zambia), and ± 440 km east of Lusaka, Zambia (Figure 2). The Project Site is approximately 33 350 hectares (ha) in size, while the footprint of the Project is between 8 000 and 10 000 ha. The Project Site is strongly rural and populated by a number of small villages. The nearest town is Katete, which is a small but well established town located immediately southwest of the Project Site. The main access road is the T4 National Road (Great East Road), which is main route connecting the Zambian capital of Lusaka to the smaller towns of Nyimba, Katete and Chipata in the east.

A map showing the Project Site and the proposed powerline route alternatives is presented in Figure 3. Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from ZESCO. Phase 1 (“Unika I”) will include the development of a 40 – 200 MW wind farm (the Project), with Phase 2 (“Unika II”) and Phase 3 (“Unika III”) considering a further 150 MW each. Once all the phases have been completed the project will have a capacity of approximately 450 MW. The final size and layout of the Project will be determined by current baseline investigation and wind monitoring data.

Unika I Wind Farm has been prioritised for development. All three phases of the Project will fall within the Project Site as shown in Figure 3.

It is also proposed to build an on-site substation and a 132 kV power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site (as shown in Figure 2). The current preferred route for the power transmission line runs mainly along the existing road leading from the Project Site to the Msoro substation.

The Project Site is located on traditional land, controlled by Kalonga Gawa Undi Mkhomo V, the King of the Chewa people. Land marks within the Project Site include Mkaika Palace, Kachingwe Cobalt and the Mtetezi military camp. A number of villages namely Isibaki, Chimoto Kachngwe, Sumbwi, Pindu,

Chamani, Undi, Mchaela Chimbundu and Mbangombe Villages are found on the south western area of the Project Site. Other villages located within the Project Site area include Gomani, Sunku, Mkokeza, Katimba, Malanda, Mlangali, Phindani, Tambala and Sakoba.

Below is a table presenting the GPS co-ordinates of the Project Site boundary:

Reference point	Latitude (South)	Longitude (East)
B1	14° 4'10.75"	32° 0'48.02"
B2	13°56'59.25"	32° 9'47.72"
B3	13°55'4.31"	32° 9'44.92"
B4	13°53'56.72"	32° 9'6.36"
B5	13°53'19.56"	32° 9'28.19"
B6	13°52'4.09"	32° 9'40.00"
B7	13°51'43.31"	32° 9'54.47"
B8	13°50'10.07"	32°10'0.83"
B9	13°49'27.07"	32° 9'17.13"
B10	13°49'22.06"	32° 8'29.44"
B11	13°49'41.71"	32° 8'13.65"
B12	13°49'24.74"	32° 7'3.96"
B13	13°49'5.89"	32° 6'40.30"
B14	13°48'14.39"	32° 6'46.38"
B15	13°47'21.86"	32° 6'3.44"
B16	13°46'58.66"	32° 5'24.66"
B17	13°47'12.09"	32° 4'50.93"
B18	13°48'3.48"	32° 3'54.64"
B19	13°53'15.63"	32° 0'50.45"
B20	14° 2'42.45"	32° 0'48.45"

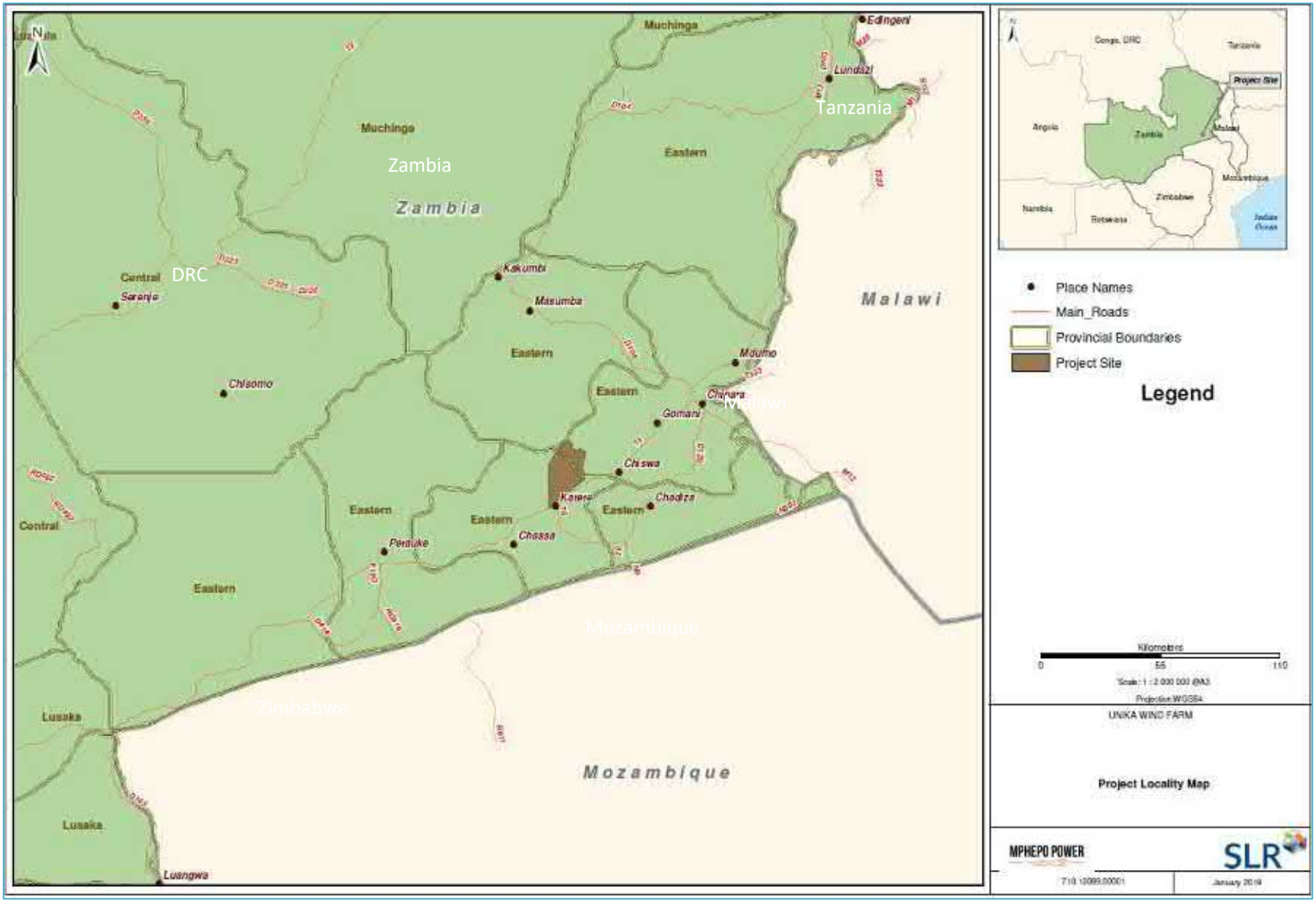

Figure 2: Location of the Project Site

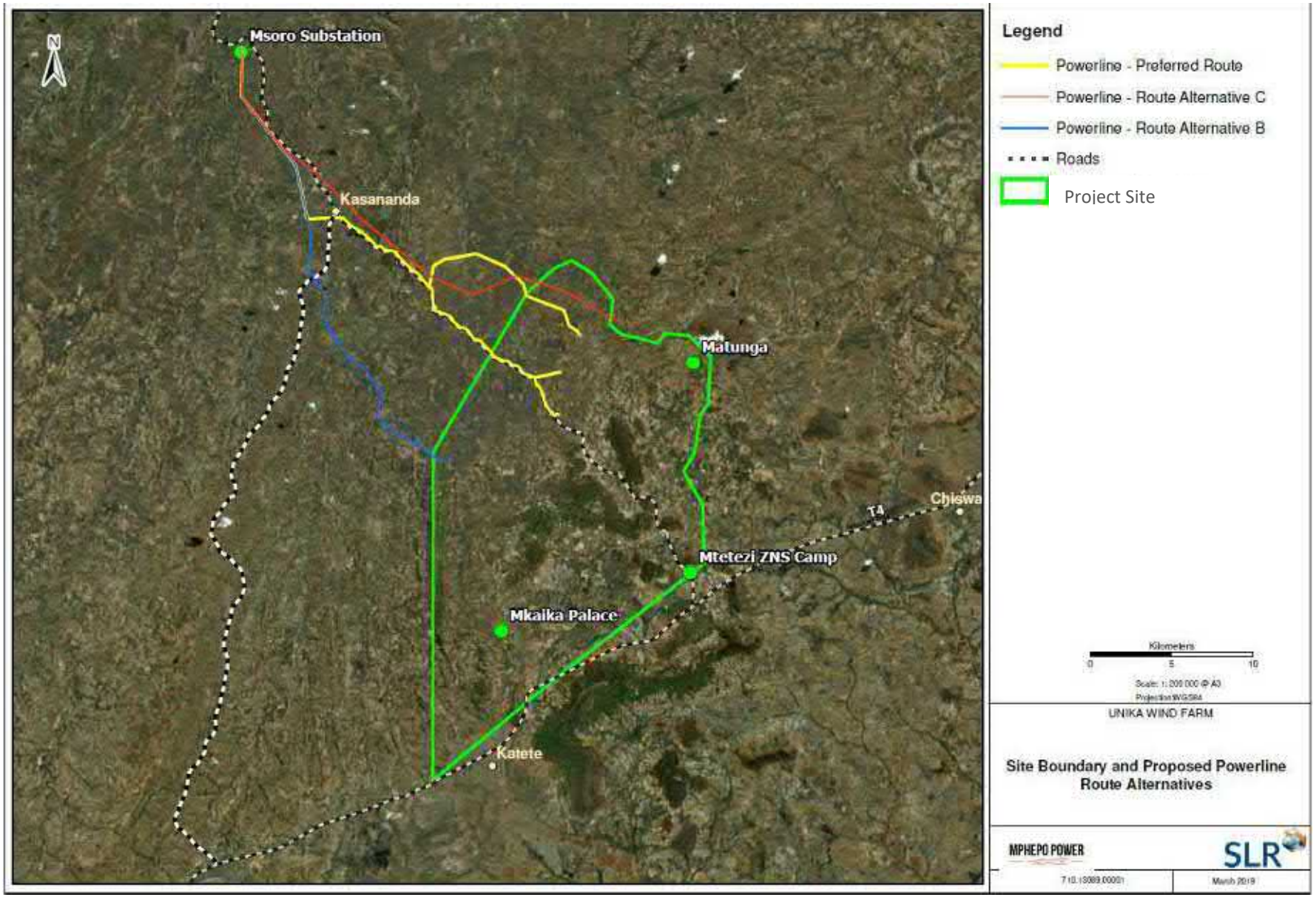

Figure 3: Project Site and proposed powerline route alternatives

2.4.2 Nature of the Project

The description of project components below is specific to the Unika I Wind Farm Project, and will be further refined during the ESIA Phase. Detailed information (e.g. turbine design, turbine numbers, etc.) on project components specific to the future Phases 2 and 3 have not been established yet; however, all project components would be similar, other than for the increase in turbine numbers and additional access roads associated with the larger wind farm phases.

Project Components

Wind Turbine Generators

For Phase 1 there could be between 20 and 60 wind turbines, with an individual capacity of between 2.8 and 5.5 MW. The turbines will range in hub height from 60 m to 165m, with a rotor diameter range of between 70 m and 165 m. Each turbine will have a concrete foundation of approximately 400 - 900 m^2, to a depth of approximately 2.5 – 5 m.

There will be a circular gravel hard standing area of approximately 800 m^2 around each turbine that will be used during construction and for maintenance during the life span of the project.

Each turbine will have an electrical transformer, either on the inside or beside it outside.

Each turbine may have to be fenced off for safety reasons, but the land-use surrounding the turbines may continue, depending of the relative distances from the turbines.

Electrical Connections

The wind turbines will be connected to each other by means of medium voltage cables. The cables will be buried approximately 1 - 2 m below ground level.

A substation (typically 80 m X 90 m) will be constructed within the site for collection of power from the wind turbines.

The substation will then be connected to the National Grid through a new 132 kV power transmission line to be constructed above ground between the wind farm substation and the existing Msoro Substation.

Access Roads

The site will be accessed from the T4 main road running between Lusaka, Katete and Chipata. An internal gravel road network will need to be constructed to facilitate movement between turbines during construction and operation. This will include upgrading of existing roads within the area as well as constructing new access roads.

Roads will be 10 - 13 m wide including drainage, turning circles, passing points and cabling. Some existing public roads and bridge structures may also need to be upgraded to facilitate the heavy loads and vehicle sizes associated with the turbine equipment transport, especially the mast sections and the blades.

The main access roads and internal service roads would be constructed or upgraded from material sourced from quarries or borrow pits within and around the area (if available). The exact location and number of quarries and borrow pits required are not known at this stage. All material will need to be sourced from quarries and/or borrow pits approved from the Ministry of Mines and Minerals Development.

Additional Infrastructure

A single story Operations and Maintenance (O&M) building of up to 5 000 m^2 with a warehouse/workspace, office, telecoms, security and ablution facilities will be constructed.

Buffers will be implemented around each of the wind turbines in order to exclude certain activities and to avoid impacts as much as reasonably possible.

Production capacity

The proposed project will have a capacity of 40 – 200 MW for Phase I. All power generated will be fed directly into the ZESCO national grid. The annual production will continue to be revised as more data is collected and site design is optimised.

Schedule and life of Project

The construction phase is estimated to take approximately 12-24 months to complete. The construction of Phase 1 is anticipated to commence during Quarter 3 of 2021.

The Power Purchase Agreement (PPA) is anticipated to last 25 years. Beyond that duration, the Project may continue to operate subject to further approvals.

2.5 RELEVANT POLICY, LEGISLATIVE AND PLANNING FRAMEWORK

2.5.1 National Energy Policy

The Zambia National Energy Policy (2008) (NEP) sets out a number of policy measures for electricity and renewable energy. The overall objective of the NEP is '*to ensure availability of dependable, affordable energy to support poverty reduction and sustained economic growth in an environmentally sound manner by encouraging the economically efficient supply and consumption of energy*'.

Policy measures to address energy and environmental issues include increasing the utilisation of renewable energy sources.

The policy recognises that accessibility to electricity by the majority of the Zambians remains low and increasing access is a priority, and that renewable energy represents one of the best sources of electricity supply. Policy measures to address energy and environmental issue include increasing the utilisation of renewable energy sources.

2.5.2 National Policy on the Environment

The National Policy on Environment (NPE), which was officially launched in 2009, is the overall policy on environment and provides environment and natural resources management policies to address current and future threats to the environment and to human livelihoods and provides policy guidelines for sustainable development. The NPE was preceded by the National Conservation Strategy (NCS), adopted in 1985, which saw the establishment of environmental legislation and institutions. The NCS was updated in 1992 through the National Environment Action Plan (NEAP) to meet the demands of economic liberalization and new technical information.

Amongst others, a specific objective of the NPE is to accelerate environmentally and economically sustainable growth in order to improve the health, sustainable livelihoods, income and living conditions of the poor majority with greater equity and self-reliance.

The development will be carried out in line with the energy sector objective of the NPE: 'to meet national energy needs with increased efficiency and environmental sustainability'.

Other strategies relevant to the proposed Project include:

- Ensure that plans for development and construction of industries have adequate and appropriate waste disposal and pollution control facilities organised to meet international standards;
- Promote use of environmental guidelines and EIA before sites are developed and ensure application of a monitoring and auditing system for operating industries.

2.5.3 Environmental Management Act

The Environmental Management Act (EMA) is the principal law on integrated environmental management and was enacted in April 2011 following adoption of the NPE. The EMA replaced and repealed the Environmental Protection and Pollution Control Act (EPPCA) of 1990, which was established under the NCS.

Relevant sections of the Act include:

- Part III: Integrated Environmental Management which requires the carrying out of Environmental Impact Assessment for certain types of projects;
- Part IV: Environmental Protection and Pollution Control which provide for conservation of natural resources; and
- Part VII: Public Participation which gives the public the right to be informed and participate in environmental decision making.

Part IV, Division 6 of the EMA deals with Noise. According to the EMA "noise" means any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. It prohibits the emission of noise in excess of the noise emission standards. It also allows the grating of a permit allowing excessive emission of noise.

2.5.4 The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997

As part of the implementation process the government through the EPPCA adopted a framework for environmental impact assessment for developmental projects in Zambia and the Environmental Impact Assessment (EIA) Regulations were established in 1997. These regulations continue to be in force under EMA.

2.5.5 Environmental Management (Licensing) Regulations, SI No. 112 of 2013

Under this statutory instrument established in accordance with Section 43, the EMA controls and regulates the following areas relevant to the project:

Air and Water Pollution: Part II (Regulations 3-9) of SI 112 (2013)

These regulations (Statutory Instrument No. 72 of 1993) provide for the ZEMA to regulate the treatment and discharge of sewerage and other effluents into the natural aquatic environment.

Waste Management: Part III (Regulations 10-15) of SI 112 (2013)

These regulations provide definitions of waste and sets out the licensing requirements for transporters and waste disposal sites.

Hazardous Waste: Part IV (Regulations 18-30) of SI 112 (2013)

These regulations provide for the control of generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and transboundary movement of hazardous waste as listed in Fifth Schedule or any waste specified in Sixth Schedule, if that waste exhibits characteristics found in the Seventh Schedule to these Regulations.

2.5.6 Natural Resources Management

Provision is made by the EMA for ZEMA to develop regulations for the conservation and protection of natural resources (Part IV Division 8 of EMA).

Use of natural resources will need to be managed sustainably in order to avoid their degradation or depletion and ensure the viability of the project.

In accordance with section 77 of the EMA the project shall not introduce any invasive alien species into any element or segment of the environment. Should any land dereliction or contamination occur as a direct result of project activities, the project will be responsible for carrying out rehabilitation works within such period as the ZEMA inspectorate may specify.

In addition, and subject to the provisions of the EMA, various natural resources shall be managed in accordance with specific Acts pertaining to environmental protection and management of these elements. For example, in relation to the present project, water resources shall be managed in accordance with the *Water Resources Management Act, 2011*; regional and urban planning shall be managed in accordance with the *Town and Country Planning Act*, etc. These and other relevant acts relating to environmental protection and management with regards to the project, and the compliance thereof, are discussed further in below.

Under the Act an inspector may carry out survey to assist in the proper management and conservation of natural resources, inspect land uses to determine their impact on the quality and quantity of natural resources; and publicise land use guidelines and natural resources conservation regulations.

2.5.7 Other Relevant National Legislation

The Acts outlined in Table 1 below have also been reviewed in order to assess Project alignment with other relevant existing laws that have a bearing on environmental management and the project.

Table 1: Other relevant legislation

Ref	Legislative Instrument	Description	Relevance and/or Compliance
Constitution			
1	The Zambian Constitution	The Constitution of Zambia Act (as amended by Act No. 2 of 2016) is the fundamental law of the land and provides the framework on which all other laws stand. In particular, *Part IV – Bill of Rights* of the Constitution which enshrines fundamental human rights and protection of property, and *Part XIX: Land, Environment and Natural Resources* which establishes the principles of environmental and natural resources management and development and the protection and utilisation of environmental and natural resources. The Zambian Constitution recognises certain fundamental rights of relevance to the project: **Article 11:** states that every person in Zambia irrespective of race, place of origin, political opinions, colour, creed, sex or marital status, is entitled to fundamental right to life, liberty, security of the person and the protection of the law, freedom of conscience, expression, assembly, movement, association, protection of young persons from exploitation, protection for the privacy of his home and other property and from deprivation of property without compensation. **Article 16:** provides that property of any description shall not be compulsorily taken possession of, and interest in or right over property of any description shall not be compulsorily acquired, unless by or under the authority of an Act of Parliament which provides for payment of adequate compensation for the property or interest or right to be taken possession of or acquired. **Article 23:** guarantees protection from discrimination on the ground of race, tribe, sex, place of origin, marital status, political opinions, colour or creed. **Article 24**: guarantees protection of young persons from exploitation including employment which interferes with their education and well-being, physical or mental ill treatment, all forms of neglect, cruelty or exploitation and trafficking.	The project should not require the acquisition of land which will result in displacement and possible resettlement of persons or communities. However some compensation may be required for land occupied by the project (e.g. turbines, roads, powerlines, etc.). In line with Article 16 (and international guidelines) there must be adequate compensation before any personal property is compulsorily acquired. In this context Article 23, which protects against all forms of discrimination, is also very important with regards to women or the vulnerable who may not have any title to land (and therefore not entitled to any compensation) in a traditional society.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
Natural Resources/Heritage			
2	The Water Resources Management Act, 2011	This Act establishes the Water Resources Management Authority and provides for the integrated management, development, conservation, protection and preservation of the water resource and its ecosystems; the Act ensures the right to draw or take water for domestic and non-commercial purposes, and that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges; provides for the constitution, functions and composition of catchment councils, sub-catchment councils and water users associations; repeals and replaces the Water Act, 1949; and provides for matters connected with, or incidental to, the foregoing.	The project may involve the abstraction of ground water or surface water. A "Permit to Access Water" may be required. Section 46(2) of the Act requires a developer to discharge any trade or other effluent (e.g. in this case run-off from workshops and bulk fuel storage areas) in accordance with the provisions of the EMA (2011), and steps must be taken by a developer to control or prevent any water pollution as may be required by the Water Authority (section 49).
3	Forestry Act (No. 4 of 2015)	This Act repeals and replaces the Forests Act, 1999. The Act provides for the establishment and declaration of National Forests, Local Forests, joint forest management areas, botanical reserves, private forests and community forests; provides for the conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity; provide for the implementation of the United Nations Framework Convention on Climate Change, Convention on International Trade in Endangered Species of Wild Flora and Fauna, the Convention on Wetlands of International Importance, especially as Water Fowl Habitat, the Convention on Biological Diversity, the Convention to Combat Desertification in those Countries experiencing Serious Drought and/or Desertification, particularly in Africa and any other relevant international agreement to which Zambia is a party.	The Forestry Act is relevant to this project because parts of the powerline are proposed to run through some Forest Reserves. This will involve the removal of trees and must adhere to the general principals of the Act in the conservation of trees and forest resources, and obtaining consent.
4	The Noxious Weeds Act, Cap 343	This Act provides for the declaration, control and eradication of noxious weeds.	Under this Act the project will be responsible for preventing the introduction and/or controlling the spread of common weeds on the site. In addition undesirable invasive species must not be introduced under any landscaping activities. Species declared as noxious weeds under the act (such as *Lantana camara*) are prohibited. ZEMA have an active project seeking to eliminate alien and invasive species.
5	Mines and Minerals Act, Cap 213	The Mines and Minerals Act of 1997 regulates the law relating to mines and minerals. The Act provides for the granting of or, renewal and termination of mining rights. It also provides for the control mining activities with regard to	Material sources (e.g. borrow pits and/or quarry) will be required for various activities, including construction of new access roads and upgrading of existing access roads.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		environmental protection. The Act repeals the Mines and Minerals Act of 1976.	
6	National Heritage and Conservation Commission Act, 1989	The Act of 1989 provides for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, prehistoric, archaeological or scientific interest by preservation, restoration, rehabilitation, reconstruction, adaptive use and good management. The Commission also provides regulations for archaeological excavation and export of relics. If a development is unable to proceed without affecting an item of heritage, permission must be sought from the NHCC as outlined in Sections 35 and 36 of the National Heritage Conservation Commission Act.	All measures will need to be undertaken to protect and conserve the cultural and natural heritage of the Project Site. For any new discoveries made of items of historical or archaeological interest during implementation of the project, the provisions of the NHCC Act shall apply, and the required procedures for the reporting of such discoveries shall be followed.
Energy Regulation, Investment and Standards			
7	Energy Regulation Act, Cap 436	The Act of 1995 makes provision with respect to the production and distribution of energy in Zambia and establishes the Energy Regulation Board for purposes of control and licensing of energy undertakings. The Board shall, in conjunction with other Government agencies, formulate measures to minimize the environmental impact of the production and supply of energy and the production, transportation, storage and use of fuels and enforce such measures by the attachment of appropriate conditions to licences held by undertakings.	The Project will undertake to generate electricity; the Developer shall apply for a licence for energy generation in accordance with provisions of this Act prior to the commencement of the development. Permits will be required for the bulk storage of fuel on site during construction and operational phases.
8	Petroleum Act, Cap 439	The Act provides for the regulation of the importation, conveyance and storage of petroleum products and other inflammable oil and liquids (e.g. petrol and diesel) for the protection of the public and the environment.	Bulk fuel storage facilities will be required to be constructed and operated in accordance with regulations as set out in the Act.
9	The Zambia Development Agency Act, 2006	The Act provides a legal framework for investment in Zambia and recognises the role of other agencies, including those responsible for environmental protection, in authorizing specific projects. In considering an application from an investor for a licence, permit or certificate of registration, the Act stipulates that the Board shall have regard to the impact the proposed investment is likely to have on the environment and, where necessary, the measures proposed to deal with an adverse environmental consequence in accordance with the Environmental Protection and Pollution control Act (Section 69d). The Zambia Development Agency Act has replaced the Investment Act of	The developer may apply for an investors licence from the Zambia Development Agency (ZDA).

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		1993.	
Land Use, Land Acquisition and Regional Planning			
10	The Urban and Regional Planning Act (Number 3 of 2015)	The Act provides for development, planning and administration principles, standards and requirements for integrated urban and regional planning processes and systems so as to ensure multi-sector and level cooperation and coordination; the Act endeavours to ensure sustainable urban and rural development by promoting environmental, social and economic sustainability in development initiatives and controls at all levels of urban and regional planning. The Act repeals the Town and Country Planning Act, 1962, and the Housing (Statutory and Improvement Areas) Act, 1975.	The development cannot proceed without planning permission from the local authorities. The necessary documentation will be submitted to the relevant authorities for approval for project implementation in accordance with the terms of the Act.
11	The Lands Act, 1995	The Act provides for the alienation, transfer, disposition and charge of land. Although the Act does not refer to matters of conservation this Act is important in that land is one of the basic natural resources. The Act also provides for compulsory acquisition of land by the president whenever he/she is of the opinion that it is desirable or expedient to do so in the interest of the republic.	All land located within the Project Site falls under Customary Land which is legally recognised and protected under the Lands Act, Chapter 184, and any customary land vested in or held by any person under customary tenure is similarly recognised.
12	Local Government Act, Cap 281, 22 of 1991	The Act provides for the establishment of Councils in districts, the functions of local authorities and the local government system. Some of its functions relate to pollution control and the protection of the environment in general.	Implementation and operation of new development will be subject to the procedures laid out by the local authorities; all applicable by-laws will be adhered to.
13	The Electricity Act No.433 of 1995	The Electricity Act (EA) regulates the generation, transmission, distribution and supply of electricity. The EA authorizes the compulsory acquisition of land by the state whenever necessary for the generation, transmission, distribution or supply of electricity by an operator of any undertaking (Section 14.1). Before such an order is given, however, the operator shall have taken all reasonable steps to acquire the land intended to be used on reasonable terms by agreement with the owner of the land (Section 14.2). The Act states that adequate compensation shall be paid to any person who suffers loss or damage through the exercise of the powers conferred by this section in accordance with the provisions of the Lands Acquisition Act (Section 14.4).	The project will require some compensation for land occupied by the project components. A Livelihoods Restoration Framework will need to be prepared in line with the provisions of the Act.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
Employment, Health, Safety and Human Rights			
14	The Employment Act, Cap 268	The Employment Act provides legislation relating to the employment of persons and makes provision for the engagement of persons on contracts of service and for the enforcement of contracts. It also makes provision for the protection of wages of employees. The Employment Act has added a chapter on HIV and AIDS which will compel employers to respond to HIV and AIDS in the workplace, recognising that HIV and AIDS is a disease that undermines production. The Chapter also makes it mandatory by law for companies to formulate comprehensive HIV/AIDS Workplace Policies. The Employment of Young Persons and Children's Act regulates the employment of young persons and children.	The developer must ensure that all recruitment procedures and conditions of employment of persons under the project will comply with the provisions of the Act. The developer must also ensure that the contractors promote STDs & HIV/AIDS awareness among construction workers during project implementation.
15	Workers Compensation Act, Cap 271	The Act provides for the establishment and administration of a Fund for the compensation of Workers disabled by accidents to, or diseases contracted by, such workers in the course of their employment, and for the payment of compensation to dependents of Workers who die as a result of such accidents or diseases.	There is a possibility that some workers employed on this project, might be involved in accidents. In case of any accidents occurring to any worker, the developer and appointed contractors must treat such employees in accordance with these regulations.
16	Factories Act, Cap 441	The Factories Act provides a framework for the setting of regulations to ensure the safety, health and welfare of persons employed on construction work sites and in factories.	The solar PV plant during operation and as a construction site is subject to provisions of the Act as a place of work. All work procedures and workers Personal Protective Equipment (PPE) will be required to meet the provisions of this Act. Inspection procedures for the operation of all plant and equipment during construction and operation will be governed by this Act.
17	Occupational Health and Safety Act, No. 36 of 2010	An Act to establish the Occupational Health and Safety Institute and provide for its functions; provide for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work; provide for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; provide for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work; and provide for matters connected with, or incidental to, the foregoing.	The project will involve procedures and activities with inherent risks to the occupational health and safety of employees and other persons (e.g. community members). The developer and appointed contractors shall be obliged to comply with the provisions of the Act.
18	Public Health Act, Cap 295	The Act provides for the prevention and suppression of diseases and general regulation of all matters connected with public health in the country under	For the proposed development, this will cover such matters as solid waste management, levels of hygiene and the standards

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		the local authority of each district as the enforcement agency.	of the general working environment. Good housekeeping and proper waste management and disposal protocols must be adhered to by the contractor and the developer to avoid the spread of vermin and diseases.
19	Public Roads Act (No. 12 of 2002)	This Act provides for the care, maintenance and constriction of public roads in Zambia, and for the regulation of inter alia road signage (including temporary signs) and storm water disposal structures	The designs of project access roads must adhere to the requirements of this Act, including the use of temporary safety signage. It is proposed that the ownership of any new access roads be handed-over to the Roads Authority or District Authority and be open to Public use for the life of the Project. The hand-over should include an agreement on long-term maintenance and care of the roads between the Project and the public entity.
20	Human Rights Commission Act (No. 39 of 1996)	The Act covers the functions, powers and composition of Human Rights Commission which include investigation of human rights violations; investigation of any maladministration of justice; and proposing effective measures to prevent human rights abuse.	The project will adhere to all laws and guidelines (including international standards) with regards to land acquisition, compensation and employment.

2.5.8 Institutional Framework

The Zambia Environmental Management Agency (ZEMA) is a statutory body under the Ministry of Water, Sanitation and Environmental Protection (MWSEP) which facilitates at the national level the coordination of the various Ministries and regulatory bodies that play a role in in the management and conservation of the environment.

Government ministries, departments and local authorities work on behalf of the public to ensure that ecological, cultural, social and economic issues are addressed in line with existing government policy and legislation. Institutions with a supervisory and monitoring role relevant to the Project are described in Table 2.

Table 2: Institutions with a supervisory and monitoring role relevant to the Project

Institution	Responsibility
Zamia Environmental Management Agency (ZEMA)	ZEMA is responsible for the enforcement of the provisions of the EMA on environmental impact assessment, pollution control, natural resources management and solid waste management which includes establishment of landfill sites. The services provided by the ZEMA specifically in relation to EIA studies include: • Assisting the developer to determine the scope of EIA studies; • Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making; • Disclosure of the EIS to the public through the media; • Holding public hearing meetings to discuss the EIS with stakeholders; • Conducting verification surveys of the affected environment; • Monitoring the project once implemented; • Conducting compliance audits of the project between 12 and 36 months after implementation; and • General administration of all the Regulations under the EMA. In addition to the Project Environmental Permit, ZEMA is responsible for the issuing of licenses relating to: • Emissions (air and waste water), • Waste management and • Hazardous waste management.
Water Resources Management Authority (WARMA)	A statutory body under the Ministry of Water, Sanitation and Environmental Protection which is responsible for the management of water resources and liaises with ZEMA on issues relating to water pollution. In accordance with the provisions of the Water Resources Management Act, WRMA will regulate and control the rates of water abstraction to ensure that available surface and underground water resources are not depleted and is responsible for issuing of water permits (previously known as 'water rights').
Department of National Parks and Wildlife (DNPW)	The research permit requires supervision by an Area Ecologist during research fieldwork.
Ministry of Lands and Natural Resources: Forestry Department	Consent will be required from the Forestry Department for the construction of the power transmission line as parts of the current preferred route run through the Chiulukire West and Chivuna Hills Forest Reserves.
The National Heritage	The NHCC, which falls under the Ministry of Tourism and Arts (MOTA), is responsible for the

Institution	Responsibility
Conservation Commission (NHCC)	identification of sites of cultural and historical interest and their conservation. In the case of new discoveries of cultural or historical sites, the NHCC will be the first agency to be notified and give guidance on how to handle and preserve them. The NHCC is responsible for issuing permissions to Remove/Alter/Destroy heritage sites and for establishing concession agreements for the management of heritage sites. The NHCC has undertaken a heritage impact assessment (HIA) as a component of the ESIA.
Ministry of Health (MoH)	The Ministry of Health is concerned with issues of health of the human population. This ministry works hand in hand with local authorities to ensure quality good health of the residents through provision of health services and health risks awareness. As such the MoH is responsible for monitoring the health status and trends of the communities in the Project Site through the Health Management Information System.
Ministry of Mines and Minerals Development	The main access roads and internal service roads would be constructed or upgraded from material sourced from quarries or borrow pits within and around the area (if available). All material will need to be sourced from quarries and/or borrow pits approved from the Ministry of Mines and Minerals Development.
Department of Energy (DOE)	The DOE falls under the Ministry of Energy and its functions, among others, are to develop and implement a Policy on Energy, integrate the Energy sector into Zambia's national and regional development strategies; to regulate the Energy sector through appropriate legislation including the development of new laws and bye-laws.
The Energy Regulation Board (ERB)	The ERB is the statutory body under the Ministry of Energy which has the mandate of regulating the energy sector in line with the provisions of the Energy Regulation Act of 2003. In order to carry out this role, the ERB, among other functions, ensures that all energy utilities in the sector are licensed, monitors levels and structures of competition, and investigates and remedies consumer complaints. The unit price of that electricity generated by the Project and sold to the national grid will be regulated by the ERB. ERB issues licenses for electricity generation plants and energy related facilities such as bulk fuel storage facilities.
Provincial Planning Office	Planning permission for the Project will be sought through the Provincial Planning Office (Western Province)
District Councils	The district councils are responsible for issuing Building Permits, Fire Permits and permissions for establishment of waste disposal sites (landfills).

2.5.9 International Agreements and Conventions

Zambia is a party to a number of international and regional conventions related to the environment and natural resources management which influence the country's policies and legislation.

The environmental treaties and conventions most relevant to the project are set out in Table 3.

Table 3: International treaties and conventions of relevance to the Project

Name of Convention (Date of ratification)	**Description**	**Aspects related to the Project**
Convention on Biological Diversity (1992)	The Convention is relevant in that land clearing activities have potential to cause loss of habitat and associated biodiversity and habitat disturbance. In addition, the IFC Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management) reflects the objectives of	The Project will be executed sustainably in such a way as to conserve natural aquatic, woodland and wildlife habitat as far as possible and minimize disturbance to the site ecosystem.

Name of Convention (Date of ratification)	Description	Aspects related to the Project
	the Convention to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.	
United Nations Framework Convention on Climate Change (1996)	The Convention is relevant as the clearing of land for the Project has the potential to contribute to climate change since loss of vegetation deprives the earth of the carbon sink which help mitigate global warming.	The Project will ensure a conservative approach to vegetation clearing so as to limit loss of vegetation.
African Convention on the Conservation of Nature and Natural Resources (1968)	This convention aims at enhancing environmental protection, to foster the convention and sustainable use of natural resources and to harmonies and coordinate policies in these fields.	This convention is relevant to the planning, construction and operation phases of the Project.
Convention on the Protection of World Cultural and Natural Heritage (ratified 1984)	Provides for the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage which are of outstanding universal value from the point of view of history, art or science.	The Project will implement the necessary procedures to protect cultural and natural heritage.
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage	The purposes of this Convention are to safeguard the intangible cultural heritage; to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; and to provide for international cooperation and assistance.	The Project will implement the necessary procedures to protect cultural and natural heritage.
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) (ratified 1993)	This is an international agreement between governments to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Protection of the biodiversity in the surrounding area of the Project.
Basel Convention on the control of transboundary movements of hazardous wastes and their disposal (1999)	International treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries	Waste management during the construction and operation of the Project will be managed accordingly

In addition, Zambia is a signatory to various **International Labour Organisation (ILO) Conventions** which are relevant to working conditions and regulation on site during construction and operation of the Project. These include[1]:

- C138 - Minimum Age Convention, 1973 (ratified 1976)
- C182 - Worst Forms of Child Labour Convention, 1999 (ratified 2001)
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (ratified 1979)

[1] Source: http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11200:0::NO::P11200_COUNTRY_ID:103264

- C017 - Workmen's Compensation (Accidents) Convention, 1925 (ratified 1964)
- C148 - Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (ratified 1980)
- C155 - Occupational Safety and Health Convention, 1981 (ratified 2013)

2.5.10 Equator Principles

The Equator Principles are a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. Equator Principle Financial Institutions (EPFIs) commit to implementing the Equator Principles in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the Equator Principles.

In order to facilitate potential access to funding for project development potential borrowing organisations need to consider the Equator Principles and environmental and social risk management as part of the ESIA process.

There are 10 principles as shown below, and these require that Projects conduct an ESIA process in compliance with the IFC Performance Standards on Environmental and Social Sustainability.

1. Review and categorisation
2. Social and environmental assessment
3. Applicable environmental and social standards
4. Environmental and Social Management System and Equator Principles Action Plan
5. Stakeholder Engagement
6. Grievance mechanism
7. Independent review
8. Covenants
9. Independent monitoring and reporting
10. Reporting and Transparency

2.5.11 IFC Performance Standards on Environmental and Social Sustainability (2012)

The IFC's Environmental and Social Performance Standards (international PSs) define IFC clients' responsibilities for managing their environmental and social risks an provides an international benchmark for identifying and managing environmental and social risk and has been adopted by many organizations as a key component of their environmental and social risk management. The IFC Performance Standards encompass eight topics as shown in Table 4.

Table 4: IFC Performance Standards and their applicability to the Project

IFC Performance Standard	Applicability to this project
PS1: Assessment and Management of Environmental and Social Risks and Impacts PS1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project.	Yes An Environmental and Social Impact Assessment needs to be conducted and an Environmental and Social Management Plan needs to be developed
PS2: Labour and Working Conditions PS2 asks that companies treat their workers fairly, provide safe and healthy working conditions, avoid the use of child or forced labour, and identify risks in their primary supply chain.	Yes Various people will be employed which will require measures for managing labour

IFC Performance Standard	Applicability to this project
	and working conditions
PS3: Resource Efficiency and Pollution Preventions PS3 guides companies to integrate practices and technologies that promote energy efficiency, use resources—including energy and water—sustainably, and reduce greenhouse gas emissions.	Yes The Project will require various resources and activities (especially during construction) could lead to pollution
PS4: Community, Health, Safety and Security PS4 helps companies adopt responsible practices to reduce such risks including through emergency preparedness and response, security force management, and design safety measures.	Yes Project activities (e.g. construction, transport, power distribution, etc.) could pose a risk to community health and safety
PS5: Land Acquisition and Involuntary Resettlement PS5 advises companies to avoid involuntary resettlement wherever possible and to minimize its impact on those displaced through mitigation measures such as fair compensation and improvements to and living conditions. Active community engagement throughout the process is essential.	Yes Although no physical displacement is anticipated, economic displacement is expected as a result of the placement of Project infrastructure. Land rights are also required.
PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and managing living natural resources adequately are fundamental to sustainable development.	Yes The Project could have impacts on biodiversity and living resources which will require management/mitigation measures
PS7: Indigenous Peoples PS7 seeks to ensure that business activities minimize negative impacts, foster respect for human rights, dignity and culture of indigenous populations, and promote development benefits in culturally appropriate ways. Informed consultation and participation with IPs throughout the project process is a core requirement and may include Free, Prior and Informed Consent under certain circumstances.	No There are no Indigenous Peoples as defined by the IFC present within the Project area of influence
PS8: Cultural Heritage PS8 aims to guide companies in protecting cultural heritage from adverse impacts of project activities and supporting its preservation. It also promotes the equitable sharing of benefits from the use of cultural heritage.	Yes The Project could have impacts cultural heritage which will require management/mitigation measures

2.6 ASSOCIATED PROJECTS AND RESOURCE COMPETITION

According to publically available information there are currently no associated projects, wind farm projects or any other projects within the immediate region (within 100 km) which may complete for the same resources. It is understood that the upgrading of the Great East Road (T4) section running past the Project Site has been completed. There may be some other road upgrade projects in the general region which may compete for material sources. This will be confirmed during the ESIA phase of the project. Any road upgrades as part of the Project will not be in competition with the Road Development Agency (RDA), and Mphepo will collaborate with the RDA with regards to any new access roads and upgrading of existing roads.

2.7 PROJECT PRODUCTS, BY-PRODUCTS AND PROCESSES

2.7.1 Products and By-Products

The main product associated with the Project is electricity.

Waste by-products may result from the manufacture, transportation, installation, maintenance, removal, and disposal of the wind generation equipment. This includes carbon dioxide, various chemicals, building rubble, etc. During the operational phase waste by-products (e.g. waste oil, damaged equipment, etc.) are expected to be generated, but at a much lower level when compared to the construction phase.

2.7.2 Processes

As depicted in Figure 4, a wind turbine turns energy in the wind into electricity using the aerodynamic force created by the rotor blades, which work similarly to an airplane wing or helicopter rotor blade. When the wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor is connected to the generator, either directly or through a shaft and a series of gears that speed up the rotation. This translation of aerodynamic force to rotation of a generator creates electricity. The generated electricity is then directed to transformers where the voltage is increased before being directed to the electricity grid.

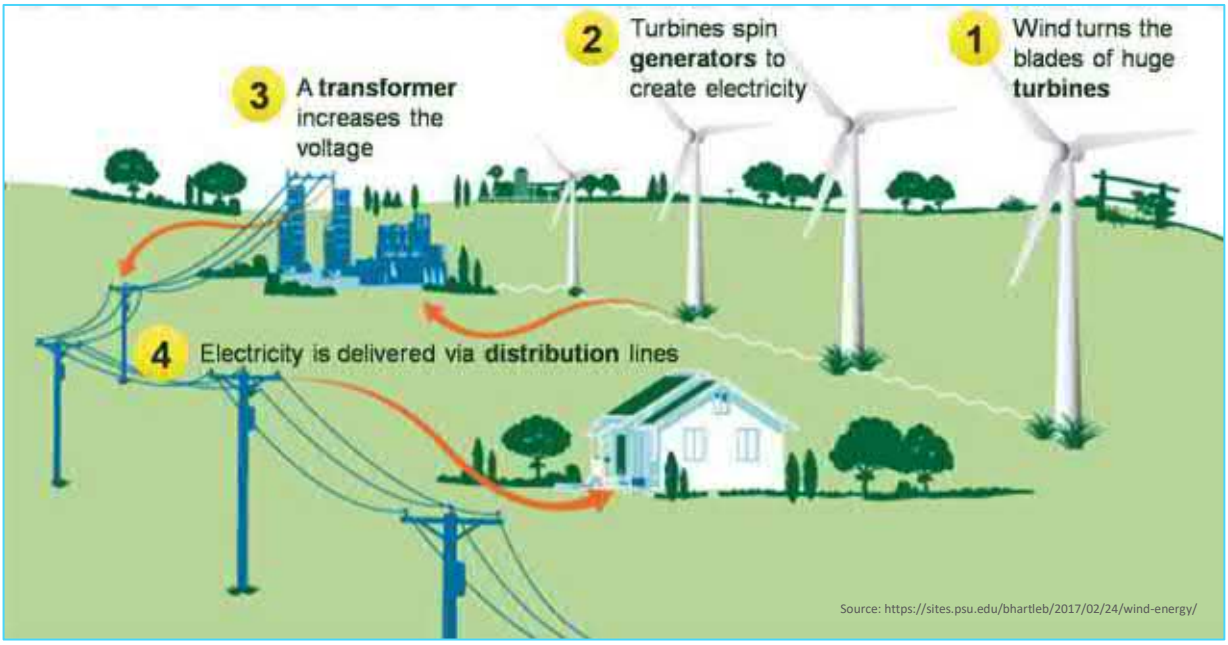

Figure 4: Wind generation process

2.8 RESOURCES REQUIRED

Resources that will be required to manufacture the wind turbines and associated components, as well as other resources required to construct the wind farm include:

- The resources associated with the wind turbine equipment manufacturing (e.g. steel, cast iron, copper, strategic metals, plastic, rubber, lubricants, resins, carbon fibre, fibreglass, etc.);
- Copper for grid connection and connections between turbines and substations;
- Material sources for construction of roads and turbine foundations;
- Construction materials for building structures (e.g. cement, brick, timber, etc.);
- Electricity for general construction and power supply to equipment/buildings;

- Cement/concrete, materials and steel for the turbine foundations;
- Fuel and chemicals for construction equipment and vehicles;
- Water for construction, sanitation and drinking;
- People for labour;
- Food for labour force;
- The resources associated with maintenance of construction equipment and vehicles (e.g. metal, plastic, rubber, oil, lubricants, etc.); and

The resources associated with the maintenance of the wind turbines and general infrastructure (e.g. .g. steel, cast iron, copper, plastic, rubber, lubricants, carbon fibre, fibreglass, fuel, chemicals, cement, brick, timber, etc.).

3. PROJECT OBJECTIVES

The main objective of the Project is to develop wind power capacity and to transmit that power into the national and regional power transmission system to meet existing and future demands. Other objectives include:

- Diversifying energy sources in Zambia;
- Improving electricity supply distribution locally and nationally;
- Creating local employment and business opportunities;
- Improving the local economy of the Eastern Province; and
- Assisting the Chewa Development Trust (and associated socio-economic initiatives).

4. EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 LANDSCAPE AND TOPOGRAPHY

In general the Project Site is comprised of a landscape of tall forested hills, elevated ridges and low-undulating hills, with broad, flat valleys extending between the hills. The valleys in-turn supports a number of ephemeral streams and well as seasonally flooded wetlands (Figure 5).

Figure 5: Images of the Project Site Landscape

In order to better understand the topography, a regional Digital Elevation Model (DEM) was generated. The data is generalised, and although will not reflect smaller topographic features, is very effective in understanding the broader landscape character which is mapped in Figure 6. Graphical representation of the terrain was also implemented with West to East and North to South profile lines cutting through the Project Site and extending beyond the area approximately five km on either side. The purple tick marks represent the opposite direction profile line, and the green tick marks the approximate outer boundary of the Project Sites, with the profile also depicting the terrain six km on either side of the project boundary as these areas could influence (or be influenced by) the proposed landscape modification.

As is depicted in the West to East profile (Figure 7), the hills located within the Project Site are strongly accentuated due to the flatter terrain to the west and east. Along this axis, the elevation ranges from a western low of approximately 900 mamsl, to a high of just below 1 375 mamsl in the centre. Although the profile below depicts a single hill, in the landscape, there are numerous other small hills which also range from 200 m to 300 m in height. Smaller cone shaped hill features are also apparent on this profile, which due to their conical shape, create interesting topographic features in the landscape.

The North to South Profile (Figure 8) reflects less of a dramatic visual picture due to the higher ground to the south outside of the Project Site. Also apparent is the flatter, southern extents of the Project Site, which are less undulating due to fewer drainage lines. The northern extent of the Project Site depicts rough terrain to the north of the central hill range. These areas are fairly difficult to access and as such less settlement has taken place.

Although the hilly terrain does add value to the surrounding landscape, the form and scale of the hills do not create significant topographic features that are unique to the region. Larger and more interesting hill features are located to the south of the proposed Project Site, which do add to the landscape character. However, there are numerous ridgelines, peaks on the hills, as well as conical shaped, steep sided hills.

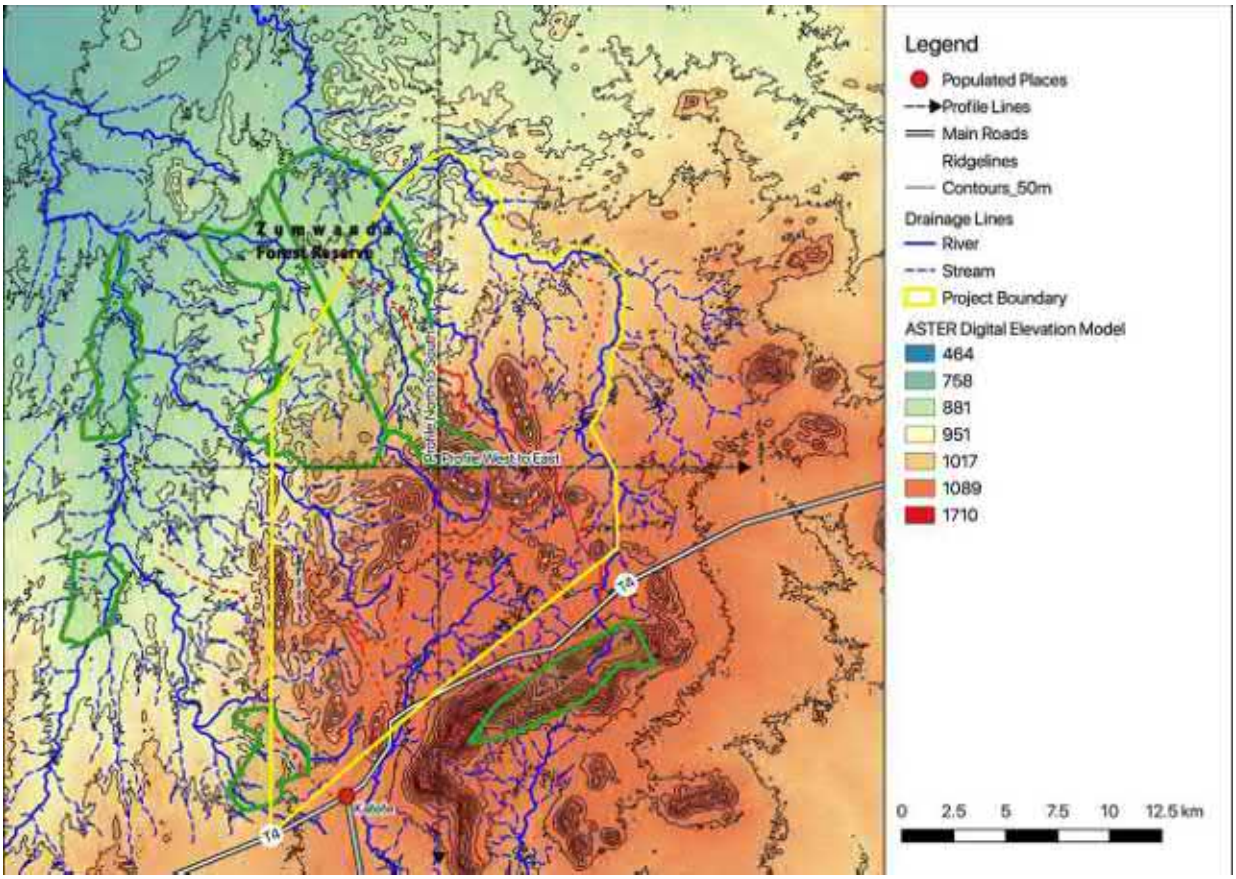

Figure 6: Regional Digital Elevation Map

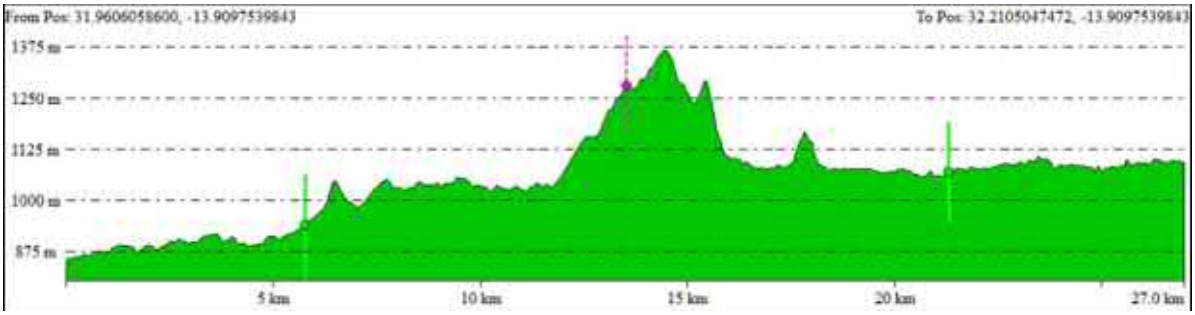

Figure 7: West to East Topographical Profile

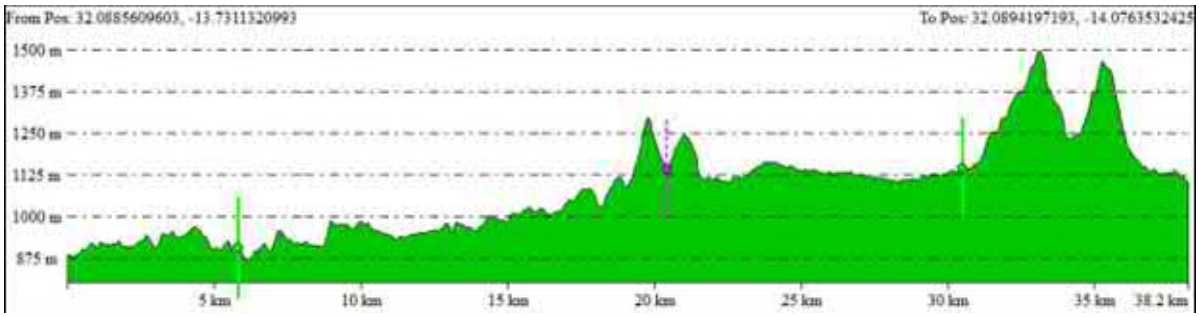

Figure 8: North to South Topographical Profile

4.2 CLIMATE

The proposed Project Site is found in Katete which is characterized by three distinct seasons: cool dry season from mid-April to August; hot and dry season from September to October; and a rainy season from November to April. The Project Site receives annual rainfall in the region of 450 mm to 1 000 mm with the mean annual rainfall being in the order of 850 mm. The months between December and February typically receive 70% of the annual rainfall.

The temperatures experienced within the Project Site are moderate with the mean monthly temperatures ranging between about 17 °C in the cold season to about 32 °C in the hot season when humidity is relatively high.

The area is dominated by prevailing easterly winds during the dry season with fresh winds experienced in the months of July and August. Winds from the south-east are also experienced during the dry months while westerly winds are experienced in the wet months.

According to the IRENA Global Atlas for Renewable Energy the wind speeds in this area range from 4 – 8 meters per second.

A meteorological mast and LiDAR devices have been installed to monitor and verify the weather and wind speeds at the Project Site. The LiDAR devices can measure the wind conditions from the ground up to a height of 200 meters. Thus the wind speed and wind direction up to rotor blade tip-height or for the whole rotor blade area can be used to calculate the wind energy yield forecast.

4.3 AIR QUALITY

There are currently no major sources of anthropogenic pollution such as industries in or near the Project Site. Possible sources of impact on the local air quality include:

- The T4 National Road (Great East Road) which supports large volumes of both heavy and commuter traffic, while traffic within and surrounding Katete is typical of any urban settlement. Medium to small vehicles and motorcycles were noted on the access roads within the Project Site;
- Households within Katete Town will likely use electricity for cooking and lighting, while rural households remain dependant on wood and charcoal for cooking, resulting in localised air emissions in communities within and around the Project Site;
- Fugitive dust along gravel access roads and from areas cleared of vegetation; and
- Smoke from bush clearing and charcoal making that takes place in certain areas within the Project Site.

According to the Global Health Observatory (GHO) data for Zambia the annual mean concentrations of fine particulate matter ($PM_{2.5}$) ranges between 15-25 µg/m^3.

4.4 NOISE

The Project Site is largely undeveloped with a rural character, though there are a significant number of communities dispersed in the area. Ambient sound levels are typical of a rural noise district.

A number of ambient noise measurements were collected during February 2019. Measurements were collected in 10-minute periods for a period of 1 hour. Noise levels ranged from 29.2 – 47 dBA ($L_{Aeq,f}$) or 21.5 – 31.7 dBA (L_{AF90}) as indicated in Table 5 below.

The results indicated a quiet environment where natural noises, mostly wind-induced as well as faunal noises, dominate. Anthropogenic noises increase ambient sound levels, especially closer to the communities and local towns. The data is similar to sound level measurements measured at other, similarly natural locations.

Available data indicated that wind-induced noises start to increase at wind speeds 3 – 4 m/s, becoming significant (and frequently the dominant noise source in rural areas) at wind speeds higher than 10 – 12 m/s. Most wind turbines reach their maximum noise emission level at a wind speed of 8 – 10 m/s. At

these wind speeds increased wind-induced noises (wind howling around buildings, rustling of leaves in trees, rattling noises, etc.) could start to drown other noises, including those being generated by wind turbines.

Table 5: Summary of ambient sound levels measured onsite

Measurement name and location (WGS 84)	$L_{Amax,I}$ dBA	$L_{Aeq,I}$ dBA	$L_{Amin,I}$ dBA	$L_{Aeq,I}$ dBA	L_{AF90} dBA90	Comments
MPWFSTSL01 (-13.996717°, 32.063896°)	67.0	44.3	20.2	39.8	24.8	Quiet location with wind induced noises generally defining ambient sound levels. Bird sounds audible and dominating when close to microphone. People walking or cycling past raising noise levels at times. Insects audible at times. Large group of people passing on bicycles during measurement 5, significantly raising noise levels for around 60 seconds. Car passing measurement 6 with cyclist with large radio.
MPWFSTSL02 (-13.961734°, 32.071422°)	69.5	45.2	17.7	43.8	21.5	Wind induced noises from maize leaves the dominant sound at times. Birds and some insects. Voices of passersby at times. Sound levels peaking with wind gusts. Motorcycle passing during measurement 3. Motorcycle passing during measurement 5.
MPWFSTSL03 (-13.939922°, 32.121561°)	65.5	47.4	21.7	43.9	26.2	Quiet with birds and wind induced noises dominating. Sound of running water just audible. Frogs audible at time dominating sound level during event with call up to 58 dBA. Wind through maize leaves dominating during wind gusts. Wind increasing resulting in sound level of approximately 42 dBA for around 30 seconds. Main source of noise is frogs and birds.
MPWFSTSL04 (-13.853300°, 32.104418°)	51.9	34.2	17.3	29.2	21.5	Birds calls dominant. Some insect sounds. Very low winds all measurements.
MPWFSTSL05 (-13.867597°, 32.079747°)	76.2	49.7	26.2	47.0	31.7	Some wind induced noises likely dominant. Crickets and birds audible. Cicada species audible. Possibly frogs audible. Natural noises dominant. Sound from town with wood cutting and voices of kids. Vehicle passing during measurement 2.
MPWFSTSL06 (-13.966362°, 32.155850°)	73.9	46.8	25.0	43.4	28.3	Natural noises dominate with birds being the main source of noise. Background noise due to water flowing in river. Voices audible in distance. Traffic on tar road audible at times. Passersby at times increasing noise level.
MPWFSTSL07 (-13.931836°, 32.140911°)	58.3	39.4	22.9	34.6	29.1	Wind induced noises dominate with light winds. Stream running audible in far distance. Lots of broad leaved trees. Birds audible. Voices barely audible in far distance. Natural sounds dominate. Thunder in distance at times. Chopping of wood in far distance during last measurement. Humidity increasing with light rain end of measurement (not influencing measurement).
MPWFSTSL08 (-13.834341°, 32.129462°)	69.8	46.0	21.3	37.9	26.2	Bird sounds dominating with light drizzle of rain audible. Wind through leaves at times. Voices barely audible at times. Insects audible. Thunder in distance not impacting on sound level. Wind reducing third measurement with lighter drizzle. Voices from passersby raising noise level 5th measurement.

4.5 GEOLOGY AND SOILS

Geology in the vicinity of the Project Site is broadly defined as metamorphic rocks of the Mozambique Belt of the Proterozioc eon according to the Geological Map of Africa compiled by Dr Schlüter. Although this area can reflect large granite domes which create unique landscape features adding to the scenic quality, no domed granite features were identified in the vicinity. The regional terrain is hilly, surrounded mainly by gently undulating terrain.

4.6 SURFACE HYDROLOGY AND DRAINAGE

Numerous extensive drainage systems were identified within the Project Site, many of which are interlinked and extend far beyond the boundaries of the Project Site. At a high level, these watercourses were classified as Inland Systems falling within the Middle Zambezi – Luangwa and Lower Zambezi Aquatic Ecoregions. The identified drainage systems comprised the following primary hydrogeomorphic (HGM) types: rivers with associated riparian vegetation and in some cases with associated floodplains, valley bottom wetlands (both channelled and unchannelled), and what are referred to locally (in Zambia) as 'dambos' (characterised by relatively even topography and situated in low-lying areas).

Whilst there were distinct differences between the different HGM types (e.g. between the rivers with associated riparian zones and dambos), it was noted during the fieldwork that conditions were largely homogenous within each group of the various drainage systems. For example, dambos were all characterised by the same floral species composition and vegetation communities throughout the Project Site, and the rivers had distinctive riparian zones characterised by woody species (with species composition unvaried).

The boundaries of the aquatic features/watercourses were delineated using terrain units, vegetation and soil morphological characteristics. The watercourse delineation map is presented in Figure 9.

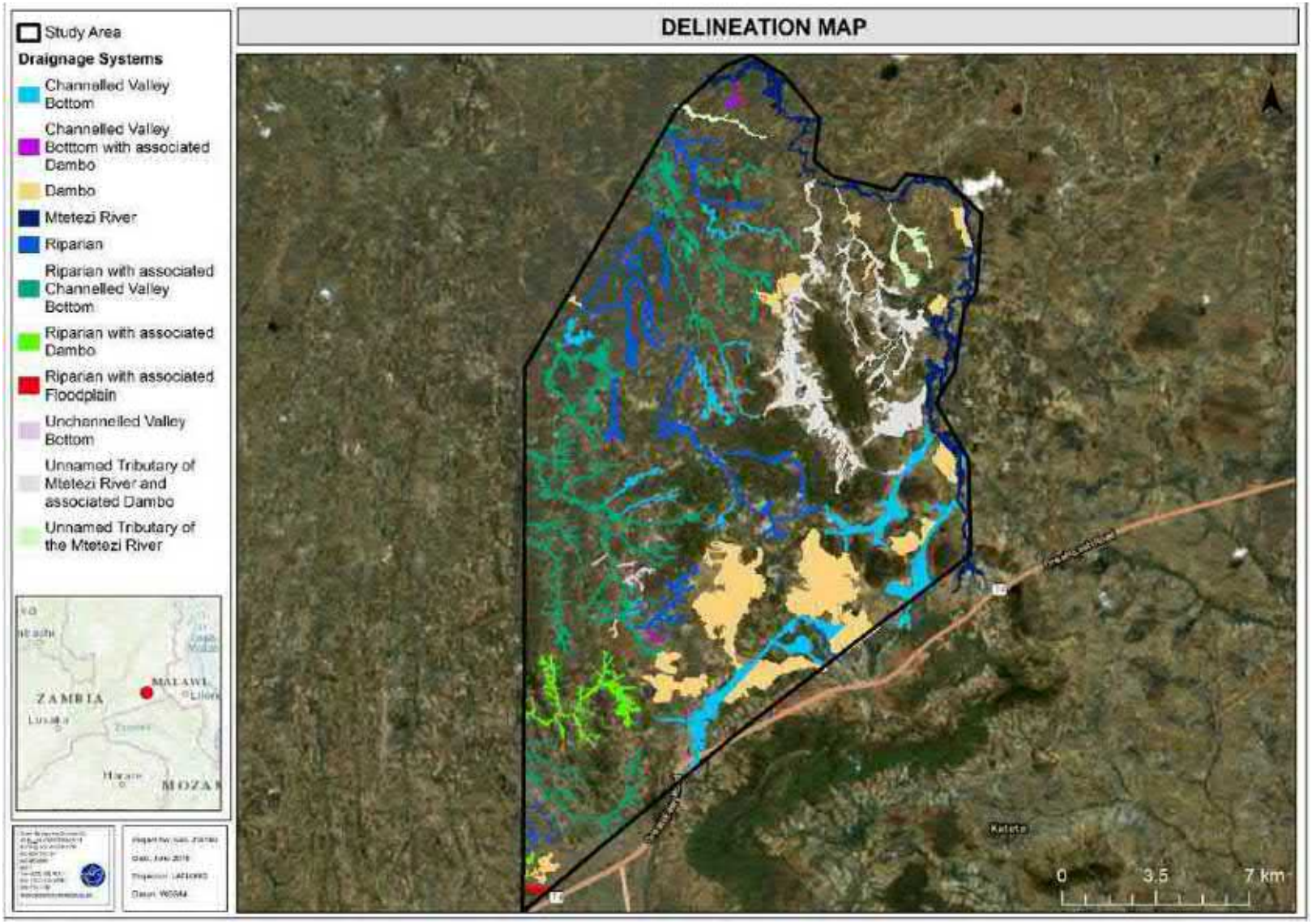

Figure 9: Conceptual depiction of the aquatic features delineation in relation to the Project Site

4.6.1 Mtetezi River

Hydraulic regime

The hydraulic regime of the Mtetezi River has been altered primarily by the presence of impoundments, both within the Project Site and downstream thereof. Of particular mention is the Katete dam located upstream (south) of the Project Site which provides the town of Katete with water. Although no other instream infrastructure was noted within the reach of the river within the Project Site, the T4 road traverses the river, necessitating a bridge crossing.

Geomorphology and sediment balance

Although the entire reach of the river could not be accessed and assessed those areas which were surveyed were noted to be moderately incised. This was attributed to vegetation clearing in the adjacent areas, leading to increased runoff entering the river and potentially at increased velocity, causing scouring and bank incision. Apart from the aforementioned impoundments, no other significant impacts on the geomorphological regime were noted. Increased sediment is expected due to cultivation adjacent to the river in some areas.

Water quality

Significant rainfall occurred during the week of the field work, resulting in large volumes of sediment being transported into the river, causing turbidity. Due to steep inclines at the assessment points as well as the depth and velocity of the water at the time of assessment, it was not possible to safely access the river to assess basic water quality parameters. Based on water quality parameters obtained in other river systems within the Project Site, and taking into account the surrounding land-uses, water quality is expected to be relatively unimpaired.

4.6.2 Riverine systems (excluding the Mtetezi River)

Hydraulic regime

The hydraulic regimes of the various riverine systems have not been notably impacted, except where some instream infrastructure, such as weirs and road crossings (informal and formal) has been constructed. The occurrence of heavy rains at the start of the site assessment enabled assessment of how such infrastructure causes alterations to flow regimes, with flow being concentrated at specific points either around or through the centre of such infrastructure. Additionally, it was apparent that debris occasionally becomes lodged against instream infrastructure, impeding flow and causing turbulence. Aside from these impacts however, no formal abstraction (e.g. pump stations) or unnatural water inputs were observed.

Geomorphology and sediment balance

The proximity of subsistence agriculture in close proximity to the rivers has resulted in increased volumes of sediment transported into the rivers. This in turn has resulted in scouring and bank incision. Where bank incision was observed, in most instances it was not considered severe.

Water quality

Although information pertaining to the reference state of these rivers is scarce, it is considered possible that the clearing of vegetation and disturbance of soils has contributed to the increased turbidity of the rivers. It must be noted that the assessment took place during a period of relatively high rainfall though, and therefore this may be considered a natural state due to the dispersal of sediment in stormwater runoff. Basic water quality parameters (temperature, pH and Electrical Conductivity [EC]) were measured at five sites. At all five sites, pH ranged from 7.07 to 7.60, and EC ranged between 1.2 mS/m to 3.0 mS/m. These results indicate that water quality is relatively unimpaired, save for increased turbidity and possibly increased nutrients.

4.6.3 Valley bottom wetland systems

Hydraulic regime

No impacts on the hydraulic regime were observed within the valley bottom systems, with the exception of very few informal road crossings which may potentially impede flow and cause accumulation of natural debris (e.g. branches, grass stalks etc.) Within the channelled valley bottom systems, no impacts on hydraulic connectivity or flow regimes were observed. Some impacts on the vadose zone (i.e. the movement of water through soils, specifically the recharge zone) may have occurred due to soil disturbances relating to agriculture. The hydraulic regime is deemed to be in a largely natural state.

Geomorphology and sediment balance

Soil disturbances and informal road crossings were the most commonly observed impacts on the geomorphological processes of these wetland systems. Vegetation loss due to agriculture is likely to have contributed to increased sediment inputs, in turn leading to an altered sediment budget and possibly changes to sediment distribution within the wetlands. Although some stream bank incision was apparent in certain systems, erosion was not considered severe at the time of the assessment and is therefore not considered a significant modifier.

Water quality

Water quality parameters, where measured, indicated that aside from turbidity, water quality is relatively unimpaired. This is as anticipated due to the remote geographical setting and the fact that the rivers are more regularly utilised for domestic purposes. Increased nutrients are expected due to increased faecal matter from domestic livestock in these areas.

4.6.4 Dambos and floodplain wetland systems

Hydraulic regime

Disturbances to the soils within dambo areas may have led to altered movement of groundwater within the vadose zone of the wetlands, in turn potentially altering the hydraulic regime of these systems. Additionally, the increased woody component within these systems may have resulted in increased water use.

Geomorphology and sediment balance

Once again, the primary impact on geomorphological processes is disturbances to soils, and informal road crossings. Movement of sediment through the wetlands is driven largely by movement of surface water, thus is likely to only be transported through the dambos during the rainy season. Some patches of erosion were observed within areas subjected to long-term cultivation, however re-establishment of pioneer graminoid species, as observed in some of these areas, should mitigate the erosion.

Water quality

Although surface water was present in some dambos at the time of the assessment, it was due to rainfall received and is not likely to be present during the dry season. Based on water quality parameters recorded in the various riverine and channelled valley bottom systems, water quality within the dambos is likely to be relatively unimpaired, although potentially has high sediment loads due to the disturbances to soils.

4.7 LAND USE AND TENURE

4.7.1 Land Use

The Project Site is comprised of several different land-uses, and dominated by (1) rural settlements, (2) urban and peri-urban settlement at Katete Town, (3) small-scale agriculture, and (4) open public/communal land. Each land-use is described in more detail below:

- ***Rural Settlements:*** The Project Site contains a number of rural villages that vary considerably in size – varying from large villages (supporting hundreds of households) to smaller isolated hamlets (supporting 1 to 5 households) and single isolated farmsteads. The rural villages also tend to be located on elevation ridges, while avoiding the valley flats and the local hills. The larger villages tend to function as local centres and are generally clustered along main district roads. Smaller satellite villages and hamlets have grown around the larger villages and this is normally in response to population growth. The distribution of villages and households in the Project Site is depicted in Figure 10.

- ***Urban and Peri-urban Settlement at Katete Town:*** Katete Town forms the south-western boundary of the Project Site. The town functions as the administrative centre of the Katete District and is the only true urban centre in the area with a total population of 21 458 individuals in 2010 (Central Statistics Office of Zambia, 2012). Katete contains both urban and peri-urban residential development, and interviews suggest that the town is expanding northward into the Project Site. The land, administrated by the Katete Town Council (which is designated State Land), is formally limited to 100 m north of the T4, however much of the urban and peri-urban residential areas have expanded into customary land. The Katete Town Council has considered converting all residential areas located on customary land to state and titled land; however, no specific boundaries or agreements have been reached yet.

- ***Small-Scale Agriculture:*** Small-scale agriculture is the dominant land-use, and accounts for approximately 34 % of the total Project Site. The distribution of the farmland is largely restricted to the low-lying valley flats interspersed between high hills. The distribution of farmland in the Project Site is depicted in Figure 10. There are noticeable forms of farming that include large dryland farm plots that concentrated on maize production and are entirely rain-fed. There are also smaller garden plots that are localised to local seasonal streams and drainage areas, where the soil-moisture content support water-thirsty crops.

- ***Open Communal Land:*** Communal land encompasses all lands that are not held under private ownerships, and generally covers the open bush as well as natural or transformed vegetation. This land-use type is not actively farmed but is commonly used by local village for natural resource harvesting as well as grazing of livestock. Communal land is administered by the traditional authorities.

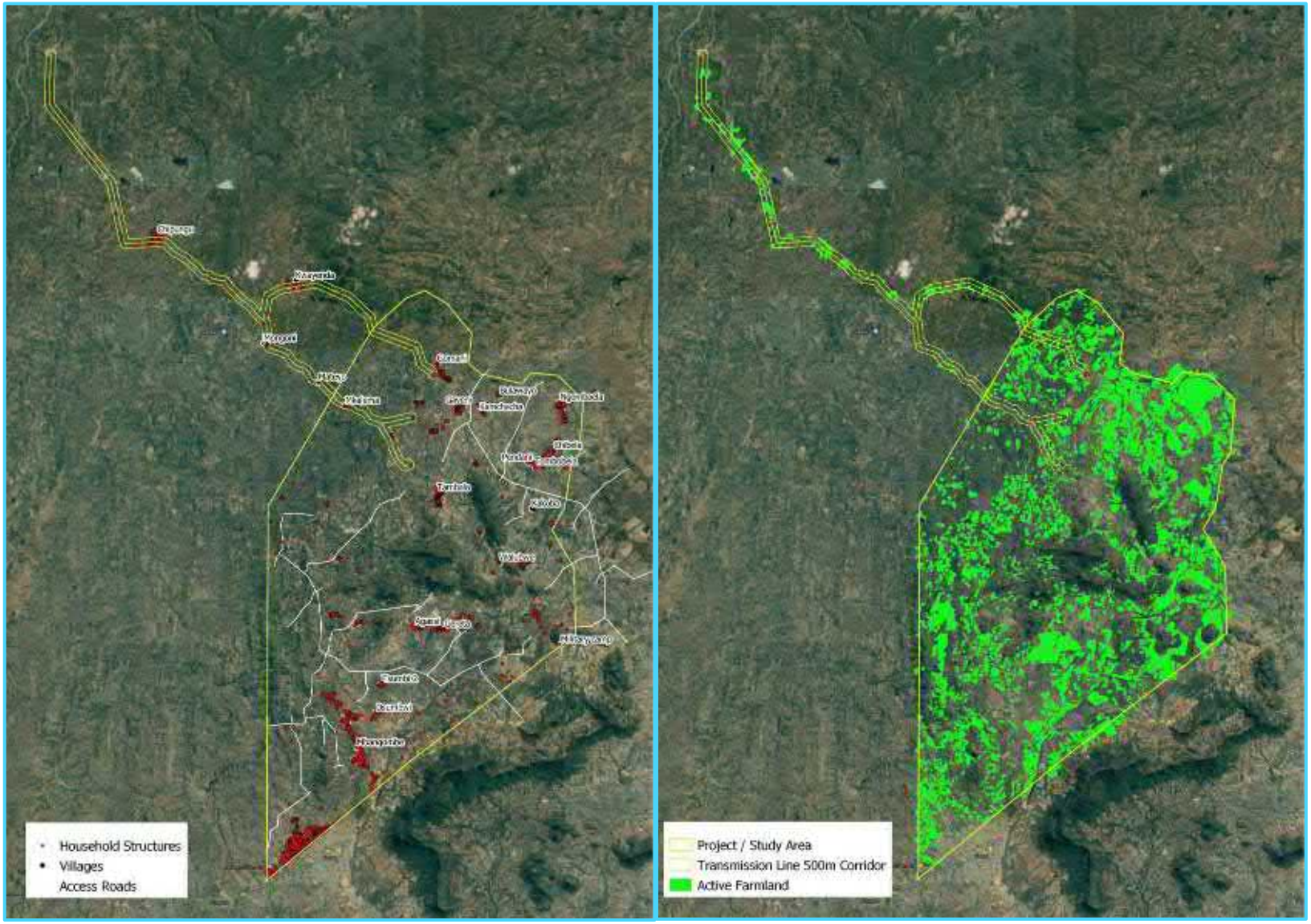

Figure 10: Distribution of households/villages (left) and farmland (right).

4.7.2 Land Ownership and Tenure

All land in Zambia is vested absolutely in Government of Zambia and is held by the government in perpetuity and in trust on behalf of the people of Zambia. Under such an arrangements, land in Zambia essentially falls into two main categories – Customary and State Land.

All land located within the Project Site and along the power transmission line route fall under Customary Land which is legally recognised and protected under the Lands Act, Chapter 184, and any customary land vested in or held by any person under customary tenure is similarly recognised.

The administration of the Project Site customary land is via the Chewa Royal Establishment and the local chiefs. The chiefs, with support from headmen/headwomen, are granted powers to allocate land to individuals or families for their personal use (i.e. farming) and occupation (i.e. establishment of homes). Interviews suggested that such allocation is done verbally, and there is little written evidence or certification of rights been granted.

Historical land ownership would have been secured for large tracts of land by the original family-clans in the area. Any clan lands would have, over time, been divided and granted to family members of the clans. Any family member granted land is thereafter deemed to be the exclusive owner of their land. However, the clan may place certain restrictions on how the land is sold or disposed of.

The allocation and administration of land is undertaken directly by the headmen/headwomen, with support from a village committee and via direct consultation of the villagers. The headmen/headwomen generally have strong ties to the major family-clans in of the villages they administer. The relationship between clans and headmen/headwomen therefore has a major influence on land administration at the village level.

In addition to the above individual land arrangements, customary tenure also relates to community, common, or forest land within a village, as well as communal grazing land. Such land will not be under any form of individual exclusive right but is freely and openly used by local communities.

All land not held under customary tenure is deemed to be state land. With respect to the project this is limited to the Katete Town Council Land as well as land held by the Ministry of Defence, although the latter is being contested as customary land. Any attempt to convert customary land to state land, may only be undertaken under national law and only after the approval of the chief and the local authorities in whose area the land to be converted.

4.8 SOCIAL, ECONOMIC AND CULTURAL HERITAGE

4.8.1 Administrative Structure

The Project Site is located in the Katete District in the Eastern Province of Zambia, while the Project Transmission Line extends into the neighbouring Mambwe District. The area also falls directly on Chewa Traditional Establishment land and under two separate Chiefdomships.

The Katete District is formally administered by the District Council located at Katete Town. The town is located on the south-western boundary of the Project Site, and functions as the district administrative centre. The District Council is headed by District Council Chairman and assisted by the District Council Secretary and elected councillors. The mandate of the Council varies, but primarily concerns infrastructure development and management as well as local administration, while also supporting the offices of national government ministries.

Katete District is divided into 18 wards of which the Project Site is located in the Matunga, Mkaika and Mphangwe Wards. The Project Site encompasses major portions of the Matunga and Mkaika Wards, while the Mphangwe only extends into the southern boundaries of the Project Site and includes Katete Town.

Zambia supports a dual administrative structure comprised of formal government departments (i.e. the District Councils) and traditional structures. The traditional structures are founded on the Chewa Royal

Establishment, which constitutes the Paramount Chief (or King), his advisors as well as a number of chiefs, indunas and headmen / headwomen.

The traditional administration in the area is a complex and interconnected set of relationships and responsibilities. The Paramount Chief/King is the overall leader of the Chewa Kingdom and is supported by the Chewa Royal Establishment and the Royal Council (including the royal family, chiefs and other functionaries).

The functions, powers and duties of the Paramount Chief are delegated to Chiefs, whom administer broad areas of the Kingdom (i.e. Chiefdoms). The Project is located in a single chiefdom under Chief M'bangombe, while the power transmission line may extend into an area located under Chief Msoro. The chiefs are further supported by headmen/headwomen that administer one or more villages. The Chief and headmen may also be supported by indunas which function as advisors but have no specific powers.

The areas controlled by the different headmen/headwomen is fluid. Headmen/headwomen are often selected based on their ties with major or founding clans of their respective villages. The headmen/headwomen provide direct administrative functions at the village level, and therefore play a direct role in supporting individual households as well as the administration of land.

4.8.2 Population Demographics

Population Statistics

The Katete District supports a total population of 243 849 persons in 2010 (See Table 6) while the three wards that intersect with the Project Site support 20 % (49 690 persons) of the district population. With a predicted growth rate of 2.6 % per annum (Central Statistics Office of Zambia, 2012), the total district population is expected to be 307 218 in 2019, with similar increase for the three wards.

Table 6: Population Profile

Administrative Division	Census 2010			Projected Population (2019)	Pop. Density (persons/km^2)
	Males	Females	Total		
Katete District	119 995	123 854	243 849	307 218	61.1
Matunga Ward	3 159	3 270	6 429	8 100	38.7
Mkaika Ward	11 961	12 210	24 171	30 452	61.2
Mphangwe Ward	9 379	9 711	19 090	24 051	136.4

Source: (Central Statistics Office of Zambia, 2012)

The population density for the Katete District is 61.1 persons per km^2. There is however greater variation in population density between the three wards. The Matunga Ward has half of the district population density, which is attributed to the low density and isolated nature of many of the villages in the ward. Mphangwe Ward has a higher population density as Katete Town is located within this ward and supports a much larger resident population.

The district population will be resident in either urban or rural areas, with the greater proportion (87 %) of the district population being resident in rural areas (Table 7). There is however clear differentiation between the three target wards. The Matunga and Mkaika Wards support a near exclusive rural population and are characteristic of the typical population patterns found in the Project Site.

Table 7: Urban / Rural Divide as a Percent of Total Population

Administrative Division	Urban	Rural	Total

Administrative Division	Urban	Rural	Total
Katete District	13	87	100
Matunga Ward	0	100	100
Mkaika Ward	7	93	100
Mphangwe Ward	85	15	100

Source: (Central Statistics Office of Zambia, 2012)

The average household size is 5.2 persons per households for the Katete District, and this is similar in the three wards the cover the Project Site (Table 8). Interviews with local headmen / headwomen confirm that households in their villages have, on average, 5 persons, which matches with district statistics. A typical household in the Project Site is therefore comprised of a typical nuclear family, or the father, mother and 2 to 3 children, while some households will also support grandparents and grand-children.

Table 8: Household Size

Administrative Division	Total Population	Total Households	Household Size
Katete District	243 849	46 852	5.2
Matunga Ward	6 429	1 206	5.3
Mkaika Ward	24 171	4 733	5.1
Mphangwe Ward	19 090	3 785	5.0

Source: (Central Statistics Office of Zambia, 2012)

A single-family retaining use of a single homestead is by far the most common form of household, as confirmed during local interviews. However, there are also some compound homesteads although this is rare. Such households comprise of a large extended family on a single plot. The extended family comprises of a senior male (usually the grandfather) whom retains ownership of the land and his own household assets, while young adult sons and daughters may divide into separate households upon marriage but remain on their father's land.

Age and Gender Composition

The age and gender profile of the District and targeted wards are presented in Table 9. The total population is relatively young with just under half being below the age of 14 years. The only real variation is the slightly higher proportion of persons above 14 years in the Mphangwe Ward. As this ward contains Katete Town, the greater proportion of adults is likely attributed to either improved living conditions or in-migration of young adults into the town.

Table 9: Age and Gender Profile as Percent of Population

Administrative Division	% of Males			% of Females			Total (%)		
	0-14	15-34	> 35	0-14	15-34	> 35	0-14	15-34	> 35
Katete District	48	33	19	47	33	20	48	33	19
Matunga Ward	50	31	20	47	33	20	48	32	20
Mkaika Ward	49	32	19	46	33	20	47	33	20

Administrative Division	% of Males			% of Females			Total (%)		
	0-14	15-34	> 35	0-14	15-34	> 35	0-14	15-34	> 35
Mphangwe Ward	43	39	18	42	41	17	43	40	17

Source: (Central Statistics Office of Zambia, 2012)

Literacy & Education

Adult literacy rates are poor with between 44 to 46 % of the adult population (aged between 25 to 54 years of age) having never attended school (Table 10), while illiteracy rates increase significantly for persons above the age of 55. This trend is likely reflective of the limited access to and prioritisation of education in the past, however there is some improvement in education enrolment for younger age groups.

Table 10: Percent of Population (above the age of 5) by School Attendance

Age Group	Currently Attending			Not Currently Attending			Never Attended
	Male	Female	Total	Male	Female	Total	
5 to 9	10	13	22	1	1	1	76
10 to 14	28	33	62	3	3	6	33
15 to 19	28	22	50	8	14	23	27
20 to 24	10	4	14	21	27	48	38
25 to 29	2	1	3	26	27	53	44
30 to 34	1	1	2	30	25	54	44
35 to 39	1	1	2	29	23	52	47
40 to 44	1	1	1	29	23	52	46
45 to 49	1	1	1	31	23	54	45
50 to 54	1	1	1	29	24	53	46
Great than 55	1	1	1	23	15	38	61
Total	**12**	**12**	**24**	**15**	**14**	**29**	**47**

Source: (Central Statistics Office of Zambia, 2012)

Enrolments rates of children of schooling going age (between 5 and 18 years of age) indicates that at least a third had not received any form of education in 2010 (Table 11), and this remains a major social challenge in the Project Site. Enrolment in primary school sits around 62% while enrolments in secondary schools are around 50% of the relevant age groups.

Discussion with district authorities and local leadership shows a complex range of issues in terms of gender and education. Young boys and girls are usually enrolled in education, however young boys (aged between 6 - 11 years) may be held back to function as herd-boys with a result of young girls generally receiving a better education. However, once girls enter puberty (aged around 14 years) school drop-out increases significantly largely in response to household care needs as well as a common challenge of child-brides in the region.

The maximum education achievement rates for the district population in 2010 are presented in Table 11 below. There is a noticeable education ceiling reached at Grade 7, with the majority of the district

population (75 %) reaching only Grade 7 or below. Grade 7 is the end of primary school level education, with few people continuing on to complete Secondary level education.

Table 11: Percent of Population (above the age of 5) by Highest Level of Education

Grade	Male	Female	Total
No Grade	2	2	3
1	4	5	9
2	5	6	10
3	5	6	10
4	5	6	11
5	5	5	10
6	5	5	10
7	7	6	12
8	4	3	7
9	4	3	7
10	1	1	2
11	1	0	1
12	2	1	4
Tertiary	2	1	3

Source: (Central Statistics Office of Zambia, 2012)

The low attendance rates at secondary schools are in part to the limited number and costs of attending secondary schools, whereas primary schools are more common and more importantly free. However, there is also a high and consistent drop-out rate of boys and girls throughout the different grades, and interviews attribute drop-outs to child marriages, the need to support household, or lack of interest or perceived value of both parents and children.

Ethno-Linguistic Profile

Zambian supports approximately 72 ethnic groups, with almost 90% of Zambians belonging to the nine main ethno-linguistic groups: the Nyanja-Chewa, Bemba, Tonga, Tumbuka, Lunda, Luvale, Kaonde, Nkoya and Lozi. The population of the Katete District are near exclusively comprised of the Eastern Province (Nyanja speaking) Ethnic Groups and more specifically the Chewa Ethnic Group (Table 12)

Table 12: Percent of Total Population by Ethnic Background

Language Group	Male	Female	Total
Northern and Luapula Province (Bemba Speaking)	0.5	0.5	1.0
Southern and Central Province (Tonga Speaking)	0.2	0.2	0.4
North Western Province Ethnic Groups	0.1	0.1	0.1
Western Province Ethnic Groups	0.2	0.2	0.4
Eastern Province (Nyanja speaking) Groups	47.8	50.2	98.0

Language Group	Male	Female	Total
Chewa	43.9	46.0	89.9
Nsenga	0.9	1.1	2.0
Ngoni	1.6	1.6	3.2
Nyanja	0.3	0.3	0.6
Kunda	0.5	0.6	1.1
Chikunda	0.1	0.1	0.1
Tumbuka	0.5	0.5	0.9
Senga	0.1	0.1	0.2
Yombe	0.0	0.0	0.0
Northern and Muchinga Province (Mambwe speaking) Groups	0.1	0.1	0.2
Total	**48.8**	**51.2**	**100.0**

Source: (Central Statistics Office of Zambia, 2012)

The Chewa Ethnic Group accounts for 7.5% of the national population, and 40% of the provincial population. As such, the Chewa forms the provincial majority and is not an ethnic minority. The remaining population is comprised of different ethnic groups under the Eastern Province (Nyanja speaking) Ethnic Group, which overall belong to local ethnic majority groups (including Bemba).

Broadly speaking, none of the above groups are considered to be "indigenous peoples" based on the general definitions of such people under the IFC Performance Standard 7. The noted groups are either ethnic majorities in the Eastern Province, or from majority ethnic groups in neighbouring provinces. In general, no indigenous peoples have been identified in broader Zambia that would be relevant to the Project.

Zambia provides protection for minority groups and there is limited systemic discrimination. Interviews with the District Authorities suggest that there are no ethnic or cultural tensions in the District, and in general the relationship between ethnic groups is good. In many cases, ethnic minorities are related to economic migrants from Mozambique and Malawi that provide key skills and basic labour that is generally welcomed by local people. Nevertheless, economic migrants are restricted from obtaining land from the traditional authorities.

4.8.3 Livelihoods

Employment Profile

Of the total district population, 74 % define themselves as falling into the economically active group, or persons that are older than 12 years of age and available for casual of formal work (Table 13). Formal or casual wage employment is only secured by 3 % of the district population, while the majority of economically active people are either self-employed or unpaid family-workers.

These two latter groups do not fall into the traditional interpretation of employment, and in reality, are family members of small-scale farming households. Formal employment from local agriculture is negligible if non-existent, and farm-based employment is largely restricted to households farming their own land, via provision of labour support by both male and female family members, while seasonal casual labour may be used by local households.

Table 13: Percent of Total Population (Above the Age of 12) by Economic Status

Employment Status	Male	Female	Total

Employment Status	Male	Female	Total
Economically Active Group	36	38	74
Employer	0	0	0
Employee	2	1	3
Self-Employed	23	17	40
Unpaid Family Worker	11	20	31
Unemployed (Seeking Work)	1	1	1
Unemployed (Not Seeking Work)	1	1	1
Economically Inactive Group	11	13	23
Total	48	52	100

Source: (Central Statistics Office of Zambia, 2012)

The dominance of small-scale farming in the District is similarly reflected in Table 14. The majority of the total economically active workforce (89 %) falls into the Agriculture, Hunting, Forestry and Fishing industry sector. Forestry and fishing provides minimal contributions, while all other industry sectors in combination contribute only 11 % of the total employment. This includes manufacturing, construction, trade and accommodation and transport, and government functions. These activities will be restricted to trade and services provided in Katete Town.

Table 14: Percent of District Workforce by Industry Sector

Industry Sector	Male	Female	Total
Agriculture, Hunting, Forestry and Fishing	42	47	89
Mining and Quarrying	0	0	0
Manufacturing	1	0	1
Electricity Gas Steam and Air Conditioning Supply	0	0	0
Water Supply	0	0	0
Construction and Allied Repairs	1	0	1
Wholesale, Retail Trade, Restaurants and Hotel	1	1	2
Transport and Storage	1	0	1
Accommodation and Food Services	0	0	0
Information and Communication	0	0	0
Finance and Insurance	0	0	0
Real Estate	0	0	0
Community, Social and Personal Services	2	1	2
Not Stated	1	2	3
Total	**48**	**52**	**100**

Source: (Central Statistics Office of Zambia, 2012)

Small-Scale Farming

According to Census 2010 data 92% of all households located in the Katete District engaged in some form of agriculture in the 12-months preceding the Census. Such farming tends to be small-scale and informal with the primary aim of securing household food needs and trade in surplus produce. There is no evidence of large to medium commercial farming operations within the Project Site, although farming undertaken by the local Military Units may be treated as quasi-commercial.

Interview with local leaders suggest that the average farmland holdings is 2 hectares per household. Farmland is allocated by major land-holdings clans and headmen/headwomen to individuals, and these holdings are inherited from father to sons. In many cases, any inherited land is granted equally to all sons (but excludes sisters) rather than the eldest. This has resulted in the division of land-holdings into smaller plots through multiple generations.

Interviews with local leaders suggest that the farmland is usually farmed in its entirety, and little land is left fallow or under some form of rotation. Portions of farmland may only be farmed where it is deemed sufficient to support household food needs, while the remaining farmland may be allocated to cash crops or left fallow until the following year. Interviews suggest that fallow land is rare, due to local culture where any fallow land suggests that the landowner is lazy or has been granted too much land. Both such rumours tend to be avoided by local households where possible.

Interviews indicate that staple crops for local households are maize, with sunflower, cotton and groundnuts functioning as important secondary crops. This largely reflects the same crop diversity farmed by households in 2010 in the Katete District (Table 15). The majority (91 %) of households grow maize as their primary crop. Groundnuts, sunflower, cotton, sweet potato is also commonly grown. Other important crops include vegetables, sugar cane and cassava.

Table 15: Percent of District Households by Cultivated Crop Type and Typical Yields

Crop Type	Households	
	No	%
Maize	42 715	91
Groundnuts	31 432	67
Sunflower	23 204	50
Cotton	21 823	47
Sweet Potato	16 555	35
Mixed Vegetables	10 992	23
Mixed Beans	9 014	19
Cow Peas	7 870	17
Sugar Cane	6 439	14
Cassava	4 591	10
Other Crops	3 313	7

Source: (Central Statistics Office of Zambia, 2012)

It is noted that local households also grow a mixed diversity of vegetables (Table 15). This is related to a clear divide between what may be termed dryland farming and vegetable gardens as detailed below in Figure 11.

Figure 11: Images of Dryland Farm plots and Vegetable Gardens

1. **Dryland Farmland:** This type of farmland entails relatively large (interviews suggest average fields holdings of around 2 hectares) farm plots located on slightly elevated land away from local streams and may even extend up into the local hills. These farm plots comprise the major landholdings of local households and are near exclusively comprised of maize, cotton and sunflower with some secondary crops. Interviews suggest that most of the land is farmed and rotation farming / fallow land is largely non-existent, suggesting that land will be under pressure from over-use. Depending on the unique characteristics of each household and their total landholdings, most will farm maize that is just enough to feed their households with some surplus for trade. The remaining land is either not used or is planted with a diversity of other crops (notably sunflower and groundnuts) that protects households from shocks from maize losses as well as permitting some additional trade in produce. Dryland farming, irrespective of the crop, is undertaken at a very specific season (See Table 16). Land preparation and planting is undertaken between October and December and coincides with the seasonal rains. Harvesting is undertaken around May of the following year.

2. **Vegetable Gardens:** Vegetable gardens are restricted to local rivers, streams, drainage lines or dambos (or any drainage feature that sustains water during the dry season). The gardens are normally very small (on average 40 metres squared) relative to the dryland farm plots. The gardens are predominately used to grow high-value and water-hungry vegetables (including tomato, onion, water melon, and other mixed vegetables). The cropping season for vegetables is almost an inverse of the dryland crops (Table 16). The gardens are not farmed during the rainfall seasons as they are usually flooded or water-logged. Land preparation and planting is undertaken in around June, and just after the harvest of the dryland crops. The harvesting of the crops, depending on crop type, extends over July to September.

The two cropping seasons also permit a clear distribution of labour. Preparation for vegetables gardens occurs immediately after the harvesting of the dryland crops and when household labour is readily available. The harvesting of any gardens crops occurs before the need to prepare the dryland farm plots for the next season.

Analysis of latest available crop forecast data covering the staple crop of maize in year 2017/2018 shows that the expected yields for the Katete District, and by extension the households within the Project Site, is only 1.60 tonnes per hectare (Table 17). There are however clear seasonal differences with the 2016/2017 yields predicted at 2.20 tonnes per hectare.

In comparison, the expected yields for Zambia as a whole and the Eastern Province is 2.12 and 2.25 tonnes per hectare respectively for the 2016/2017 season. The Katete District yield is therefore similar to both national and provincial norms, but tends to be lower when compared its immediate neighbouring districts.

Table 16: Cropping Calendar

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryland / Upland Crops												
Land Preparation										■	■	■
Planting										■	■	■
Tending	■	■	■	■								
Harvesting					■							
Fallow						■	■	■	■			
Dambo Crops / Garden Crops												
Land Preparation						■						
Planting						■						

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tending												
Harvesting												
Fallow												
Rainfall Seasons												
High / Wet Season												
Medium												
Low / Dry Season												

Table 17: District Estimates on Crop Yields and Utilisation

Crop	Unit	Crop Yield				Use of Crop (2017/2018)	
		2016/17	2017/18	2016/17	2017/18	Home Food	Sale / Trade
		50 kg bags/Ha		Tonnes/Ha		%	
Maize	x 50 Kg	44	32	2.20	1.60	60	40
Groundnuts	x 50 Kg	17	14	0.85	0.70	60	40
Soybeans	x 50 Kg	15	13	0.75	0.65	20	80
Mixed beans	x 50 Kg	5	4	0.25	0.20	30	70
Cotton	MT	0.54	0.5	0.03	0.03	0	100
Sunflower	x 50 Kg	21	18	1.05	0.90	40	60
Cowpea	x 50 Kg	13	9	0.65	0.45	60	40
Irish Potatoes	MT	5	3	0.25	0.15	39	61
Sweet Potatoes	MT	6.5	6.0	0.33	0.30	40	60
Cassava	MT	3.8	3.5	0.19	0.18	40	60
Tobacco	MT	0.8	0.8	0.04	0.04	0	100
Rice	x 50 Kg	4	2	0.20	0.10	60	40

Source: District Agricultural Office, n.d.

Interviews indicate that households farm crops to secure household food needs first, and any surplus is then traded. Trade in surplus is fairly common, however interviews suggest that the net total volumes are low, but this will vary by household. District estimates are that 40% of the district total produce is allocated to trade, but interviews suggest that it is likely to be lower.

Interviews suggest that the sale of surplus produce is largely targeted towards local bulk buyers or the government (under the food reserve programme) that visit the villages. In limited cases, households may transport their produce to Katete and Chipata, however this incurs additional travel time.

Interviews indicate that bulk buyers may buy crops, however at heavily discounted prices (half of the market price) while households receive market related prices from both traders in Katete Town and from the Government. The markets rates for the primary staple crops is presented in Table 18. The typical income generated by a household for a 50kg bag of maize will vary from 50 to 100 Kwacha.

Assuming that only 40% of total produce is sold and the household excessively farms maize, a typical household would earn between Kwacha 1 200 to 3 520 for a season's surplus produce from 2 hectares of land.

Table 18: Markets Rates in Kwacha (ZMW) for Selected Crops

Crop	Market Rate Per Kilogram			Market Rate Per Typical 50kg Bag		
	2016	2017	2018	2016	2017	2018
Maize	1 -2	1 -2	1 -2	50 - 100	50 - 100	50 - 100
Groundnuts	5 - 10	4 -5	4 -5	250 - 500	200 - 250	200 - 250
Soybeans	5 - 7	4 -5	4 -5	250 - 350	200 - 250	200 - 250
Sunflower	1.5 - 2	1.5 - 2.5	2 - 3	75 – 100	75 - 125	100 - 150

Source: District Agricultural Office, n.d.

The division of labour in farming is shared between the household males and females with some support from children, while there may be the use of casual labour. Males largely contribute in the clearing of trees and vegetation as well as ploughing with oxen. Women focus on hand-ploughing, sowing, tending, irrigating, and harvesting of crops. Casual labour is generally comprised of hiring local young adults during the labour-intensive land clearing and preparation that extends over October to December.

The division of labour tends to be weighted toward women with most of the post-land preparation activities being undertaken by women with some support from males and children. Harvesting of the crops is undertaken by women, with men assisting in the transport of crops to the homestead. Both men and women can be involved in the sale of agricultural produce.

Interviews note that storage of produce is problematic, although this varies by household and the level of care given to storage. Most produce is stored in thatch or reed storage bins or in large bags. Both are however prone to losses from weevils and rats as well as rot. The former two may result in the loss of around 10 to 20 % of produce, while households may lose around 5 % of produce to rot.

Local farming is generally thought to be purely subsistence farming, where crops are used to secure household food needs. However, this is not strictly true as households engage in farming to first secure household food needs, and then engage in some degree of trade in produce.

The proportion of crops that is allocated for consumption and trade varies based on the levels of surplus food available throughout the year, and interviews note that a significant challenge is crop price fluctuations during the year. The lowest prices for crops just after the crop harvests where there is an oversupply in produce in the national and local markets. The highest crop prices occur just prior to the next season's harvest where surplus crops are the lowest in local markets. The latter is normally at the same time as where households are at their lowest in terms of food reserves, and households are rarely are able to benefit from the higher rates.

Livestock Grazing

According to the Census Statistics (Table 19), 77% of all households located in the Katete District engaged in livestock or poultry rearing in the 12-months preceding the 2010 Census. Chicken, pigs, goats and cattle were the main livestock that are reared, and this remains the case within the Project Site.

Table 19: Percent of District Households by Livestock Holding Type

Livestock Type	Households	
	No	%
Cattle	18 965	40
Goats	9 802	21
Pigs	21 997	47
Sheep	320	1
Donkeys	130	0
Chickens	28 362	61
Other Poultry	2 104	4
Other Livestock	1 382	3

Source: (Central Statistics Office of Zambia, 2012)

Interviews indicate that local households rear chicken, pigs and goats mostly to secure household food needs, and would function as a primary source of protein. Cattle are commonly reared for the primary function of accumulating household wealth; however, cattle are also used for ploughing and carting.

Grazing of small livestock is undertaken near the home as chickens, pigs and goats are allowed to range at random. With respect to cattle, there are no communal grazing areas and cattle are grazed at random on community land in and around local villages. Livestock are actively herded by men/boys during the day before returning to the home where the cattle are penned in informal corrals.

Interviews with the District officials indicated that livestock play a primary role for local households, however most livestock numbers of kept low due to a number of diseases, specifically Newcastle disease (chickens), African Swine Flu (pigs) and East Coast Flu (cattle).

4.8.4 Housing and Household Structures

Households within the Katete District are predominately rural with a smaller percentage of urban households. Rural households are generally clustered into small rural villages or as isolated farmsteads, and support between 1 to 3 structures per household, generally comprising of a main house, secondary bedroom and kitchen, however pit latrines and storage sheds are also common (Figure 12).

Of the structures, most (54%) are constructed with traditional materials (including mud or burnt mud bricks, grass or thatch roofing, compacted mud or earth floors) while an additional 31% of structures have a mix of traditional and modern materials (i.e. corrugated iron roof) (Table 20). Only 11% of all structures are constructed of conventional or modern standards, and this is likely limited to Katete Town.

Table 20: Count and Percent of Household Structures by Type

Type of Housing Structure	Household Structures	
	Count	Percent
Traditional Structures	26 642	54
Improved Traditional Structures	15 377	31
Mixed Structures	1 601	3

Type of Housing Structure	Household Structures	
	Count	Percent
Conventional Flat	723	1
Conventional House	4 568	9
Commercial Building	356	1
Improvised / Makeshift Building	19	0
Collective / Institutional Quarters	54	0
Unintended	32	0
Other	24	0
Total	**49 402**	100

Source: (Central Statistics Office of Zambia, 2012)

The profile presented above is reflected in the homesteads present in the Project Site. Households tend to be clustered into villages with homestead blending into the next homestead. Most households have a main residential structure/main home that is primarily used for sleeping, while cooking is either undertaken in the open or in a separate free standing rondavel. Most households also retain at least one poultry coup and grain store, while households with livestock will also establish small corrals.

Figure 12: Typical Examples of Homesteads and Homestead Structures

4.8.5 Basic Services

There was limited electrical infrastructure in the Project Site in 2010, and there has been little further development of infrastructure outside of Katete Town. Candles, paraffin and other fuels sources are primarily used by district households for lighting, while only 3.4 % of households have access to electricity.

The Project Site does support a transmission line established by ZESCO. This link provides connections for some households in village that are in proximity to the line. However, the majority of households in the Project Site do not have power, and are reliant on firewood, charcoal and other fuels for cooking and lighting.

The primary fuels used by District Households for cooking profiled are wood (88.7 %) and charcoal (8.4 %), while only 2.2 % of district households utilise electricity. Firewood remains the primary fuel and is collected from the open bush surrounding communities, while local trees are cut down for charcoal production.

There was a limited diversity of water sources used by District households in 2010, with the majority (85 %) of households securing water from boreholes or wells. A further 11 % of households obtained water from rivers, dam and streams, although this is limited to households that do not have access to private or communal boreholes or wells. Only 2.7 % of district households had access to piped water; however this is limited to Katete Town.

Villages within the Project Site largely reflect the district level patterns in terms of access to water. Water is nearly exclusively obtained from community boreholes that have been established by the Government in the larger or medium sized villages, while the smaller hamlets and isolated farmsteads will likely obtain water from natural sources or hand-dug wells.

Basic sanitation in the Katete District in 2010 was predominately comprised of unimproved pit latrines, which was used by 45 % of the district households. The remaining households (52 % of households) claim to have no formal or informal sanitation, and therefore rely on the local bush.

Interviews with local headmen and ward councillors indicate that there has been improvement in the use of pit latrines over the last 10 years, however most are unimproved pit latrines constructed by local households. The pit latrines constructed by local households are also prone to collapse, and often they are abandoned in favour of using the bush.

There were limited formalised waste management practices in the District in 2010, and there has been limited further development over the last decade. District households are largely dependent on disposal of waste in community or private open pits (46% of households), while burning and street dumping is regularly used by 35% of district households. Only 2.9% have formal waste collection and again this is likely limited to Katete Town.

4.8.6 Access and Mobility

The Project Site is located just north (within 1 km along some sections) of the Great East Way (T4), while inside the Project Site there is one District (D-road) and several rural roads (R or U-Roads) as depicted in Figure 13 below. These are gazetted roads maintained by the District Council and the Zambian Road Development Agency.

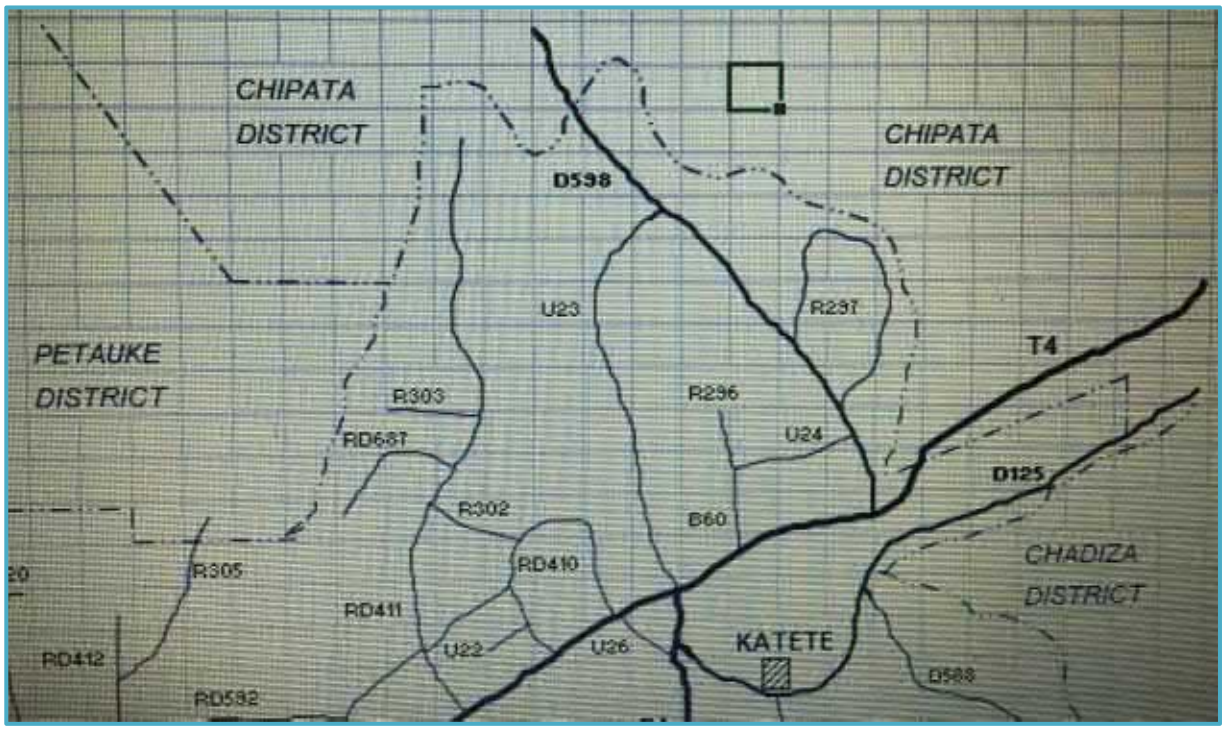

Figure 13: Road Network as provided by the Katete Town Council

The D598 is the primary access road into the Project Site and is in poor condition. This is equally applicable to the rural areas that connect the various villages (see Figure 14). Interviews with local authorities and leadership repeatedly cite the need for repairs and maintenance, and many stakeholders envision this being a key potential benefit of the Project.

In addition to the gazetted roads, there is a network of community roads/tracks. These tracks are central in terms of connecting smaller village to larger villages as well as to existing district and rural roads. These roads are constructed by local communities and have no specific design standard, and will vary in terms of width, quality and condition from good gravel roads to limited cart tracks. A key aspect of these roads is that they extend directly into villages and often cross and wind through individual households.

Interviews indicate that only a few households own their own vehicles. Mobility and movement along the roads are predominantly pedestrians, bicycles or cart-drawn carriages between nearby villages, while local communities utilise taxi's and motorcycle taxis to reach further areas such as Katete Town.

Interviews suggest that transport is expensive therefore most people do not leave their village on a regular basis. Rather transport will be used only when there is a need to reach community services in nearby villages or Katete Town. Some households will also transport goods (such as charcoal or crop produce) to major markets in the area notably Katete Town, as they will obtain better prices.

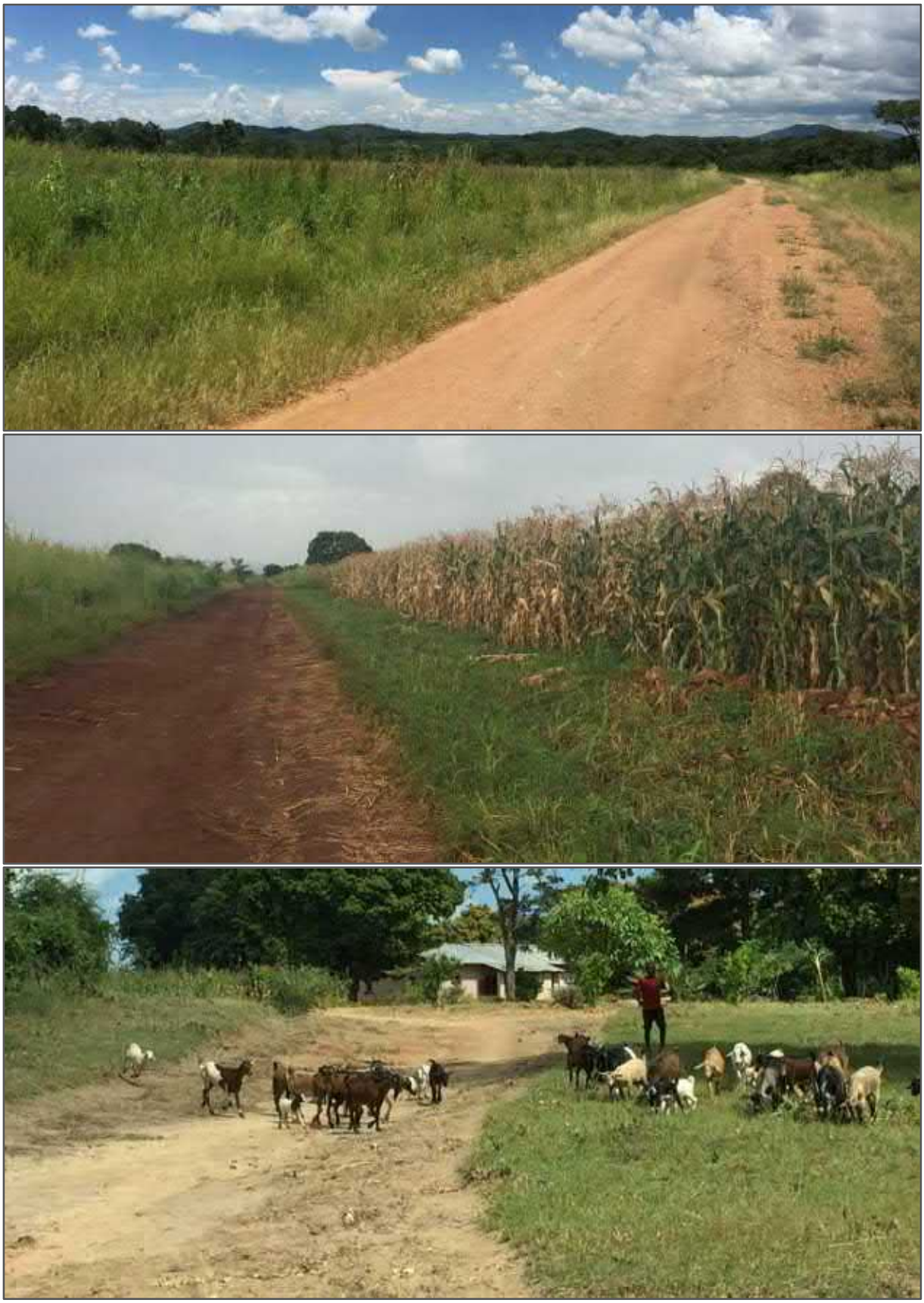

Figure 14: Images of typical Roads Present in the Project Site

4.8.7 Vulnerable People

Vulnerable People is a term given to individuals, households, or groups of people that may be disproportionately affected by a Project based on their gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status within their community. For the purposes of the Social Impact Assessment, vulnerable people have been identified as follows:

1. **Elderly Households with Limited Support:** Elderly headed households (older than 65 years of age) or where the household is comprised of elderly, who have no or marginal support from economically active (able adults) family members. However, some caution is needed, as some households may be headed by an elderly patriarch or matriarch with substantive support of able adult sons and daughters.

2. **Female-headed or Female-Only Households:** While the rights for women are protected under law in Zambia, local customary rights (notably those linked to land) may undermine those rights, while the lack of able adult males often limits household productivity and income. However, some caution is needed, as some households headed by women are not automatically vulnerable as they may be headed by a matriarch with substantive support of able adult sons and daughters. Interviews with the District Social Welfare office indicated that female-headed households are very vulnerable. This stems from a range of issues, but specifically the predominance of child-marriages and high divorce rates. In addition, women's right to land is tenuous and may often be undermined where there is no male head and no clear line of inheritance from father to son. Land ownership is entirely patriarchal, and where the male head as passed females may be evicted from their home or land by the male's clan or extended family.

3. **Child-Headed Households:** The vulnerable group covers cases where the household head is below the age of 18 and has no or marginal support from an economically active (adult) family member.

4. **Persons with Disabilities or Long-Term Illnesses:** Households where one or more household members are defined as disabled (including physical, mental, and long-term illness) are potentially vulnerable.

5. **Landless:** Agriculture is the primary livelihood strategy adopted by local households. Therefore, households without claim to land are potentially vulnerable as their ability to generate food and income is undermined. Interviews suggest that often landless households are headed by females, as their rights to land may be undermined or entirely removed once their husband has passed away or divorced.

6. **Ethnic Minorities:** Local households are near exclusively comprised of the Eastern Province (Nyanja speaking) ethno-linguistic group irrespective of their gender, and this ethnic group is the largest group in the Eastern Province.

Only 2 % of the Census 2010 population are not part of the above group but are linked to other major ethnic groups from surrounding provinces. It can be reasonably assumed that the 2019 population will not be different from the 2010 trends.

Broadly speaking, Zambia provides protection for minority groups and there is no evidence to show that there is local systemic exploitation or pressure on ethnic minorities that may result in these groups being deemed vulnerable.

Interviews with local officials also note that ethnic monitories are generally linked to economic migrants from Mozambique, Malawi and other parts of Zambia. Such migrants are generally welcomed and accommodated by local communities, and the District Authorities noted that here is no evidence of any

systemic conflict or tensions. However, any immigrants have limited opportunities to secure land for homes or farming, therefore they tend to be labourers or semi-skilled individuals.

4.8.8 Social Networks

Local households build networks between people, families, village, facilities, and services within and outside of their home village. These networks are often needed to sustain basic household needs and livelihoods, while building resilience in times of stress. However, to access such networks, personal relations as well as more physical forms of accessibility (roads and waterways) and mobility (means of transports) need to be established.

Most family support networks will be within their own homestead (as part of a single or extended clan structure) and within their home village. There is also little evidence of systemic or wide-spread outward migration therefore dependency on non-local families is likely to be limited.

There is little in the way of public facilities (outside of schools and shops) and services in local villages in the Project Site, and the level of service will vary from village to village. In many cases, households are required to travel to neighbouring villages to access basic facilities, while core services (including formal administrative functions, secondary schooling, hospitals, cemeteries, markets, police stations, and markets) are concentrated in Katete.

Interviews suggests that most households concentrate activities within their home village, however they may visit neighbouring villages on a regular basis as it entails, on average, a 1 to 2 km walk. Given the relative isolation of the rural villages within the Project Site, the poor local roads and the need to pay for transport, most households will likely only travel to Katete only a needs basis, and this is undertaken irregularly.

4.8.9 Natural Resource Use by Communities

Natural resource harvesting is common for rural communities within the Project Site, and there is a rich diversity or materials and locations from which such materials are collected. The most common form of natural resource harvesting is firewood collection, which is usually undertaken by women and children and is the most common fuel for cooking. Firewood is generally collected from the open bush/community land in and around the household.

The majority of households (75%) are constructed of traditional or natural materials, or a mix of modern and natural materials (as shown in Figure 12). This includes mud and clays for mud-bricks, cut lumber and poles for the frames of traditional homes, as well as reeds and grasses for thatching. All materials are sourced locally on communal land. Interviews suggest that a key natural resource is the local streams which provide clays, reeds for thatching and fishing.

Charcoal production is also commonly undertaken, mostly by males. Charcoal may be used as household fuel; however, it is more commonly sold along roadsides or to local buyers. Charcoal production is inherently destructive as it requires the cutting of mature trees, and in most cases is deemed an informal and illegal activity. The most visible evidence of charcoal production has been around the base and along the slopes of the local hills. In addition, the collection of wild fruit, vegetables and mushrooms is also common, while local households are also able to harvest fruit from communal fruit trees (including mango). There are no specific areas that are targeted although most of such harvesting is undertaken in the open bush (notably in intact or semi-transformed vegetation around the villages and in the local hills).

Local households may undertake hunting of local animals, while interviews also note that children may often dig out burrowing rodents.

4.8.10 Cultural Heritage

A number of villages namely Isibaki, Chimoto Kachngwe, Sumbwi, Pindu, Chamani, Undi, Mchaela Chimbundu and Mbangombe Villages are found on the south western area of the Project Site. Other villages located within the Project Site area include Gomani, Sunku, Mkokeza, Katimba, Malanda, Mlangali, Phindani, Tambala and Sakoba. It is these communities including those that travel from

different parts of Zambia, Malawi and Mozambique for the Kulamba Traditional Ceremony, which over time, have shaped the landscape of the Project Site. Just like many other African Societies, these Chewa people have graveyards/cemeteries where they burry their deceased members of the communities. Coincidentally, Gule Wamkulu (believed to be spirits) typically emerge from these graveyards according to their belief.

The culture of the Chewa people is matrilineally driven and therefore focuses on the “mbumba” female members of the community. Their entertainment is centred on dances such as chintali chitele as the apex of their totality. As such, the landscape of Mkaika Royal Village and its immediate surrounding villages is the centre of Gule Wamkulu. The Mkaika Royal Village that houses the “King’s” Palace and that of the Queen Mother Nyangu as well as the Kulamba Cultural Arena known as the Gwalada (the spiritual centre) and the Dzimbabwe entertainment centre, where people converge to celebrate the good things relating to those that have transitioned, are some of the important aspects of the cultural landscape. Gule Wamkulu is the emergence of the re-incarceration in the form of spirits of the departed souls mimicking their deeds, lifestyles or achievements (e.g. deceased of a farmer, a dancer etc.). The emergence of Gule Wamkulu is mainly associated with secrecy and in this case, they appear and disappear into thickets which are mainly associated with pristine forests and graveyards.

Generally, Katete area is occupied by the Chewa people who are part of the Bantu grouping. To date they have continued to venture into agriculture and animal husbandry activities. Paramount Chief Kalonga Gawa Undi presides over the Chewa people not just in Zambia but also the Chewa in Malawi and Mozambique. They have an annual traditional ceremony called “Kulamba” held after harvest in late August, as a way of bringing together different Chewa chiefs from the three countries to present their reports of grievances to paramount chief Kalonga Gawa Undi. The name Kalonga means the one who installs subordinate chiefs. Gawa is the one who gives out land and Undi means the one who protects the subordinates. The Kalonga Gawa Undi is head of all the Chewa chiefdoms and takes care of all the installations of chiefs not only in Zambia but in Malawi and Mozambique as well.

Ancestors and spirits of other living creatures play an important part in present day society by being in constant contact with the living world, predominately through dance of those initiated to "Nyau", or secret societies. "Gule Wamukulu", literally meaning "big dance", have become a sort of title for secret societies of traditional Chewa religious practices. The Gule Wamukulu is one of the only two World Intangible Cultural Heritages recognized by UNESCO.

The Gule Wamukulu ceremonies consist of formally organized dances to admire the remarkable physical abilities of these individuals (considered to be adept at their dance as a result of their spiritual state). Informally, Gule Wamukulu, or "Gule" is a term associated with anyone who participates in the rituals of these secret societies. The peak season for Gule occurs in July, with young men dressed as ancestral animals, trees, or in masks of ancestral spirits. The Gule themselves are initiated through formal ceremony into this society. Gule are considered to be in 'animal state' when they are dressed in such attire, and are not to be approached. If one has the misfortune of passing a Gule on the road, traditional behaviour consists of dropping a few coins for the Gule (never handing them the money directly for fear they will grab you and take you to the cemetery for ritual purposes). Generally, it is best to avoid Gule in informal situations. In their animal or ancestral state, they are unpredictable. In Chewa land, when one notices the red ribbons hanging on the tree, it simply signals that such an area is a “No Go” zone where the Gule practices.

A field assessment of the Project Site was undertaken by Envirodynamics Consulting Limited from during March 2019. Table 22 presents a summary of heritage resources and their conservation significance, and the locations of these resources are presented in Figure 15.

At this stage there are five sites of national heritage significance have been identified in the Project Site. These are presented in Table 21 below.

Table 21: Heritage site of national significance

Feature ID	Location	Description	Type
EDK13	-13.83588 South 32.15692 East	Bulawayo village Anoya Zulu (UNIP activist) grave area.	Cultural
EDK18	-13.86988 South 32.1347 East	Decorated potshed near the Kopje	Archaeological
EDK30	-13.98719 South 32.05128 East	Royal Palace, Kulamba Ceremonial Arena	Cultural
EDK31	-13.98759 South 32.05070 East	Mkaika Royal Graveyard	Cultural/ Archaeological
EDK32	-13.90119 South 32.02446 East	Grinding stone	Archaeological

The National Heritage Conservation Commission (NHCC) are reportedly interested in declaring part of the landscape in the area as a National Monument for the role that it plays in attracting and uniting people from three countries based on the Chewa ethnicity and the rich historical background of Mkaika Royal Place.

At this stage a minimum buffer distances have been recommended around the existing residential areas, the royal palace, royal graveyards and community graveyards as these areas are associated with the emergence of the Gule Wamkulu “spirits”.

Preliminary observations from literatures and field surveys revealed no fossil finds and considering that the geology Project Site is not expected to yield any significant palaeontological resources.

Table 22: Summary of heritage features and their conservation significance

Feature ID	Description	Location	Conservation / Preservation Importance	Legally Protected	Permit Required for Removal/ Alteration	Local Importance	National Importance	International Importance (IFC and UNESCO standards)
EDK1	Gomani Village graveyard one (Tombs inside the trees)	-13.97479 South 32.15549 East	High	No	Yes	High	None	High
EDK2	Gomani Village graveyard two	-13.81718 South 32.09721 East	High	No	Yes	High	None	High
EDK3	Gomani village family graveyard three	-13.81849 South 32.09651 East	High	No	Yes	High	None	High
EDK4	Mukokeza village graveyard	-13.82111 South 32.09771 East	High	No	Yes	High	None	High
EDK5	Rare rock Mukokeza village	-13.82368 South 32.09921 East	High	No	No	High	Medium	Medium
EDK6	1964 graveyard	-13.85055 South 32.09334 East	High	No	Yes	High	None	High
EDK7	Chikumba Graveyard	-13.82388 South 32.09913 East	High	No	Yes	High	None	High
EDK8	Matunga Kopje	-13.83987 South 32.10969 East	High	Yes	Yes	Low	Undetermined	Low
EDK9	Gavine Road Kopje	-13.83494 South	High	No	No	Low	Low	None

Feature ID	Description	Location	Conservation / Preservation Importance	Legally Protected	Permit Required for Removal/ Alteration	Local Importance	National Importance	International Importance (IFC and UNESCO standards)
		32.12402 East						
EDK10	Chibale Village graveyard	-13.8645 South 32.14563 East	Low	No	Yes	High	None	High
EDK11	Headman Matunga's Graveyard	-13.84102 South 32.15853 East	Low	No	Yes	High	None	High
EDK12	Chiswaswa Graveyard	-13.83594 South 32.15693 East	Low	No	Yes	High	None	High
EDK13	Anoya Zulu's Grave in Bulawayo village (UNIP activist)	-13.83588 South 32.15692 East	High	No	Yes	High	High	High
EDK14	Sizilu village headman graveyard	-13.85551 South 32.15671 East	High	No	Yes	High	None	High
EDK15	Iron Slug (laterite on sight too)	-13.870480 South 32.140490 East	Unknown	Unknown	Unknown	Low	Medium	Low
EDK16	Graveyard	-13.86441 South 32.13779 East	High	No	Yes	High	None	High
EDK17	Kopjes in the area one on the far left has a cave underneath	-13.87133 South 32.13427 East	High	Yes	Yes	High	Low	Low
EDK18	Decorated potshed near the Kopje	-13.86988 South 32.1347 East	Low	Yes	Yes	Medium	High	Low

Feature ID	Description	Location	Conservation / Preservation Importance	Legally Protected	Permit Required for Removal/ Alteration	Local Importance	National Importance	International Importance (IFC and UNESCO standards)
EDK19	Mumba village graveyard (3 villages)	-13.77633 South 32.02008 East	Medium	No	Yes	High	None	High
EDK20	Ntambwa Graveyard 1	-13.86411 South 32.11724 East	Medium	No	Yes	High	None	High
EDK21	Ntambwa graveyard 2	-13.86546 South 32.11538 East	High	No	Yes	High	None	High
EDK22	Ntambwa graveyard 3	-13.86635 South 32.11555 East	High	No	Yes	High	None	High
EDK23	Ngonye village graveyard	-13.84263 South 32.12148 East	High	No	Yes	High	None	High
EDK24	Katimbila village graveyard	-13.83146 South 32.11544 East	High	No	Yes	High	None	High
EDK25	Tinyakula Village graveyard	-13.81818 South 32.05085 East	High	No	Yes	High	None	High
EDK26	Mtonyo village graveyard	-13.83773 South 32.05271 East	High	No	Yes	High	None	High
EDK27	Quarrying area	-13.84806 South 32.06938 East	N/A	N/A	N/A	N/A	N/A	N/A
EDK28	Katandale village graveyard	-13.85157 South	High	No	Yes	High	None	High

Feature ID	Description	Location	Conservation / Preservation Importance	Legally Protected	Permit Required for Removal/ Alteration	Local Importance	National Importance	International Importance (IFC and UNESCO standards)
		32.07252 East						
EDK29	Kazembe Hills village Graveyard	-13.88747 South 32.09679 East	High	No	Yes	High	None	High
EDK30	Royal Palace: Kulamba Ceremonial Arena	-13.98719 South 32.05128 East	High	No	Yes	High	High	Critical
EDK31	Mkaika Royal Graveyard	-13.98759 South 32.05070 East	High	No	Yes	High	High	Critical
EDK32	Grinding stone	-13.90119 South 32.02446 East	High	Yes	Yes	Medium	High	Medium
EDK33	Mutachi village graveyard	-13.94374 South 32.0486 East	High	No	Yes	High	None	High
EDK34	Royal Palace at Mkaika	-13.987190 South 32.051284 East	High	No	Yes	High	High	Critical

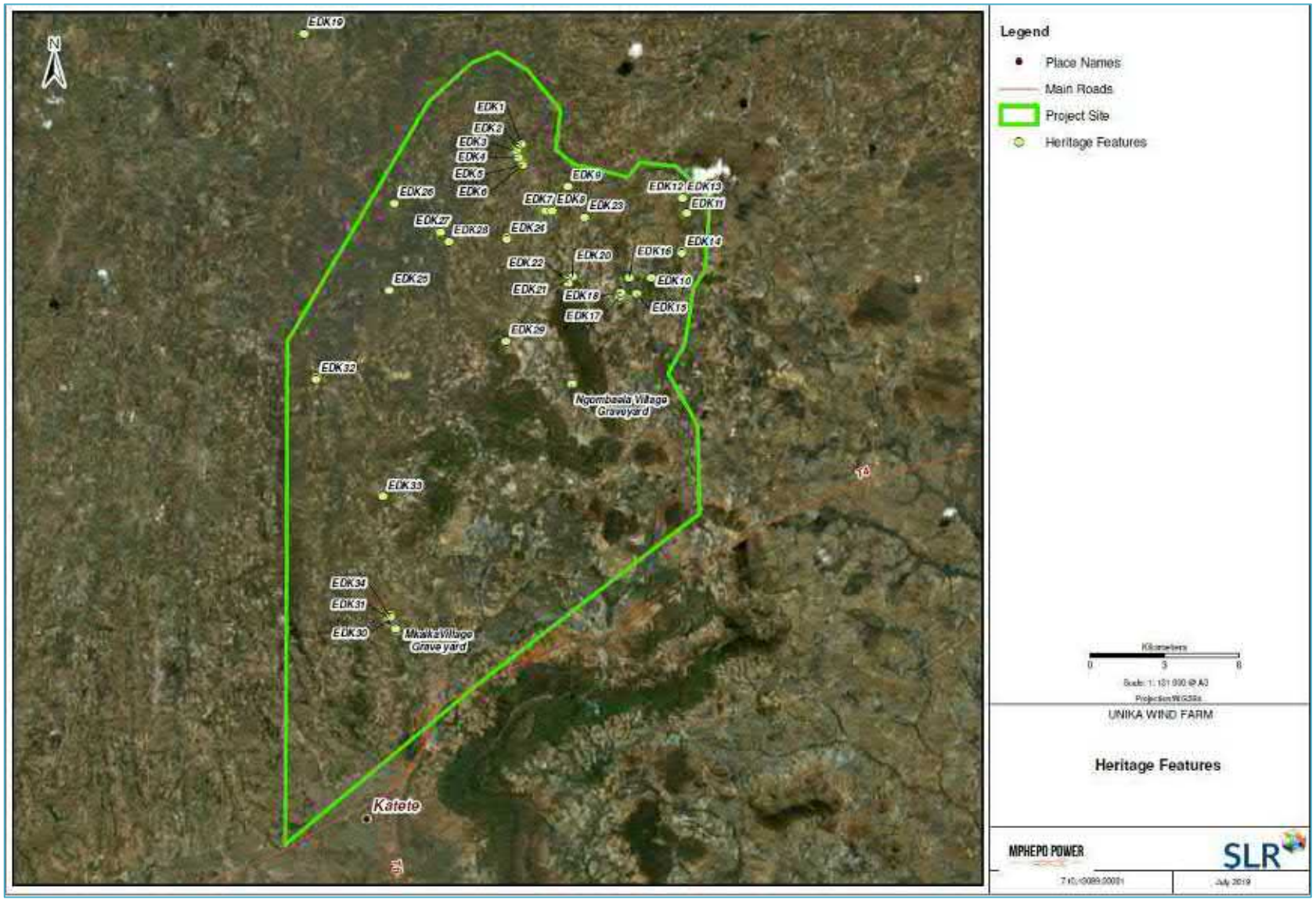

Figure 15: Locations of Heritage Features within the Project Site boundary

4.9 ECOLOGICAL RESOURCES

4.9.1 Flora

The following terrestrial habitat units were identified within the Project Site:

- **Degraded Forest Habitat,** comprising several forest tree species, where trees exceeded 8 m in height with large predominantly interlinking canopies. This habitat unit was observed primarily in the upper reaches of the large inselbergs and central mountainous areas of the Project Site This habitat however is continually being impacted upon and decreasing due to the harvesting of timber for charcoal production, leading to the encroachment of miombo woodland species;

- **Degraded Miombo Woodland Habitat**, the dominant vegetation type within the Project Site and that of southern Zambia. The characteristics of this habitat unit were varied, with some of the more degraded areas being noted to have fewer characteristic/typical miombo floral species. The woodlands typically comprised trees varying between 4 – 8 m in height but without densely interlocking canopies;

- **Freshwater Habitat**, comprising streams and dambos (wetlands). This habitat unit has been notably impacted upon as a result of vegetation clearance for agriculture (grazing and crop cultivation). The dambos and streams convey large amounts of water through the Project Site, however the large-scale removal of vegetation has resulted in increased peak water flows leading to erosion within the dambos and that of the stream banks; and

- **Transformed habitat**, associated with cultivated fields and areas where vegetation has been cleared in order to provide increased grazing for livestock, both in association with the areas surrounding the villages and at some distance from villages where new fields are being cleared.

Figure 16 provides the extent and locations of these terrestrial habitat units.

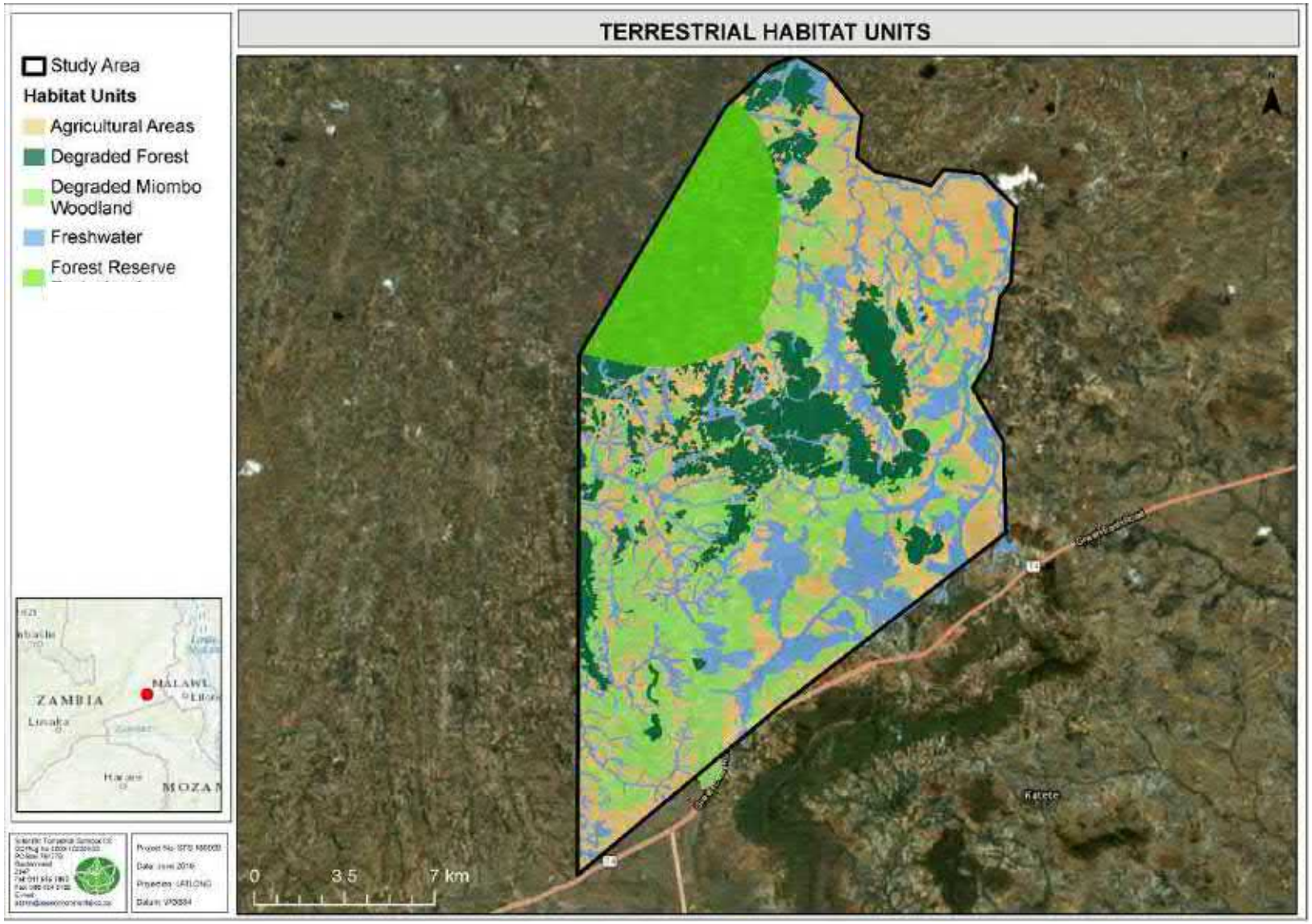

Figure 16: Conceptual illustration of the habitat units within the Project Site.

Degraded Forest

The Degraded Forest habitat has, over the years, been subjected to continuous wide scale impacts. The habitat degradation comes largely from collection of firewood, wood used for structures and the charcoal trade in rural areas in order to generate an income. This has led to the extensive felling and removal of older large trees at a rapid rate. Due to the demand of wood many of the younger intermediate sized trees are also being harvested, with the net result being that the forest environment is unable to recover. This continuous deforestation has led to an encroachment of miombo woodland species along the outer borders of this habitat unit, as well as the overall retraction of the forested areas. In addition to the deforestation, slash and burn activities were regularly observed in order to clear forested lands for crop production. These anthropogenic activities have led to the forest habitat becoming isolated and fragmented, occurring only in areas where the terrain is not suitable for agriculture, or where areas bear cultural significance. This has led to the overall loss of habitat integrity, driving species diversity loss and the degradation of the overall forest habitat.

Floral species observed in this habitat unit include, but are not limited to *Julbernardia globiflora, Brachystegia bussei, Adenia senensis, Lannea discolour, Cassia singueana, Diospyros kirkii, Pericopsis angolensis, Pterocarpus angolensis, Pterocarpus chrysothrix, , Dalbergia martini, Dichrostacys cinerea, Brachystegia utilis, Acacia nigrescens, Commiphora africana, Erythrina abbyssinica, Brachystegia boehmi, Diplorhyncus condylocarpon, Pseudolacnostylis maprouneifolia* and *Brachystegia longifolia* amongst others.

Only two floral species occur within this habitat unit which can be considered of conservation concern, not so much due to their conservation status but rather due to their continued decline due to increased harvesting. Although only listed as Least Concern (LC) by the IUCN, the tree species *Pterocarpus tinctorius* (*chrysothrix*) (Makula) is highly exploited in Zambia which has resulted in the Government banning the harvesting and trading of this species. The tree species *Pterocarpus angolensis* (Mukwa/Bloodwood) is listed as LC by the IUCN but due to continued harvesting is noted to be decreasing across its range. However, currently this species is still fairly widespread across Zambia.

Habitat Sensitivity of this unit is considered to be Moderately High.

Degraded Miombo Woodland

The miombo woodland habitat is the dominant habitat within the Project Site, however, due to this it is also the habitat that has been subjected to the highest degrees of disturbance and vegetation clearing. These impacts have resulted in the degradation of the habitat integrity, detracting from the unique landscape that this habitat unit is. The characteristics of this vegetation community varied across the Project Site due to varying levels of anthropogenic impacts and activities. Although numerous miombo woodland species were present, it was evident that in the more degraded areas where charcoal burning activities were higher, *Parinari curatelifolia* appeared to be more dominant. In these areas coppices and miombo saplings were evident, however larger trees had been harvested for charcoal production. In areas where less disturbance was observed the habitat unit was dominated by the miombo species *Julbernadia paniculata* and *Brachystegia boehmi*.

Floral species observed in this habitat unit include, but are not limited to *Ochna schweinfuthiana, Dyospyros kirkii, Lannea discolour, Julbernadia paniculata, Brachystegia boehmi, Pterocarpus angolensis, Dichrostachys cinerea, Terminalia sericea, Swartzia madagascariensis, Albizia harveyii, Burkea africana, Kigelia africana, Hexalobus monopetalus, Dyplorynchus condylocarpon, Cassia abbreviata, Strychnos cocculoides, Afromomum alboviolaceum, Ledebouria revoluta, Boophone disticha, Chlorophytum clarae* and *Costus spectabilis*.

The tree species *Pterocarpus angolensis* (Mukwa/Bloodwood) was observed in this habitat unit. This species is listed as LC by the IUCN but due to continued harvesting is noted to be decreasing across its range. However, it must be noted that currently this species is still fairly widespread across Zambia. In

addition, *Boophone disticha* was observed in this habitat unit. Although not formally protected this species is often harvested for medicinal purposes or plant collections.

Habitat Sensitivity of this unit is considered to be Intermediate.

Agricultural Areas

The agricultural areas have been cleared to make way for agricultural crops such *Zea mays* (Maize), *Glycine max* (Soybean) and *Cucurbita* sp (pumpkin) which are grown throughout the Project Site. Large tracts of the low-lying lands have been cleared for cultivation, whilst in the western portions of the Project Site, even the uneven, steep hillsides are used for cultivation activities. It was noted that larger trees are often left along the field boundaries, presumably as a wind break but also as it would require unnecessary time and effort to remove them. Larger fruit bearing trees, notably *Mangifera indica* (mango) are left in place and fields cultivated around them. This is attributed to their importance as a food resource in the region.

The agricultural areas have been significantly transformed and bear no similarity to the reference Miombo Woodland vegetation type of the region. Although the agricultural lands are important for food production, they are not considered important for floral species, with a moderately low floral species diversity and a notable loss of habitat integrity. The agricultural areas are furthermore not considered unique areas of habitat nor do they contribute to the overall conservation status or value of the region. Floral species observed in this habitat unit include, but are not limited to *Uapaca siberiana, Terminalia sericea, Ficus sycamorous, Vangueria infausta, Brachystegia boehmi, Dichrostachys cinerea, Diospiros kirki* and *Mangifera indica*.

No floral Species of Conservation Concern (SCC) were encountered within this habitat unit. Vegetation clearance activities in these areas have left limited natural vegetation remaining.

Habitat Sensitivity of this unit is considered to be Moderately Low.

Freshwater Habitat (Dambos and Streams)

The freshwater habitat was observed extensively throughout the Project Site. The dambos and riparian areas were noted to have increased floral species diversity, as is to be expected, with many of the floral species observed in these areas not occurring within the other habitat units, particularly orchid species. The riparian areas are still largely intact and of moderately high integrity, although the agricultural lands do encroach heavily upon the riparian vegetation. However, the dambos located around the villages have been significantly impacted upon as a result of vegetation clearance and crop cultivation, leading to species diversity and habitat loss in these areas. The freshwater habitat unit is considered important in terms of ongoing species conservation and habitat provision, whilst also being unique in the landscape in terms of species diversity. Although the freshwater habitat has been subjected to several anthropogenic impacts, the overall integrity and diversity of is still considered Moderately High.

Species observed in the freshwater habitat include *Cyperus esculenta, Platycoryne buchanania, Cyperus* sp., *Kyllinga pumila, Habenaria schimperiana, Gnidia chrysantha, Ascolepis protea, Hypoxis nyasica, Drocera* sp*., Popowia obovata, Senegalia polyacantha, Ficus sycamorous, Mucuna coriacea, Stereospermum kunthianum, Vitex doniana, Piliostigma thonningii, Pseudolacnostylis maprouneifolia, Antidesma venosum, Grewia caffra* and *Markhamia obstifolia*.

Although no SCC were observed in the freshwater habitats, the dambos do provide habitat for unique floral species such as *Habenaria schimperiana* (Orchid), *Drosera sp.* (Sundew), *Boophone disticha* and *Hypoxis nyasica*, which although not formally protected are often harvested for medicinal purposes or plant collections.

Habitat Sensitivity of this unit is considered to be Moderately High

Floral Species of Conservation Concern

An assessment considering the presence of any floral Species of Conservation Concern (SCC), as well as suitable habitat to support any such species was undertaken. Threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories as Critically Endangered (CE), Endangered (EN) or Vulnerable (VU) is a threatened species. SCC are species that have a high conservation importance floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare (CR), Rare (R) and Declining (D).

There is no specific list of protected floral species for Zambia, thus all floral species observed were cross referenced with the IUCN database in order to ascertain their conservation and threat status.

None of the floral species as identified during the field assessment had a conservation status higher than that of Least Concern (LC) on the IUCN database. However, species such as *Pterocarpus tinctorius* (*chrysothrix*) and *Pterocarpus angolensis* are of concern as their known population numbers are declining due to overharvesting. In addition to these woody species, small bulbous species such as *Boophone disticha* and *Habenaria schimperiana*, although of LC according to the IUCN, are also considered under pressure due to harvesting for medicinal purposes and species collections.

Alien Invasive Plant Species

Alien invasive plant species identified within the Project Site were mostly associated with villages and in particular agricultural areas and livestock pens, where in some instances they were completely dominant, notably in the case of *Lantana camara* (Lantana). Table 23 lists the exotic and invader species identified during the assessment along with their basic methods of control. Aline invasive plant species will require control. The only two exceptions on the list below are that of *Mangifera indica* (mango) and *Psidium guajava* (guava) which have an important social and economic use in the communities as a seasonal supply of food. Removal or destruction of these trees should be avoided where possible.

Table 23: Exotic or invasive species

Scientific name	Common name	Control
Bidens pilosa	Spanish Blackjack	Pre-emergence herbicide
Mangifera indica	Mango	None, agricultural use
Psidium guajava	Guava	None, agricultural use
Lantana camara	Lantana	Mechanical control, herbicide

Medicinal Plant Species

The majority of the plants identified in the Project Site all have medicinal properties and are considered to be common to the region, especially within the degraded forest and miombo woodlands. Local traditional healers may have to be consulted when planning the Project footprint. A list of the traditional medicinal plants species is provided in Table 24.

Table 24: Traditional medicinal plant species

Scientific name	Medicinal use
Annona senegalensis	The bark is used medicinally to treat gastrointestinal ailments and the gum from the bark is used for sealing cuts and wounds .
Pericopsis angolensis	Included in treatment for ringworm, stabbing pains, eye problems, malaria,

Scientific name	Medicinal use
	blackwater fever, stomach problems and to increase the supply of breast milk.
Stereospermum kunthianum	Pods are chewed with salt for coughs and are used in treatment of ulcers, leprosy, skin eruptions and venereal diseases; also used to cure flatulence in horses.
Mangifera indica	Charred and pulverized leaves make a plaster to remove warts and also act as a styptic. Seeds are used to treat stubborn colds and coughs, obstinate diarrhoea and bleeding piles. The bark is astringent, homeostatic and antirheumatic.
Bauhinia petersiana	Wounds were successfully treated when pounded leaves boiled in a salt solution were applied.
Vachellia sieberiana	In Central Africa, a bark/root decoction is used for inflammation of the urinary passages. Leaf, bark and resin are used as an astringent for colds/chest problems, diarrhoea, hemorrhage and eye inflammation. In Tanzania, bark is used to treat gonorrhoea.
Philenoptera violacea	Most parts of the plant are used to treat diarrhoea. The roots are used for gastro-intestinal problems; powdered root-bark is used to treat colds and snakebite. Root infusions are commonly used as part of a hookworm remedy.
Syzygium cordatum	The powdered bark is used as a fish poison. In central Africa the tree is known as a remedy for stomach-ache and diarrhea. It is also used to treat respiratory ailments and tuberculosis.
Parinari curatellifolia	An infusion of the roots is used to treat toothache and a leaf decoction is either drunk or used in a bath as a remedy for fevers. The crushed or pulped leaves are used in a dressing for fractures or dislocations, and for wounds, sores and cuts.
Erythrophleum africanum	An infusion of the bark is drunk to treat stomach-ache or dysmenorrhea. The bark is used to make a mouth wash for relieving toothache. Steeped in water, the bark is applied externally and internally to cure cardiac diseases and epilepsy. A paste of root bark is applied to the skin to cure scabies.
Strychnos cocculoides	The fruit is mixed with honey or sugar and used to treat coughing. The fruit is used in making eardrops for treating ear complaints. The root can be chewed to alleviate stomach disorders, eczema and sores on the skin. It is also an alleged cure for gonorrhoea.
Combretum adenogonium	The branches, free of fruit, are used to prepare an infusion in Liberia for washing the body to relieve pain. An infusion of the bark is taken with natron to relieve “lekki beernde” (pains in chest). The bark, together with a mistletoe which commonly parasitizes the tree, is made into an infusion for washing the body.
Diplorhynchus condylocarpon	A decoction of the root bark is used to treat indigestion, diarrhoea, fever, snakebites, infertility and venereal diseases. A decoction of the root is used to treat a variety of complaints including chronic cough, pneumonia and pulmonary tuberculosis; rectal prolapse; diabetes; testicle inflammation; and to facilitate giving birth.
Brachystegia spiciformis	An infusion provides treatment for dysentery and diarrhoea. A decoction is applied as an eyewash for conjunctivitis.
Pseudolachnostylis maprouneifolia	A root decoction is taken as a purgative to treat stomach-ache and abdominal problems. The smoke of burning roots is inhaled to treat pneumonia, A root

Scientific name	Medicinal use
	infusion is taken to treat abdominal pain, gonorrhoea and female sterility. Dried, pulverized root is sniffed to treat nosebleed and headache. It is sprinkled on fresh wounds to heal them.
Rothmannia globose	In some parts of southern Africa the powdered roots are rubbed into incisions to treat leprosy.
Strychnos spinosa	It is believed that the presence of strychnine in the bark and unripe fruit, along with other alkaloids, are responsible for helping overcome the venom of certain snakes, such as Mamba. Strychnine is a powerful central nervous system stimulant that may be able to fight the respiratory depression caused by the venom of these snakes. It is also used as a purgative, for uterine problems and to treat sore eyes.
Albizia antunesiana	The roots have numerous uses in traditional medicine. An infusion or decoction is used to treat sore throat, tonsillitis, tuberculosis, gonorrhoea and other sexually transmitted diseases, abdominal pains, depressed fontanelle in infants and infertility in women.
Turraea nilotica	Traditionally, the roots of this species have been used to treat toothaches, pneumonia, epilepsy, abdominal pain and venereal diseases.
Bobgunnia madagascariensis	A decoction of the fruits has been used to induce vomiting to remove poison from the stomach, and to treat bilharzia, leprosy and ear-ache. Roots are used to induce abortion, counteract venomous stings and bites, kill or expel intestinal worms and treat leprosy. A warm root infusion is used to treat venereal diseases and dysentery. Chopped roots are shaken in water which is then used to treat cataract of the eye.
Steganotaenia araliacea	The stem bark contains a number of dibenzocyclo-octadiene lignans. These have displayed cytotoxic (antimitotic) activity in a manner similar to colchicine on 11 human tumour cell lines. The lignans steganangin (the most abundant analogue), steganacin and steganolide A were most abundant. Saponins isolated from the leaves have shown antileukemic activity. An infusion of the plant is strongly emetic. The roots are used in treating snake bites and painful chest conditions.
Combretum zeyheri	The gum of *Combretum zeyheri* has antibiotic properties. The roots of the tree are used to make baskets, necklaces for young girls and fishing traps. Pounded roots mixed with fats are used for an ointment to relieve haemorrhoids. Powdered roots are taken orally in porridge to stop a bleeding nose and to ease kidney pains. Leaves mixed with oil are used as an embrocation (liquid for rubbing on the body to relieve pain), to ease a stiff neck and backache. Crushed leaves are mixed with water and the resultant fluid.
Khaya nyasica	The bark is bitter, similar to quinine, and is used for colds. Oil from the seed is rubbed into the scalp to kill insects.
Ozoroa insignis	The roots and bark are considered to be cholagogue, purgative and vermifuge. A decoction is used to treat kidney and liver complaints; ulcers and hernias; throat infections; chest pain; diarrhoea; schistosomiasis.
Hymenocardia acida	The leaves, combined with the roots, are used for treating deficiency diseases and oedema caused by malnutrition. The root bark is eaten with porridge as a treatment for malaria. The sap from the roots is applied topically for treating earache and tooth-troubles.
Piliostigma thonningii	Tender leaves are chewed, and the juice swallowed to treat stomach-ache,

Scientific name	Medicinal use
	coughs and snakebite. The roots are used to treat prolonged menstruation, haemorrhage and miscarriage in women and also for the treatment of coughs, colds, body pain and STDs.
Mimusops zeyheri	A root infusion is taken to treat candidiasis. A bark decoction is used to treat wounds and ulcers.
Ceratotheca sesamoides	The leaves, when eaten as a vegetable, act as a laxative. The leaves are steeped in water and the slimy liquid is dropped into the eye to treat conjunctivitis.
Combretum collinum	Most African people use boiled root decoction to treat constipation, headaches, stomachs, fever, dysentery and swellings, and as an anthelmintic for hookworm. The leaves are chewed, soaked in water and the juice drunk for chest complaints; it can also be used as an inhalant in a hot steam bath.
Senna singueana (Cassia singueana)	Extracts of the root bark have shown significant analgesic, antipyretic, anthelmintic and antiplasmodial activity. An infusion of the leaves is used as a remedy for venereal disease, malaria, convulsions, epilepsy, coughs, intestinal worms, constipation, heartburn and stomach-ache.
Commiphora africana	The fruits are used for the treatment of typhoid fever and as a remedy for stomach problems. The fruits are chewed or pounded and used as a treatment against toothache and diseases of the gum.
Peltoforum africanum	African wattle is commonly used in African traditional medicine, especially the bark and the roots. They are taken internally to treat a range of digestive disorders and as general tonics, whilst externally they are used to treat wounds and sore.
Ficus sycamorous	The bark is used for the treatment of scrofula, coughs, and throat and chest diseases. The milky latex is used for treatment of dysentery and chest diseases or is applied to inflamed areas.
Xeroderris stulhmannii	The bark is purgative. It is used in traditional medicine to treat coughs, colds, rheumatic arthritis, stomach-ache, dysentery, eye infections, and wounds.
Flacourtia indica	The leaf is carminative, astringent and used as a tonic, an expectorant and for asthma, pain relief, gynaecological complaints and as an anthelmintic, and treatment for hydrocele, pneumonia and intestinal worms.
Terminalia sericea	The leaves and roots are boiled in water and the infusion is taken orally for the treatment of coughs, diarrhoea and stomach-ache. The leaves can be used as an antibiotic for wounds. In the case of bleeding, a paste can be made by cooking the leaves in water and placing them on the wounds.
Cassia abbreviate	The leaves are smoked as a treatment for haematuria. The smoke of smouldering twigs is inhaled to cure headache. The powdered stem bark is applied to abscesses and added to food to cure diarrhoea. A decoction of the stem bark is used as a purgative and to cure malaria.
Adenia senensis	An infusion of the bark is used as a remedy for mental disorders and snakebite. The leaves and bark are boiled and the decoction inhaled to treat fever and influenza.
Adansonia digitate	**T**he leaves are hyposensitive and an antihistamine. They are used to treat kidney and bladder diseases, asthma, general fatigue, diarrhoea, insect bites, and guinea worm. The fruit pulp, seed and bark are reputedly an antidote to *Strophanthus* poisoning. The pulp is widely used in Africa as a diaphoretic to

Scientific name	Medicinal use
	combat fevers, and to treat dysentery.
Thespesia garckeana	A decoction of roots is taken in the treatment of painful menstruation; coughs and chest pains. An infusion made from the roots and leaves is dropped into the ear to treat earache or is taken orally as an antiemetic.
Friesodielsia obovata	The roots are boiled, and the decoction used for treating stomach-ache, infertility in women and as an antidote for snakebite.
Philenoptera violacea	The roots are used to treat stomach disorders, hookworms, and coughs.
Ziziphus abbysinica	The roots are boiled and the liquid drunk as a treatment for after-birth pains, stomach-ache, snakebite, and also to induce abortion. A decoction of the roots, mixed with those of *Rhynchosia resinosa*, is drunk as a treatment for stomach-ache. The roots are pounded and the powder is rubbed on the chest, which is first scarified, as a treatment for pneumonia.
Stereospermum kunthianum	The pods are chewed with salt as a treatment for coughs. They are also used in the treatment of ulcers, leprosy, skin eruptions and venereal diseases. A leaf infusion is used for washing wounds. The macerated leaves are used to treat asthenia and exhaustion. The bark is used as a haemostatic and for treating wounds. A stem-bark decoction is used to cure bronchitis, pneumonia and coughs. The roots and leaves are used in the treatment of venereal diseases, respiratory ailments and gastritis.
Vangueria infausta	The root is anthelmintic, antidote and purgative. A popular snake-bite remedy, it is also used to treat a variety of complaints such as malaria, pneumonia, coughs and other chest troubles. A warm decoction of the roots is considered to be an effective remedy for heart ailments in Namibia. The leaves are applied externally as a treatment for swellings on the legs; inflammation of the navel in children; abdominal pain; and for the relief of dental pain.
Bidens pilosa	Its roots, leaves, and seeds are reported to have antibacterial, antidysenteric, anti-inflammatory, antimicrobial, antimalarial, diuretic, heptoprotective, and hypotensive properties. In Africa, *B. pilosa* is used to treat headaches, ear infections, hangovers, diarrhoea, kidney problems, malaria, jaundice, dysentery, burns, arthritis, ulcers, and abdominal problems. It is also used as an anaesthetic, coagulant, and treatment to ease childbirth. In sub-Saharan Africa, its fresh or dried shoots and young leaves are eaten as a leaf vegetable, especially in times of food scarcity.
Euphorbia hirta	Asthma weed is a very important herbal medicine both within its native range and also beyond. It has traditionally been used to treat respiratory system disorders including bronchitis, asthma, hay fever, emphysema, coughs, colds and laryngeal spasm, though in modern herbalism it is more used in the treatment of gastrointestinal disorders, including intestinal parasites, diarrhoea, peptic ulcers, heartburn, vomiting and amoebic dysentery. The plant is also used as a diuretic to treat uro-genital diseases, such as kidney stones, menstrual problems, sterility and venereal diseases. The plant has a reputation as an analgesic to treat severe headache, toothache, rheumatism, colic and pains during pregnancy. It is used as an antidote and pain relief of scorpion stings and snakebites.
Xerophyta retinervis	The roots are smoked to relieve asthma, and smoke from the whole plant is used to stop nosebleeds. Stem bark preparations are reported to have anti-inflammatory and analgesic properties. The active ingredient, called

Scientific name	Medicinal use
	amentoflavone, is also found in gingko extract.
Elephantopus scaber	The plant is widely used as a medicinal herb in the tropics. It is anthelmintic, diaphoretic, diuretic, emmenagogue, emollient, febrifuge and tonic. It is used to treat conditions such as asthma, coughs and pulmonary diseases; dyspepsia, diarrhoea and dysentery; oedema; urethral discharges and venereal diseases. A decoction is used to treat fungal skin diseases.
Cyperus esculentus	The Tiger nuts are regarded as a digestive tonic, having a heating and drying effect on the digestive system and alleviating flatulence. They also promote urine production and menstruation.
Tacca leontopetaloides	The inside of the root is squeezed in water and applied as a rinse to injured eyes. The starch from the tubers of the plant was used as a remedy for diarrhoea and dysentery. The root is also used as a thickener in medical preparations. The starch from the root is rubbed onto sores and burns.
Boophone disticha	The outer covering of the bulb is applied to boils and abscesses; fresh leaves are used to stop bleeding of wounds.
Aframomum alboviolaceum	The plant is used as a febrifuge.
Bidens schimperi	The roots are used to treat coughs and colds.

4.9.2 Fauna

Similarly to the floral assessment as described above, the following faunal habitat units were identified within the Project Site:

- **Miombo Woodland**: This habitat unit has been subjected to disturbance from the local communities as it is predominantly associated with the low lying flat and undulating areas between the other habitat units. Vegetation clearing for agriculture, fuel, building materials and charcoal production has resulted in the loss of habitat for faunal species. These impacts combined with the increased human presence in the Project Site has resulted in a markedly low abundance of mammal species in this habitat, however, the abundance and diversity of invertebrates and reptiles does not appear to have suffered the same fate. This habitat sensitivity is considered to be Intermediate.

- **Degraded Forest:** This habitat unit predominantly encompasses the mountainous and inselberg areas and is characterised by large tall trees with interlinking canopies. This habitat is continually being impacted upon and decreasing in extent and diversity due to the harvesting of timber for fuel, building materials and charcoal production, leading to the encroachment of miombo woodland species. Although this habitat unit has been subject to anthropogenic activities and impacts, it is still considered capable of providing habitat and resources to a number of faunal species. This habitat sensitivity is considered to be Moderately High.

- **Freshwater Habitat:** This habitat unit comprises of the streams and dambos (wetlands) associated with the Project Site. This habitat unit has been impacted upon as a result of vegetation clearance for agriculture (grazing and crop cultivation). The dambos and streams convey large amounts of water through the Project Site, however the large-scale removal of vegetation has resulted in increased peak water flows; leading to erosion within the dambos and that of the stream banks. The streams and associated riparian vegetation still provide movement corridors for faunal species and as such are considered important for habitat connectivity. In addition, the freshwater areas provide suitable and stable habitat for insect

species, notably those often associated with water bodies as well as a diversity of amphibian and reptile species. This habitat sensitivity is considered to be Moderately High.

- **Agricultural Areas:** Associated with cultivated fields and areas where vegetation has been cleared in order to provide increased grazing for livestock, both in association with the areas surrounding the villages and at some distance from villages where new fields are being cleared. This habitat still provides rudimentary habitat and food resources for faunal species, notably insects and arachnids. It is possible that reptiles and small mammals will also utilise this habitat periodically. This habitat sensitivity is considered to be Moderately Low.

Mammals

During the field assessment very limited signs of mammal species were observed. During interveiws it was ascertained that over the years the cutting down of the forests and woodlands (for charcoal fuel, building materials, charcoal production and agriculture) and the intensified subsistence hunting has resulted in a significant decrease and loss of mammals from the region. It is likely that as a result of the habitat loss and increased persecution levels that the remaining species have either sought refuge in the more inaccessible areas of the forest habitat or have migrated to areas which are deemed safer and have a decreased human presence.

The Forest habitat in this regard in the higher mountainous areas is still likely to harbour a few mammal species, notably those which are shy and secretive, such as the *Potamochoerus larvatus* (Bushpig), *Otolemur crassicaudatus* (Brown Greater Galago) and *Cercopithecus mitis* (Blue Monkey), although these species are likely to be under increased persecution as they are hunted for the bush meat trade.

In addition, the freshwater systems may play host to *Ichneumia albicauda* (White-tailed Mongoose). The small predatory mammal *Otocyon megalotis ssp. virgatus* (Eastern Bat-eared Fox) is also likely to occur in the Project Site. The Miombo Woodlands and Freshwater Habitats are likely to provide habitat to smaller less conspicuous mammal species of the Rodentia family as well as small scrub hares. In addition, the freshwater systems and associated riparian areas may provide movement corridors for mammal species, allowing them to traverse the Project Site under cover, minimising detection. Food resources are deemed adequate for the remaining species in the Project Site; however, the continued habitat modification has had a notable impact on such resources as well as the overall habitat integrity for mammals.

No mammal SCC were observed during the fieldwork. Although not observed, it is possible that the following species may occur within the Project Site: *Eidolon helvum* (African Straw-coloured Fruit-bat, NT), *Otomops martiensseni* (Large-eared Free-tailed Bat, NT), *Hipposideros vittatus* (Commerson's Leafnosed Bat, NT) and *Aonyx capensis* (African Clawless Otter, NT).

Of these species the proposed wind turbines pose the greatest threat to the bats, which are likely to utilise the large forest canopies and caves/crevices amongst the mountains for roosting. Bat mortalities are well documented with regards to wind turbines. The impact of the turbines on *Aonyx capensis* is likely to be minimal to non-existent, as this species inhabits the freshwater systems with surface water and placement of turbines within these habitat units is unlikely. In addition to these species, although unlikely to occur in the Project Site due to poaching and the medicinal trade, *Smutsia temminckii* (Temminck's Ground Pangolin, VU) probably once did inhabit the Miombo Woodland in the Project Site.

Mammal sensitivity is considered to be Moderately High

Amphibians

During the field assessment several amphibian species were observed, notably in the freshwater habitats associated with the Miombo Woodlands and the Forests. The abundance and diversity of amphibian species in the Project Site is largely attributable to the large areas of standing water and

damp soils as well as a high level of food resources in the form of abundant insects. Amphibian species are often a good bio-indicator of ecosystem health, notably that of freshwater systems, as they are generally susceptible to pollution and unnatural toxicants in the water. Although the Project Site has been subjected to extensive habitat alteration, land use changes and forest clearing, it is evident that the water systems are still in good health. The Dambos, forest streams and streams in the Miombo Woodlands all provide high levels of suitable habitat both for foraging and breeding of amphibian species. The interconnectedness of the freshwater habitat further ensures that the overall habitat integrity for amphibian species remains moderately high, allowing for the free and relatively easy movement of such species throughout the Project Site.

Additional species that are expected to occur within the Project Site include but are not limited to *Sclerophrys gutturalis* (Guttural Toad), *Leptopelis bocagii* (Bocage's Tree Frog), *Breviceps poweri* (Power's Rain Frog), *Phrynobatrachus natalensis* (Natal Puddle Frog), *Tomopterna marmorata* (Marbled Sand Frog), *Sclerophrys pusilla* (Eastern Flat-backed Toad), *Arthroleptis xenodactyloides* (Dwarf Squeaker), *Hyperolius marginatus*, *Hemisus marmoratus* (Shovel-nosed Frog), *Schismaderma carens* (African Split-skin Toad) and frogs of the Genus Ptychadena (Ridged/Grass Frogs).

All the aforementioned species are likely to occur within the Freshwater Habitat and the associated areas of increased moisture surrounding these freshwater systems.

No amphibian SCC were observed within the Project Site. The available databases further do not indicate the possible current or historical occurrence of amphibian SCC in the Project Site.

Amphibian sensitivity is considered to be Moderately High.

Reptiles

During the field assessment several reptile species were observed throughout the Project Site but not in close proximity to the villages. Although the habitat within the Project Site has been degraded, reptile species show remarkable resilience to such degradation, often able to continue thriving in these changed environments. This is largely due to their ability to live in and amongst human populations with ease, whilst still finding adequate food resources to sustain themselves. The smaller lizards' and skinks' primary food resource is that of the abundant insect life in the Project Site, whilst the larger predatory snakes and lizards will rely on larger prey items such as rodents, other reptiles, amphibians and nestlings of bird species. Although not photographed, during the site assessment individuals of *Naja mossambica* (Mozambique Spitting Cobra) were often observed, as well as a snake most likely of the Genus Amblyodipsas (Purple-glossed Snakes). Both of these snakes were observed in and around the freshwater habitat, most likely foraging for small mammals and amphibians.

Reptile sensitivity is considered to be Moderately High.

Insects

Insect diversity and abundance was notably high throughout the Project Site. This can be attributed to the high levels of food resources as well as increased and varied habitats that suit a diversity of insects. Flowering and fruit producing plants as well as the graminoid layer all provide increased food resources to insects, whilst the smaller insects themselves are preyed upon by larger predatory insects. A high abundance of insects is imperative for the overall functioning of the ecosystem, as the insects play an important role as pollinators as well as nutrient recyclers. Although habitat degradation is evident, the Project Site is still considered to be an important area in terms of habitat provision for insects, notably the hillsides, forests and freshwater habitats.

In addition, insect overall provide the staple and important food resource for a variety of other species, without which many would not be able to survive.

No insect SCC were observed within the Project Site. The available databases do not indicate the possible current or historical occurrence of insect SCC in the Project Site.

Insect sensitivity is considered to be Moderately High.

Arachnids

Arachnid species are notoriously hard to detect over a relatively short period of time, which can often lead to the under estimation of diversity and abundance. As such, it is necessary to take into consideration the habitat conditions for arachnids as well as available resources, whilst also consulting available databases. During the field assessment particular attention was paid to searching out arachnid species, as they are known to be secretive and often elusive. By searching under rocks, fallen logs, shrubs and tree canopies, it was noted that the overall arachnid abundance and diversity of the Project Site was moderately high. This abundance and diversity of arachnid species can be sustained due to the increased levels of suitable habitat and high abundance of food resources, predominantly that of insects. Vegetation clearance has had an impact on the habitat integrity for arachnids, however the more open and cleared areas are now favoured by ground hunting spiders such as those belong to the Family Ctenidae (Wandering Spiders) and Family Lycosidae (Wolf Spiders). Like amphibians, a high abundance and diversity of arachnids further helps maintain insect population numbers, which if left uncontrolled would become problematic as well as possibly destructive.

No arachnid SCC are known to occur in the Project Site according to the available databases at the time of the assessment, with all species observed being considered common and widespread.

Arachnid sensitivity is considered to be Moderately High.

Bats

The bat monitoring study was initiated during June 2019 with the installation of the bat monitoring equipment on the meteorological mast. Currently field data on the bats is not available, but as indicated in Table 25 below there is a potential for the following bat species to be present:

- African Straw-coloured Fruit-bat (*Eidolon helvum*)
- Large-eared Free-tailed Bat (*Otomops martiensseni*)
- Commerson's Leafnosed Bat (*Hipposideros vittatus*)

In addition to physical monitoring, twelve months of acoustic monitoring will take place. The monitoring will be done in accordance with international best practise as described in the World Bank Environmental, Health and Safety Guidelines for Wind Energy (August 2015). This includes passive monitoring from at least five fixed locations (one location in each of the main habitat types), monitoring at height from the meteorological mast, roost searches, focal site monitoring and drive transects.

The bat monitoring progress reports will summarise bat activity, highlight relevant concerns or opportunities and provide an opinion, with mitigation options, on any potential impacts to bats.

Bat sensitivity is considered to be High.

Faunal Species of Conservational Concern

Species listed in Table 25 below whose known distribution ranges and habitat preferences according to the IUCN include the Project Site have been taken into consideration.

The species listed in Table 25 all have a relatively high probability of occurring within the Project Site, and are most likely to occur within and around the Degraded Forest and Freshwater Habitats, as these habitats provide suitable movement and refuge areas, as well as areas for foraging and roosting.

Table 25: A summary of the potential mammal SCC that may occur within the

Scientific name	Common name	Threat Status	POC
Eidolon helvum	African Straw-coloured Fruit-bat	NT	70 %
Aonyx capensis	African Clawless Otter	NT	70 %
Otomops martiensseni	Large-eared Free-tailed Bat	NT	70 %
Hipposideros vittatus	Commerson's Leafnosed Bat	NT	70 %

4.9.3 Avifauna/Birds

Approximately 750 bird species have been recorded in Zambia. The Southern African Bird Atlas Project has no cards (Counts) submitted for pentads near the Project Site (Figure 17), the closest being in the Nyanje Hills and South Luangwa National Park areas.

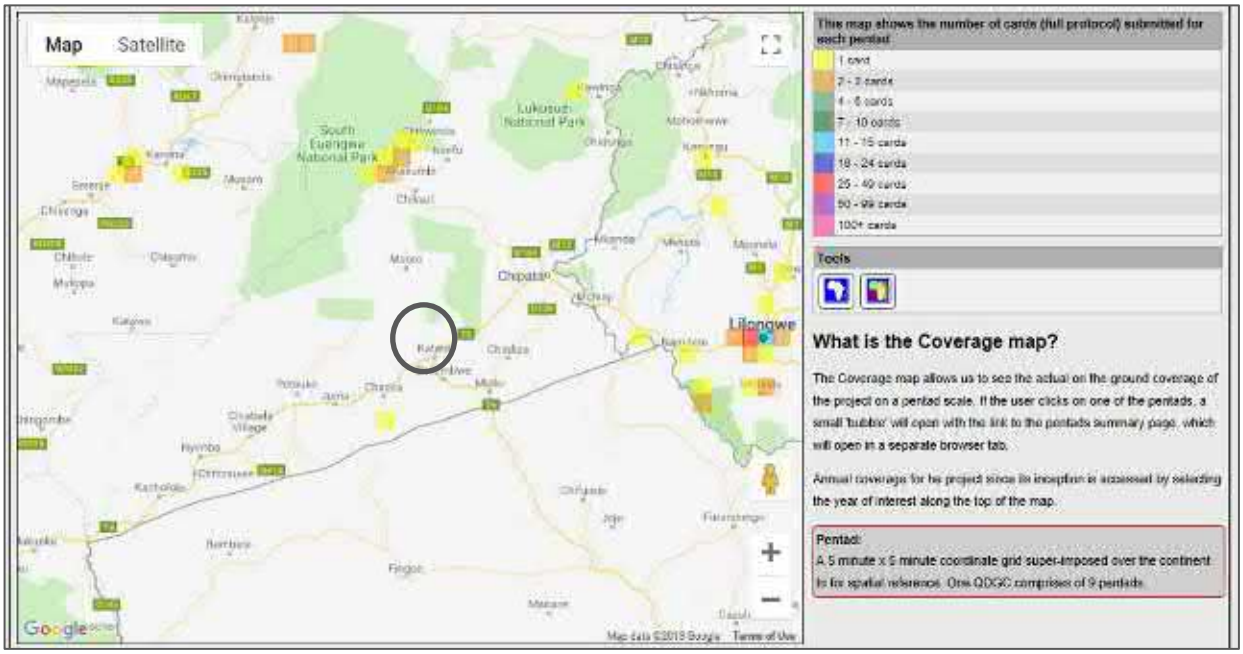

Figure 17: SABAP2 coverage of the Project Site

Zambia has 42 Important Bird Areas (IBA – BirdLife International) covering approximately 10 538 250 ha (or 14% of the country). The Project Site is not in any of these IBA's, the closest IBA being Nyanje Hills IBA, approximately 40 km south-west of the Project Site (Figure 18). This IBA is approximately 5 000 ha in size and consists of a high density of granite inselbergs.

The IBA is important for the localized and specialized Boulder Chat *Pinarornis plumosus*, Black Stork *Ciconia nigra*, Augur Buzzard *Buteo augur*, Black Eagle *Aquila verreauxii*, Lanner Falcon *Falco biarmicus*, Peregrine Falcon *Falco peregrinus*, Freckled Rock Nightjar *Caprimulgus tristigma*, African Black Swift *Apus barbatus*, African Rock Martin *Ptyonoprogne fuligula*, Striped Pipit *Anthus lineiventris*, Familiar Chat *Oenanthe familiaris*, Mocking Chat *Thamnolaea cinnamomeiventris*, Rock loving Cisticola *Cisticola emini*, White-necked Raven *Corvus albicollis*, Red-winged Starling *Onychognathus morio* and Cinnamon-breasted Rock Bunting *Emberiza tahapisi*. These birds occur here in spite of heavy transformation of vegetation around the inselbergs. Although this IBA is too far from the Project Site to have a direct

bearing, if there are similar inselbergs on the Project Site one could expect similar bird species. None of the above listed species are either regionally or globally threatened (Dowsett et al, 2008; IUCN 2018)

South Luangwa National Park IBA is located approximately 60 km north-east of the Project Site (Figure 18). The bird data from this site is probably less relevant to Project Site than that of Nyanje hills IBA, since Luangwa is a large protected area with the significant Luangwa River.

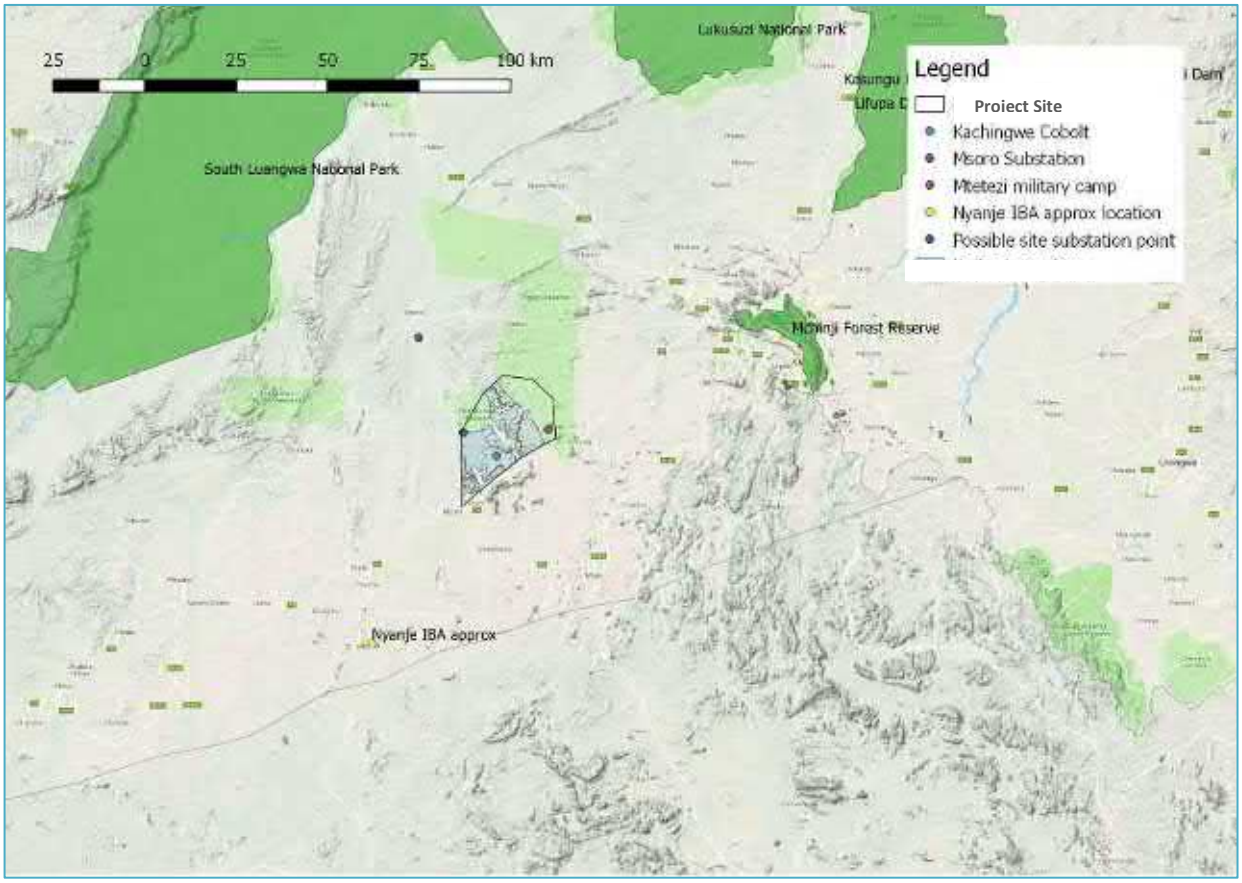

Figure 18: The Project Site relative to known avifaunal features in the landscape.

Flagship birding species in Zambia (according to Birdwatch Zambia, www.birdwatchzambia.org) are as follows: Zambian Barbet *Lybius chaplini*; Wattled Crane *Bugeranus carunculatus*; Grey-crowned Crane *Balearica regulorum*; White-headed Vulture *Trigonoceps occipitalis*; White-backed Vulture *Gyps africanus*; Hooded Vulture *Necrosyrtes monachus*; Black-cheeked Lovebird *Agapornis nigrigenis*; Slaty Egret *Egretta vinaceigula*; Shoebill *Balaeniceps rex*; Taita Falcon *Falco fasciinucha*; Margaret's Batis *Batis margaritae*; African Pitta *Pitta angolensis*; Blue Swallow *Hirundo atrocaerulea*; Kori Bustard *Ardeotis kori*; and Southern Ground Hornbill *Bucorvus leadbeateri*. A number of these species will not occur at the Project Site on account of their habitat requirements. Of this group of species it is probably the vultures (and other raptors not mentioned above) which are highest risk at the Project Site due to their wide ranging habits. Also expected are various water fowl (probably mostly common species) in the lower lying ground where there is wetland and crop lands.

Bird monitoring studies are on-going in order to:

- estimate the number/density/movements of birds regularly present or resident within the area of influence of the Project before its construction;
- document patterns of bird movements and habitat preferences in the vicinity of the proposed Project before its construction;

- estimate predicted collision risk (the frequency with which individuals or flocks fly through the future rotor swept area of the proposed Project) for key species;
- establish a pre-impact baseline of bird numbers, distributions and movements within the Project Site; and
- offer mitigation solutions that could be used in the final design, construction and management strategy of the Project.

Information based on the bird monitoring conducted to date is provided below.

Small bird species abundance & diversity

Walked transects on site recorded a total of 44 small bird species during the wet season (Figure 19). This species diversity is relatively low at this stage. The most abundant of these species were all seedeaters such as Yellow-fronted Canary *Serinus mozambicus*, Black-winged (Fire-crowned) Bishop *Euplectes hordeaceus* and Red-collared Widowbird *Euplectes ardens*. These species were mostly recorded in the open grassy areas around wetlands and crop lands. None of the species recorded to date carry regional or Global Red List status.

Large bird species & raptors abundance & diversity

Tall vegetation and consequent low visibility while driving limited data collection; however, two records were made, of a Brown Snake-Eagle *Circaetus cinereus* and a Steppe Buzzard *Buteo buteo*. Neither of these species are regionally or Globally Red Listed.

Focal site surveys

No relevant target bird species were recorded at either of the Focal Sites. In the case of Focal Site 1 (Katete) this may be due to the heavy fishing pressure (by nets) on the dam. This would reduce food availability for piscivorous birds, increase disturbance and threats to large birds, and possibly pose a risk of entanglement in nets.

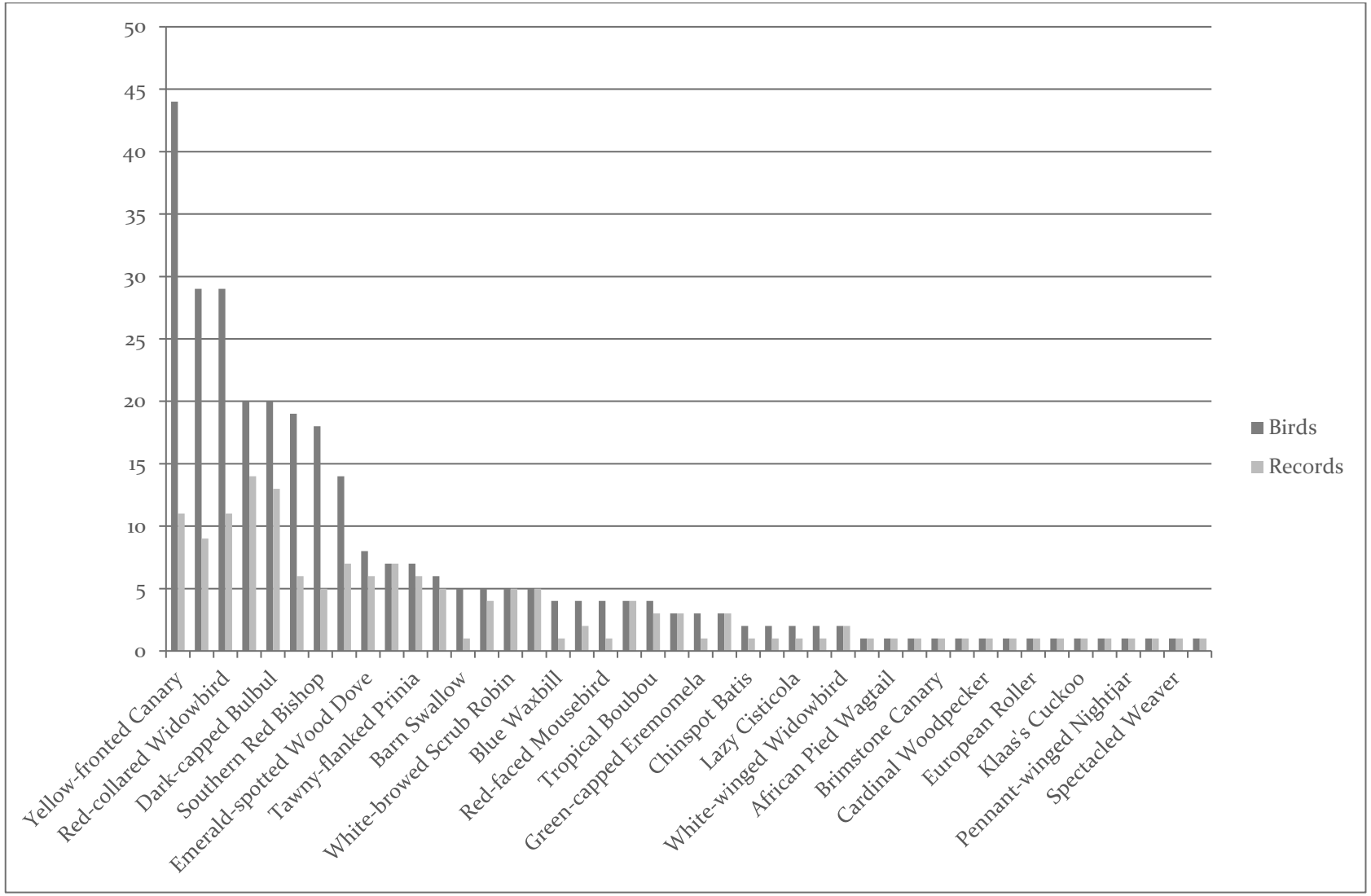

Figure 19: Summary data for small bird species – wet season

Incidental observations

Fourteen incidental records of 16 individual bird target species were made during the wet season. These records comprised 7 species (Figure 20). The most abundant was Fiery-necked Nightjar *Caprimulgus pectoralis*, followed by Spotted Eagle-Owl *Bubo africanus*. These are both nocturnal species which were recorded incidentally when traveling off-site after the days' data collection. None of the 7 species are regionally or Globally Red Listed. The locations of these observations are shown in Figure 21. Across all data collection methods and incidentally we have recorded a total of 109 species on site (47 on brief screening site visit & 98 on full monitoring).

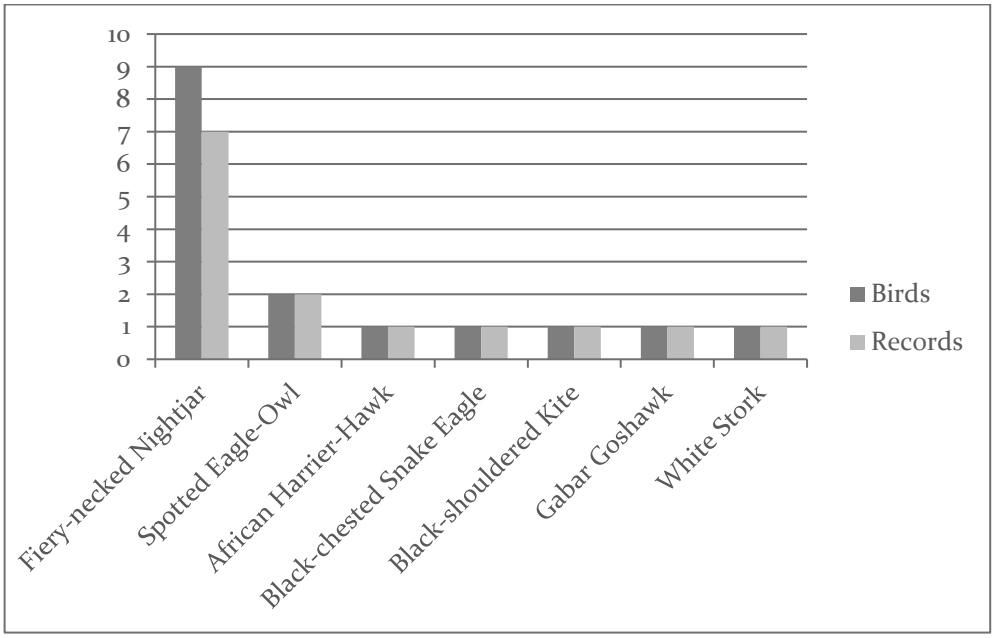

Figure 20: Incidental observations of target bird species in first season (wet season).

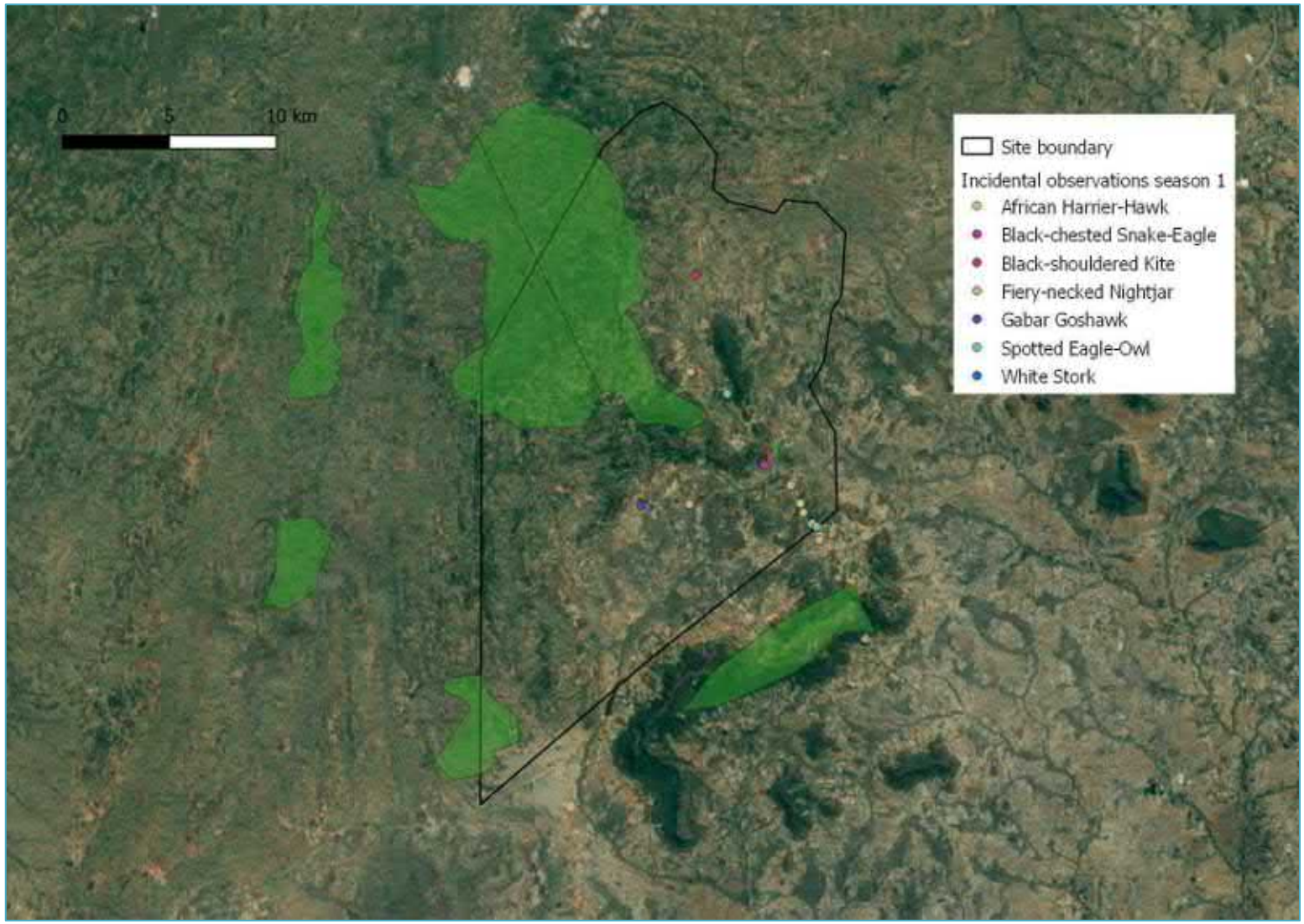

Figure 21: The location of incidental observations of target bird species in first season (wet season).

Target species flight behaviour on site

Nine target bird species were recorded flying on-site during the wet season (Figure 22). A total of 30 records of 40 individual birds were made. The most frequent flier of these was Steppe Buzzard, followed by Wahlberg's Eagle *Hieraaetus wahlbergi*. Eight of the nine target bird species recorded were raptors. One large terrestrial, the White Stork *Ciconia ciconia*, was recorded flying on site. Steppe Buzzard and Wahlberg's Eagle together made up well over half of all recorded flights on site. None of these nine species are globally Red Listed by IUCN (2019).

Figure 23 shows the spatial location of flight paths recorded to date. To date there appears to be a tendency for birds to fly above the lower lying ground, some of which is transformed for agriculture rather than above the ridges which are still natural vegetation. These patterns will be investigated further as more data is collected.

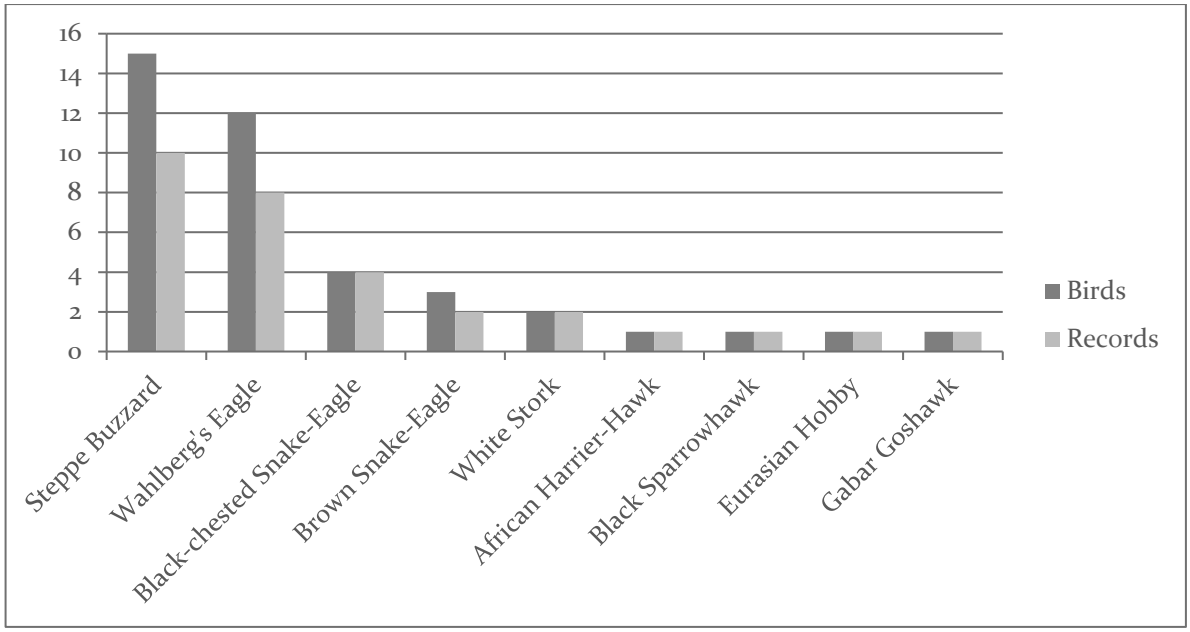

Figure 22: Summary target bird species flight data for first season (wet season).

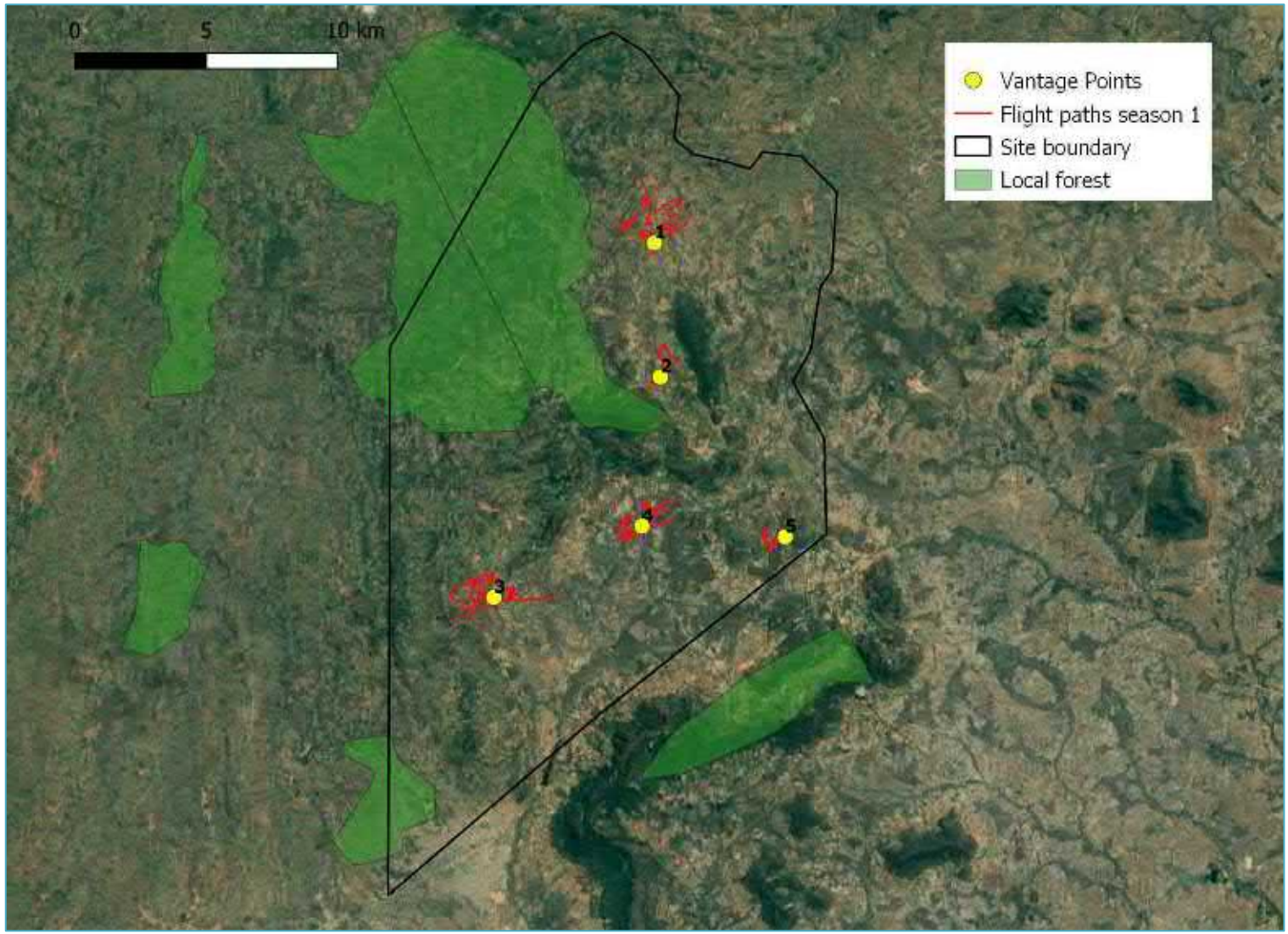

Figure 23: Recorded target bird flight paths in first season (wet season).

4.9.4 Aquatic Ecology

Mtetezi River

Ecostatus

Although not formally assessed, the Mtetezi River is considered to be of moderate to high ecological integrity. Clearing of vegetation has occurred in some areas to make way for crop cultivation, although this is not extensive as yet. The remaining vegetation comprised indigenous woody species representative of the vegetation throughout the Project Site and greater surrounds. Impoundments will have had an impact on the hydraulic regime of the system, however, except for the T4 road bridge, no other instream impacts (such as road crossings or weirs) were observed either during the fieldwork.

Habitat and biota

Due to the connectivity to surrounding undisturbed areas, relatively remote locality and inaccessibility of the river, it is expected that it provides an important faunal migratory corridor. Although minimal fauna was observed during the site assessment, snakes were encountered often in riparian areas, including at one survey point along the Mtetezi River. As noted in the PES discussion, vegetation clearing has occurred in some areas, but where clearing has not occurred the floral species composition and structure remains largely natural.

Goods and Services Provision

The Mtetezi River forms the eastern border of the Project Site, flowing in a northerly and north-eastern direction. Access to the river is hindered along much of the reach within the Project Site by dense vegetation and hilly terrain, thus reliance on the river is not as high as anticipated in such a rural area. Many of the villages located in the eastern portion of the Project Site have access to community boreholes, thus reliance on the river for water is moderate although impoundments were noted and it is likely that these are utilised by local communities for watering of cattle, swimming and fishing. Additionally, it was observed during the site visit that fishing in the river occurs daily.

Riverine systems (excluding the Mtetezi River)

Ecostatus

Due to the nature of the terrain, the majority of riverine systems that were assessed were close to human settlement, and therefore have undergone various impacts such as altered geomorphologic regimes (e.g. increased sediment loads originating from adjacent crop fields). More remote and inaccessible reaches of the various rivers are likely to remain in a largely natural condition, with impacts mostly limited to those occurring upstream such as impaired water quality due to discharge of domestic effluent.

Habitat and biota

Instream habitat in the majority of the rivers observed comprised a combination of biotopes, including sand, gravel and mud (GSM), rocks and overhanging vegetation, although very little instream vegetation was observed.

In terms of riparian habitat, as with the Mtetezi River, the rivers within the Project Site are considered to be important faunal migratory corridors as they provide connectivity to undisturbed, natural areas. Additionally, reptile and amphibian species were observed within several of these systems, indicating that breeding and foraging habitat is available and utilised.

Goods and Services Provision

Although some of the larger villages within the Project Site have access to communal boreholes and are able to obtain groundwater for domestic purposes such as cooking, the rivers are utilised extensively for bathing, washing of clothes, fishing and as previously mentioned, crop cultivation within the floodplains. In those areas where natural vegetation remains, it was apparent that the rivers provide a level of ecological services such as flood attenuation and sediment trapping. In addition, as with the Mtetezi

River and indeed most of the drainage systems in the Project Site, biodiversity maintenance is deemed high, as the connectivity to undisturbed areas provides refugia and foraging habitat for fauna.

Valley bottom wetland systems

Ecostatus

With the exception of conversion of wetland areas from 'natural' conditions to agricultural land, the related encroachment of woody species as a result, and very limited informal road crossings, very few impacts were observed within these systems. As a result, the ecological integrity of the valley bottom wetland systems is considered to be in a largely natural state. These systems are considered important not only for maintenance of biodiversity and habitat provision, but also for the recharge of larger drainage systems within the Project Site. Thus, retention of habitat and hydraulic connectivity is critically important.

Habitat and biota

With the exception of those areas cleared for crop cultivation, vegetation remains in a largely natural state although it was noted when delineating the watercourses that woody species have encroached in some areas, transforming the temporary zones from grassland to bushveld. This could potentially result in increased water use over time, as well as influencing the distribution of wetland-dependent faunal species which have a preference for open spaces. Nevertheless, the habitat remains in a largely natural state as this encroachment is presently limited in extent and severity.

Goods and Services Provision

At the time of the fieldwork, reliance on the valley bottom wetland systems for socio-cultural service provision was not as high when compared to the riverine systems or the dambo areas. In areas where terrestrial arable land is limited and therefore at a premium, the valley bottom wetland systems were utilised for subsistence farming. Although not directly observed, it is very likely, particularly in the more remote areas, that channelled valley bottom wetlands are relied upon for water provision both for domestic and agricultural purposes.

Dambos and floodplain wetland systems

Ecostatus

As with all watercourses within the Project Site, the primary modifiers of the dambo systems are related to subsistence agriculture, although due to the relatively flat terrain the extent of cultivation with the dambos is greater than in the other habitat types. Overall, the dambos are deemed to be in a largely natural to modified ecological condition, and reinstatement of natural conditions could occur with little to no human intervention.

These expansive wetland systems are considered very important for the provision of ecological (i.e. indirect services such as flood attenuation, trapping of sediment, and biodiversity maintenance) and for direct socio-cultural benefits in particular, crop cultivation, charcoal manufacturing and provision of grazing for livestock. Interviews revealed that, traditionally, local residents avoided cultivation within these wetland areas; however, due to increased populations and lack of available arable land the communities surrounding the wetlands have been forced to encroach into the wetlands.

Habitat and biota

The dambos provide essential habitat for a variety of faunal and floral species, including (as depicted above) *Drosera* sp., numerous orchid species (e.g. *Platycoryne buchanania*, *Habenaria schimperiana*), *Ascolepis protea* and *Hypoxis nyasica* amongst many others. Faunal species observed included *Hyperolius marmoratus*, *Arthroleptis stenodactylus* and *Phrynobatrachus mababiensis* along with numerous species belonging to the *Odonata* (dragonfly, damselfly) order.

Goods and Services Provision

The low-lying, extensive dambos appeared to be the most utilised of all the watercourses within the Project Site in terms of socio-economic uses. Because of the relatively flat topography these systems are generally easily accessed and are therefore preferred in terms of agriculture (both crop cultivation and livestock husbandry) as well as charcoal manufacturing.

4.9.5 Protected Areas

Protected areas located in the general region of the Project Site (as shown in Figure 18 above) include:

- South Luangwa National Park located approximately 60 km north-west;
- Lukusuzi National Park located approximately 100 km north-east;
- Kasungu National Park located approximately 120 km north-east;
- Lusandwa Forest Reserve located approximately 50 km west;
- Dzalanyama Forest Reserve located approximately 120 km south-east; and
- Mchinji Forest Reserve located approximately 50 km east.

According to the World Database on Protected Areas (UNEP-WCMC, 2016), the Chiulukire West and Chivuna Hills Forest Reserves are associated with the north western corner of the Project Site, while the Matanta Forest Reserve is situated within the south western corner (Figure 24). As highlighted above, these Forest Reserves have already been subjected to continuous wide scale impacts. The habitat degradation comes largely from collection of firewood, wood used for structures, the charcoal trade in rural areas in order to generate an income and agricultural activities.

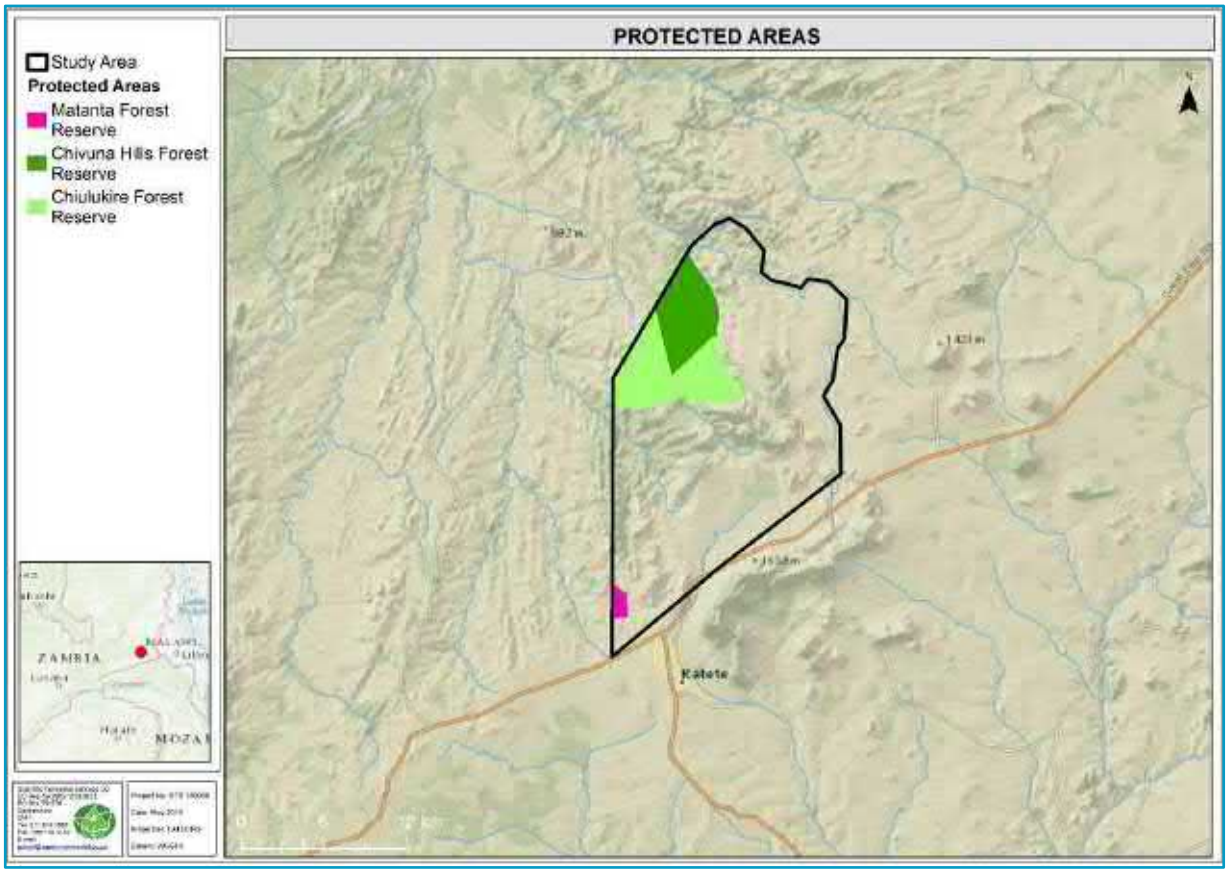

Figure 24: Protected Forest Reserves associated with the Project Site

4.9.6 Critical Habitats

IFC Performance Standard 6 defines critical habitat as "*areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; habitat supporting globally significant concentrations of migratory species and/or congregatory species; highly threatened and/or unique ecosystems; and/or areas associated with key evolutionary processes*".

It will be confirmed during the ESIA stage if there are any "critical habitats" as defined by the IFC Performance Standards present on the Project site or along the powerline transmission route. Based on the available information to date the Project is not expected to impact any "critical habitats" as defined by the IFC Performance Standards, and the Project Site does not fall within a Key Biodiversity Area according to the World Database of Key Biodiversity Areas ™.

However, the *Global Critical Habitat screening layer*[2] shows some areas as "Potential Critical Habitat" around the Project Site. This will be confirmed during the ESIA stage.

4.10 BUILD ENVIRONMENT

The build environment mainly consists of the (1) Rural Settlements and (2) Urban and Peri-urban Settlement at Katete Town, which has been described in more detail under the Land Use section (Section 4.7.1) above.

[2] http://data.unep-wcmc.org/datasets/44

5. PROPOSED PROJECT ACTIVITIES

The Project will be carried out in the following phases:

- Planning phase;
- Construction phase;
- Operational phase; and
- Decommissioning phase.

These phases are described in more detail below.

5.1 PLANNING PHASE

During the planning phase Mphepo will assess the key parameters required for the construction and operation of the Project. This will include:

- An Environmental and Social Impact Assessment (ESIA) which investigates the impacts on the surrounding biophysical environment and on the local community;
- Specialist investigations (e.g. on impacts related to bats, birds, noise, terrestrial ecology, aquatic ecology, visual aspects and the social environment) to inform the ESIA, ESMP and layout of the Project;
- Engagement with the traditional leadership, communities and key government authorities (e.g. Katete Council, District Commission, Ministry of Energy, Ministry of Roads, Ministry of Forestry, etc.)
- Establishing grid code requirements and connections;
- Establishing Zambian power requirements and support;
- Wind data gathering via a Meteorological Mast and LiDAR units;
- Identification of material resources for access road upgrades/construction; and
- Conducting geotechnical investigations.

During the planning phase the Project will adapt and evolve to meet the requirements, time schedules and expectations of all the relevant parties.

Prior to initiating construction, a number of other surveys may also be required including, but not limited to, topographic surveys, surveys to confirm the turbine micro-siting footprint, road surveys and surveys to identify suitable on-site substation site(s). A survey of the power transmission line servitude(s) to determine mast/pole locations and inform the routing will also be undertaken.

5.2 CONSTRUCTION PHASE

A number of temporary structures will be constructed during construction. These include a hard standing laydown area of a maximum of 10 000m^2 and a site compound for all contractors which would be approximately 5 000m^2 in size.

The final location, size and type of wind turbines will be determined using information gathered from the planning phase, including the environmental and social considerations described in the ESIA. Prior to the installation of the wind turbines, the site will be prepared as required (this would include construction of on-site access roads and turbine foundation construction). This can take between 3 and 6 months. Labour for the Project is expected to come from the surrounding towns and villages, and preference would be to employ local people. It is not anticipated to accommodate workers on-site at this stage, but rather in the town of Katete. A maximum of 700 workers is anticipated on site during the peak of the construction phase.

Once the turbine equipment has arrived on site, it will take approximately 3 - 9 months to complete assembly, depending on the size of the turbines. This will be followed by the completion of the internal electrical connections, as well as turbine function testing to verify proper operation.

Where possible; materials, plant and equipment, will be sourced from local suppliers. The bulk of the specialist wind turbine equipment (mast, nacelle, blades, etc.) will be imported from China, Europe or the USA and will be shipped via South Africa, Namibia, Tanzania or Mozambique.

The construction phase will take approximately 12-24 months to complete.

The 132 kV power transmission line leading from the Project Site to the Msoro substation will be developed concurrently with the construction of the wind farm (as indicated in Figure 3).

The construction phase will broadly include the activities described below.

5.2.1 Establishment of Access Roads

Access/haul roads to the Project Site, as well as internal access roads within the Project Site, will need to be established prior to the commencement of construction. Access to the site is likely to be from the T4 main road. As far as possible, existing access roads would be utilised, and upgraded where required. Within the site itself, access will be required between the turbines for construction purposes (and later for maintenance access). Special haul roads of up to 13 m in width may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. The internal service road alignment will be informed by the final micro-siting/positioning of the wind turbines.

These access roads will have to be constructed in advance of any components being delivered to site, and will remain in place after completion for future access (and possibly access for replacement of parts if necessary). It is proposed that in preparing the access roads, a portion of it will be constructed as a permanent access road and the remainder as a temporary access road that can be de-compacted and returned to its pre-construction condition. Roads that remain could be proclaimed as public roads, while the short access roads to each turbine could be proclaimed as private roads.

5.2.2 Site Preparation

This phase will include clearance of vegetation at the footprint of each turbine and excavations for foundations. These activities will require the stripping of topsoil, which will need to be stockpiled for rehabilitation later on. Site preparation will be undertaken in a systematic manner to reduce the risk of erosion. In addition, site preparation will include search and rescue of floral species of concern (where required).

5.2.3 Foundation construction

Concrete foundations will be constructed at each turbine location. Foundation spaces will be mechanically excavated to a depth of approximately 2.5 - 5 m. Concrete will be batched at an appropriate location on-site. The reinforced concrete foundation will be poured and will support the mounting rings for the wind turbines. The foundation will then be left up to a week to cure. If the geological conditions dictate, the use of alternative foundations will be considered (e.g. reinforced piles).

5.2.4 Transport of Turbine Components and Equipment to Site

The wind turbine, including tower, will be brought on-site by the supplier in sections. Turbine units which must be transported to site consist of the tower/mast (comprised of segments), the nacelle (weighing approximately 80 tons), and three rotor blades (each of up to 77 m in length). The individual components are defined as abnormal loads in terms of Zambia Road Traffic Ac, 2002 by virtue of the dimensional (e.g. blades) and load limitations (e.g. the nacelle).

In addition, components of various specialised construction, lifting equipment and counter weights are required on site to erect the wind turbines, and these also need to be transported to the Project Site. In addition to the specialised lifting equipment, the normal civil engineering construction equipment will

need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.).

The components required for the establishment of the substation (including transformers) as well as the transmission line (including towers and cabling) will also need to be transported to the site as required.

The large equipment to be transported to the site during the construction phase may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands, etc.), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines, etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls, etc.) as a result of the abnormal loads.

The equipment will be transported to the site using appropriate routes, and the dedicated access/haul road to the site itself. A transportation study will be required to will deal with external roads in this regard.

5.2.5 Establishment of Laydown Areas on Site

Laydown areas will need to be established at each turbine position for the storage of wind turbine components. The laydown area will need to accommodate the cranes required in turbine assembly.

Laydown and storage areas will be required for the normal civil engineering construction equipment which will be used on site.

A large laydown area (approximately 20 m wide x 150 m long) will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides.

5.2.6 Construction/Assembly of the Turbines

Large lifting cranes will be required on site as it will need to lift the tower sections into place. The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed on top of the assembled tower. The next step will be to assemble the rotor (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put it in place.

Turbines will be appropriately spaced to minimise wake effects and wind turbulence.

The lifting cranes will be required to move between the turbine sites. The crawler crane is self-powered and can “crawl” between locations should the ground conditions allow. When assembled, the crawler crane has a track width of approximately 11 m.

5.2.7 Construction of an on-site Substation

An electrical substation will be constructed within the Project Site. The turbines will be connected to the on-site substation via underground cabling. The position of the substation will be informed by the final positioning of the wind turbines as the layout of the turbines will determine the optimum position for the construction of a substation. The substation will be constructed with a high-voltage (HV) yard footprint of up to 80 m x 90 m.

5.2.8 Establishment of Ancillary Infrastructure

A single story Operations and Maintenance (O&M) building with a warehouse/workspace, office, telecoms, security and ablution facilities will be constructed on the Project Site. The establishment of these buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with this construction will be required.

5.2.9 Connection of Wind Turbines to the On-site Substation(s)

Each wind turbine will be connected to an optimally positioned substation by underground electrical cables though a collection system (i.e. when the electrical cables are 'collected' in a bundle from the turbines to the substation). The installation of these cables will require the excavation of trenches, approximately 1 - 2 m in depth. The underground cables will be planned to follow the internal access roads as much as possible.

5.2.10 Connecting the Substation to Power Grid

A proposed 132 kV power transmission line will connect the on-site substation to the national electricity distribution network at the Msoro Substation which lies approximately 30 km north-west of the Project Site. The connection point to the ZESCO power grid will be confirmed through a network planning exercise.

A route for the power transmission line will be assessed, surveyed and pegged prior to construction of the line. The power transmission line will be constructed utilising appropriate towers and will be approximately 15 - 25 m in height. A servitude of approximately 35 - 40 m will be required for this power line. Within this servitude no houses will be allowed, and limitations to agriculture will apply (e.g. restrictions on fruit tree/crop heights).

5.2.11 Commissioning

Prior to the start-up of the wind turbines, a series of checks and tests will need to be carried out. This will include both static and dynamic tests to make sure the turbines are working within appropriate limits.

Grid interconnection and unit synchronisation will also need to be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades. The schedule for these activities will be subject to site and weather conditions.

5.2.12 Site Rehabilitation

Site rehabilitation will be conducted in a progressive manner as construction is completed in specific areas (e.g. rehabilitation will commence around each turbine location once construction of that particular turbine is completed). On full commissioning of the facility, any new access roads which are not required during the operational phase, or requested to stay in place by the community, would need be closed and rehabilitated.

5.3 OPERATIONAL PHASE

Once the Project is completed and becomes operational, it will generate electricity and is expected to have a minimum life span of 25 years. Regular maintenance will be required to ensure the turbines are kept in optimal working order and may extend the life span beyond 25 years.

Day-to-day control of the turbines will be done remotely through the use of computer networks. The wind farm can operate in parallel with daily community activities (e.g. farming, grazing, etc.) due to the relatively small footprint of each of the turbines.

The wind farm will be operated on a 24 hour, 7 days a week basis. The operational phase of the project will mainly comprise of the following activities:

- Vegetation management for under and around the modules to allow maintenance and operation at full capacity;
- Monitoring and maintenance of all components including wind turbines, substations and ancillary equipment;
- Bird and bat monitoring;
- Office management and maintenance of the welfare facilities;

- Supervision of the electricity production; and
- Site security monitoring

Once operational, the wind farm will be monitored locally and remotely. It is estimated that the operational phase of the project will provide employment for approximately 10-15 skilled staff members, who will be responsible for monitoring and maintenance when required. It is most likely that the facility will be manned by the appointed O&M staff.

Each turbine will be operational except under circumstances of mechanical breakdown, extreme weather conditions, extremely low wind speeds or maintenance activities.

The wind turbines will be subject to periodic maintenance and inspection, and periodic oil changes will be required (mostly from gearboxes and electrical transformers). Any waste products (e.g. waste oil, damaged turbine equipment, damaged electrical equipment, etc.) would need to be disposed of at appropriately licenced disposal sites (where they cannot be recycled).

5.4 DECOMMISSIONING PHASE

The proposed Project is expected to operate for at least 25 years. Once the plant reaches the end of its life, the wind turbines may continue to operate as their expected life time is 30 years; they may alternatively be refurbished or replaced to continue operations. The facility may be closed and decommissioned. If decommissioned, all components (excluding the turbine foundations and some of the access roads) would need to be removed and the site rehabilitated. Materials would need be recycled or disposed of in accordance with local regulations and international best practice.

The activities described below are likely to be associated with the decommissioning phase of the wind farm.

5.4.1 Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, heavy vehicles and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

5.4.2 Disassembly of Existing Turbine

Large cranes will be required again to disassemble the wind turbines. These components will be re-used, recycled (where possible and practical) or disposed of in accordance with regulatory requirements. This phase will have similar activities as described for the construction phase above.

5.4.3 Clearing of other infrastructure

The other infrastructure such as the O&M building, sub-station, etc. will either be removed from site, or re-used as deemed fit and approved by the relevant authorities and Chewa Development Trust (for example, the O&M building can be re-used as a community centre).

5.4.4 Access roads

Some access roads may remain. The extent and number of the roads to remain on site is currently not known, but will need to be approved by the relevant authorities and Chewa Development Trust. All other access roads would need to be closed and rehabilitated.

6. IDENTIFICATION ENVIRONMENTAL AND SOCIAL IMPACTS

The purpose of the Scoping Phase is to identify key potential impacts and benefits and to screen out those impacts that do not warrant more detailed investigation. Based on the Scoping Phase preliminary impacts and benefits on the physical, biological and social environments have been identified and are briefly assessed below to establish which impacts and benefits need to be subject to a more detailed assessment during the ESIA Phase.

The identified potential environmental and social impacts and benefits have been discussed based on the nature of the project, area of influence, field inspections and observations, specialist studies conducted to date, concerns from stakeholder consultations and literature research.

6.1 SCREENING OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The Scoping Phase identifies potential impacts and benefits through a systematic process whereby the activities associated with the Project phases are considered with respect to the potential to interact with identified resources and receptors. Interactions have been classified in one of three categories as described in Table 26 below. The Project interactions with identified resources and receptors are presented in Table 27.

Table 26: Interaction categories

Category	*Colour coding*
No interaction, where the project is unlikely to interact with the resource/receptor. Scoped Out.	
Interaction likely, but not likely to be significant: where there is likely to be an interaction, but the resultant effect is unlikely to change baseline conditions in an appreciable way. Scoped out with justification, but mitigation measures will be prescribed in the ESMP.	
Significant interaction, where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource or receptor. Scoped in and requires further assessment.	

Table 27: Scoping Matrix

Project Activities	Biophysical Resources/Receptors									Socio-Economic Resources/Receptors									
	Landscape and Topography	Climate	Air Quality	Noise	Geology and Soils	Aquatic Ecology	Terrestrial Ecology	Bats/Birds	Protected Areas and Critical Habitats	Community Health & Safety	Occupational health & Safety	Land Use and Tenure	Livelihoods	Local Economy	Services	Access and Mobility	Social Networks	Natural resource Use	Cultural Heritage	Build Environment
Construction Phase																				
Site Preparation																				
Establishment of Access Roads																				
Foundation Construction																				
Transport of Turbines and Equipment																				
Establishment of Laydown Areas																				
Construction of Turbines																				
Construction of Substation																				
Establishment of Ancillary Infrastructure																				
Connection of Turbines and Substation																				
Connection of Substation to Power Grid																				
Wind Farm Commissioning																				
Site rehabilitation																				
Operational Phase																				
Vegetation Management																				
Monitoring and Maintenance of Components																				
Office and Welfare Facilities Maintenance																				
Security																				
Electricity Generation																				
Decommissioning Phase																				
Site Preparation																				
Disassembly of Existing Turbine																				
Clearing of other infrastructure																				
Access roads (closure and rehabilitation)																				
Scoped In																				
Scoped Out with Justification																				
Scoped Out																				

6.2 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS – WIND FARM

6.2.1 Landscape and Topography

Construction of some components like the new access roads and wind turbine foundations may have some localised impacts on the topography of the Project Site. The turbines are expected to have a significant impact on the current visual landscape. This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.2.2 Climate

Newly published research shows that wind turbines can have a measurable effect on the local climate. The action of the turbines can create small changes to local microclimates at certain times of the day. The multiple turbine wakes can affect air temperature and humidity and can extend beyond the footprint of the turbine. However, these changes are expected to be small.

Wind power generation does not rely on fossil fuels as with coal/gas fired power plants, and therefore emit significantly less greenhouse gases or pollutants when compared to conventional thermal power technologies. This should have a nett positive impact in relation to climate change.

6.2.3 Air Quality

Air quality in the immediate Project Site may be impacted during the construction phase mainly as a result of the emissions from construction vehicles and equipment, and exposing surfaces as result of vegetation clearing. Some of the existing will need to be repaired/upgraded, and new access roads need to be constructed to turbine locations. Trucks and vehicles transporting staff, equipment and construction materials may also create dust generation. Relatively low levels of air emissions are anticipated during the operational phase (mainly from vehicles, air conditioners, fire suppression systems, back-up power generators, etc.). Standard mitigation measures will be included in the ESMP.

The production of electricity using wind power during the operational phase is not expected to have any significant impacts on air quality, and should in fact be seen as a positive impact on air quality when compared to production of electricity using thermal power plants.

6.2.4 Noise

Noise within the immediate Project Site is expected to increase intermittently during construction mainly due to the movement of the heavy haulage trucks and other vehicles, and the operation of construction equipment. The construction activities such as excavation works, cutting, ground moving, compacting, etc. may create noise nuisances for local communities. Blasting may be required as part of the civil works to clear obstacles or prepare foundations. Blasting may also be required should borrow pits or quarries be used to supply material sources for construction purposes. The impacts from noise from construction activities are considered to be temporary.

Noise generation from wind turbines during the operational phase is also expected. Aerodynamic noise is emitted by a wind turbine blade through a number of sources, and mechanical noises are emitted from other components of the wind turbines, and a lower level of noise can be expected from the substation and other electrical equipment. As the wind speed increases, noises created by the wind turbines are also expected to increase.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.2.5 Land Use and Tenure

The Project is not expected to fundamentally undermine local small-scale farming practices. However, the Project will likely need to acquire portions of farmland for the establishment of the Project infrastructure. While the Project will take every reasonable effort to avoid the loss of small-scale

farmland, it cannot be fully avoided. The total land-take will be investigated during the ESIA phase but the impact on wider farming practices is not expected to be significant.

The Project will need to secure community land. The ability of local communities to continue to access and benefit from community land and communal resources is unlikely to be fundamentally undermined, and the overall impact is not expected to be significant.

The Project should not result in a material change in local land-uses. The layout will be designed so that no community or household will need to be resettled and suitable buffers will be established between the Project infrastructure and communities. The Project will seek to obtain formal title for the land; however, this will not require any changes to land under customary tenure located outside of the Project footprint. As such, the local customary systems and authorities will remain largely unchanged.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.2.6 Social, Economic and Cultural Heritage

Social, Economic and Cultural Heritage aspects will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Social and Economic

The Project will be the first major development project within the Project Site and as well as within Katete District. It therefore has the potential to support local economic development directly via (1) local employment and (2) local content (defined as use of local good and services), and (3) via community development plans.

It is expected that the Project would drive demand for local goods and services, notably from Katete Town and surrounding major urban areas (e.g. Chipata). This may specifically include goods and services required for the construction and workforce over the duration of the construction phase. This demand could provide substantive opportunities for formal business development in the area over the short to medium term.

Establishment of new access roads and upgrading of existing roads should significantly improve mobility and access which could also contributor to economic benefits in the area.

While the operational phase will have a relatively small workforce, they are expected to be resident in the town or surrounding villages. In addition to the permanent workforce, the Project will likely include regular visits by consultants, maintenance teams, engineers throughout its operational life. The workforce will require accommodation, goods and services, and will likely generate moderate benefits for local businesses over the long-term.

The Project will establish suitable buffers and ensure placement of all Project infrastructure away from all communities and households, which negate the need for resettlement of households. There is no known physical displacement based under the current Project design iteration.

The acquisition of land will result in economic displacement where land-based livelihoods and income streams are disrupted. Such displacement will occur where small-scale farming ceases or where local communities are unable to access community land for natural resource harvesting. The Project has committed to the provision of compensation and livelihoods restoration support consistent with national and international requirements, and via a formal Livelihoods Restoration Framework (LRF).

The final number of people to be employed is likely to be between 300 and 700 people during peak construction activities (for each Phase), however, the number of people employed at one time may vary as different contracts and sub-contracts are completed during the construction phase. This also depends on the final contract with ZESCO. Less people will be required during the operations and maintenance phase. Recruitment will be undertaken in collaboration with the Chewa Development Trust, local authorities and local agencies.

There will be heavy-vehicle traffic during the construction phase for the delivery of the wind turbine equipment, construction materials and machinery. The transportation route for the delivery of the wind turbine equipment has not yet been finalised, but is most likely to be one of the following routes:

- Richards Bay, South Africa via Francis Town;
- Beira, Mozambique via Tete, Zambia;
- Walvis Bay, Namibia via Livingston, Zambia;
- Dar es Salaam, Tanzania via Tunduma, Tanzania; or
- Nacala Port Mozambique, Malawi, Zambia

Transport routes will be decided upon once all the suppliers are finalised after undergoing a procurement and selection period. Route selection must be informed by a detailed transportation study. The traffic will reduce significantly post construction and there will be only a small number of vehicles travelling to and from the site during operations for management and maintenance purposes. Where appropriate, traffic management measures within the ESMP to control construction and operational traffic will be developed.

Other social impacts that could be expected include:

- impact on natural resource harvesting;
- workforce related impacts and social pathologies, including influx;
- impacts related to labour and working conditions;
- impacts related to community health and safety;
- impacts related to disruption of vulnerable peoples (including women);
- impacts related to disruption of access and mobility (e.g. pathways and roads); and
- national power generation benefits.

Cultural Heritage

A total of 34 heritage features were identified within the Project Site. At this stage five of these identified sites are of national heritage significance and 25 of these sites are of “High” of “Critical” International Importance (in terms of IFC and UNESCO standards). The layout of Project infrastructure will need to consider these heritage features and avoid disturbances, especially the heritage features that have been designated as having High Conservation/Preservation Importance.

6.2.7 Ecological Resources

Terrestrial ecology

The proposed construction of the wind turbines is likely to result in further vegetation clearance for the turbine footprints, access roads and associated infrastructure. These activities will result in additional floral species and habitat loss, with potential unplanned spinoff impacts stemming from the increased levels of area access created by the new access roads. Such spinoff impacts include an increased level of wood harvesting in areas that may have previously been less accessible, leading to increased wood harvesting and habitat degradation. The construction activities may also result faunal habitat loss and possible faunal species persecution.

The terrestrial ecology could also be affected by breakout of fires and improper handling of waste and other hazardous materials. There will be waste generated across the lifecycle of the project. During construction, wastes will mostly comprise of spoil from excavations, waste concrete, damaged turbine equipment, scrap steel, workshop waste (e.g. waste oil, oily rags, parts, PPE, etc.) general domestic waste (including sanitary and food waste), office waste and packaging material (wooden pallets, plastic and cable drums). Possible waste materials to be generated during the operational phase include waste from maintenance works, damaged turbine equipment, office waste (including electrical waste) and sanitary effluent from the O&M building. Hazardous materials used on site during operations could include fuels, oils, lubricants, cleaning products, and specialised gases (e.g. for use in switchgear and fire

protection systems). Petrol and/or diesel stored on site in above ground tanks may be used during the construction period for vehicles to transport goods and personnel, generators and construction equipment. For certain types of transformers or backup generators, oil needs to be replaced which will need to be safely stored and removed from the site and correctly disposed of.

Whilst there are few hazardous waste landfill sites near the Project Site, there are ZEMA approved and licenced companies that handle hazardous wastes through storage, transportation, recycling and disposal, depending on the waste type. In addition, ZEMA encourages recycling of waste. All solid wastes generated (hazardous and non-hazardous) must either be recycled (where possible and practical) or disposed of through contracting a ZEMA approved waste handling company and disposing of waste at a suitably licensed disposal facility. If an appropriate facility for some of the hazardous waste streams cannot be found in Zambia, then it may have to be exported for appropriate recycling or disposal. This will be the responsibility of the EPC contractor during construction and the O&M Contractor during operation. Mphepo will have overall oversight to verify that the storage, collection, transport, handling and disposal of all waste streams are being undertaken in an appropriate and lawful manner.

Waste water includes any water affected in quality by construction related activities and human influence and will include sanitary effluent, grey-water used for washing purposes (e.g. vehicles, equipment, staff, etc.) and runoff over potentially contaminated areas (e.g. concrete batching/mixing areas and equipment storing areas). Measures will need to be implemented to manage all waste water generated during the construction and operational phases. Sanitary effluent management options currently include temporary storage on-site in mobile or underground sanitary storage facilities which can be emptied by a licensed contractor and disposed of at a licensed facility on a regular basis, or on-site treatment (e.g. package plants).

The layout of Project infrastructure will need to consider sensitive areas, especially the “Degraded Forest” and “Freshwater Habitat” areas (including the riverine systems, valley bottom wetland systems, “dambos” and floodplain wetland systems).

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Aquatic Ecology

The undeveloped economy in the area increases the reliance on the wetlands, although it was revealed that this reliance may not have historical roots and may have come about largely due to an increased population and lack of arable land, forcing residents to encroach into the wetlands. Whilst the socio-cultural reliance on wetland systems may be reduced if the economy was further developed, they are nevertheless considered very important for the provision of indirect (ecological) benefits including flood attenuation, erosion control, recharge of downstream systems, trapping of sediment and assimilation of nutrients, and biodiversity maintenance.

The aquatic ecology could also be affected by erosion, fires and improper handling of waste and other hazardous materials.

Buffer zones around the watercourses have been recommended, with the intention of guiding the layout of the proposed development. Development within the delineated wetlands must be avoided and any linear developments (e.g. access roads) within the delineated wetlands will need to be carefully considered and controlled.

During construction the Project will source water either from existing or new boreholes (as required) or purchase water from service providers who have existing water use rights and excess allocation. If water is purchased then the water will be transported to site via trucks or containers or a pipe and pump system depending upon the ultimate use and distance to the source. Approximately 40 - 60 m^3 per day will be required during construction for the following uses:

- Drinking;
- Ablution facilities;
- Dust control;
- Access roads construction;

- Construction of foundations of turbine mounting structures and substations;
- General construction (e.g. office buildings, cable ways, storm-water channels, etc.) and
- Fire-fighting reserve.

During operational phase water will be supplied either from boreholes, captured in tanks from the rainwater run-off from the substation/O&M building roof, or truck supply purchased from service providers who have existing water use rights and excess allocation. Approximately 1 - 2 m^3 per day will be required during the operational period of the project for the following uses:

- Potable water for drinking;
- Water reserve for firefighting;
- Cleaning of facilities (floor mopping, window cleaning, etc.); and
- Ablution facilities

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Birds

The construction activities may have some impacts on the birds (especially nesting sites) as a result of vegetation clearance, noise from equipment and vehicles and increased human presence as results of the workforce.

The impact on birds during the operational phase may be significant as a result of bird collisions with the turbine blades while the turbines are operational. At this stage of the bird monitoring programme the small bird species diversity on site does not seem to be very high. This might be an indicator of the impacted state of the natural vegetation and woodland. In addition, the large terrestrial bird and waterfowl diversity and abundance on site is low, while the raptor species diversity on site is reasonably good. No sensitive avifaunal features (e.g. roosts or heronries of large numbers of species, sensitive species nests, etc.) have been identified on or near site to date, and none of the species recorded to date are Red Listed either in Zambia or Globally (IUCN, 2019).

At this stage the data points towards a relatively low risk to birds; however, this will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Bats

As with birds, the construction activities may have some impacts on the bats (especially roosting sites) as a result of vegetation clearance, noise from equipment and vehicles and increased human presence as results of the workforce.

The impact on bats during the operational phase may be significant as a result of bat collisions with the turbine blades while the turbines are operational. Bat monitoring is currently underway, and this will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Protected Areas and Critical Habitats

The Project is not expected to have any significant impacts on protected areas or critical habitats, as the Forest Reserves located within the Project Site will be avoided as far as possible in the design of the wind farm, but as noted above, the layout of Project infrastructure will need to consider sensitive areas, especially the “Degraded Forest” and “Freshwater Habitat” areas (including the riverine systems, valley bottom wetland systems, “dambos” and floodplain wetland systems).

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.2.8 Build Environment

The project may have an impact on the build environment as a result of the construction of wind turbines, new access roads and ancillary infrastructure. The Project is not expected to negatively impact existing community structures or the urban and peri-urban settlement at Katete Town. Positive impacts

on the build environment could be expected with the repair/upgrading of existing roads and construction of new access roads. Standard mitigation measures will be included in the ESMP.

6.3 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS – 132 KV POWER TRANSMISSION LINE

6.3.1 Landscape and Topography

There are existing power transmission lines within the Project Site and the construction of the new 132 kV power transmission line is not expected to have significant impacts on the landscape or topography of the Project Site. Standard mitigation measures will be included in the ESMP.

6.3.2 Air Quality

Air quality along the power transmission line corridor may be impacted during the construction phase as a result of the emissions from construction vehicles and equipment, and exposing surfaces as result of vegetation clearing. This is not expected to be significant and standard mitigation measures will be included in the ESMP.

6.3.3 Noise

Noise along the will likely need to acquire portions of farmland for the establishment of corridor is expected to increase intermittently due to the movement of trucks and other construction vehicles, movements of construction staff, and the operation of construction equipment during installation. Significant noise generation by the power transmission line during the operational phase is not expected. Standard mitigation measures will be included in the ESMP.

6.3.4 Land Use and Tenure

The construction of the power transmission line will likely need to acquire portions of farmland for the establishment of the masts/poles and wayleave, and could limit certain land uses within the power transmission line corridor (e.g. erecting tall structures, growing of tall fruit trees, etc.). The ability of local communities to continue to access and benefit from community land and communal resources is unlikely to be fundamentally undermined, and the overall impact of the power transmission line is not expected to be significant. The power transmission line should not result in a material change in local land-uses. The layout will be designed so that no community or household will need to be resettled and suitable buffers will be established between the power transmission line infrastructure and communities.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP

6.3.5 Social, Economic and Cultural Heritage

The acquisition of land for the power transmission line wayleave will result in economic displacement where land-based livelihoods and income streams are disrupted. Such displacement will occur where small-scale farming ceases or where local communities are unable to access community land for natural resource harvesting. The Project has committed to the provision of compensation and livelihoods restoration support consistent with national and international requirements, and via a formal Livelihoods Restoration Framework (LRF).

Suitable buffers will be established to ensure the power transmission line is placed away from communities and households, which negate the need for resettlement of households. There is no known physical displacement based under the current power transmission line route design iteration.

Other social impacts that could be expected include:

- impact on natural resource harvesting;
- impacts related to labour and working conditions;

- impacts related to community health and safety (including electromagnetic radiation);
- impacts related to disruption of services, access and mobility (e.g. pathways, roads, electricity, etc.);
- national power generation benefits; and
- employment opportunities (mainly during the construction phase).

The routing of the power transmission line will need to consider the identified heritage features and avoid them as far as possible.

Social, Economic and Cultural Heritage aspects will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.3.6 Ecological Resources

Terrestrial Ecology

The proposed construction of the power transmission line is likely to result in further vegetation clearance along the wayleave. This will result in additional floral species and habitat loss, with potential unplanned spinoff impacts stemming from the increased levels of area access created by the cleared wayleave and potential maintenance roads along the wayleave. Such spinoff impacts include an increased level of wood harvesting in areas that may have previously been less accessible, leading to increased wood harvesting and habitat degradation. The construction activities may also result faunal habitat loss/fragmentation and possible faunal species persecution.

The terrestrial ecology could also be affected by breakout of fires and improper handling of waste and other hazardous materials.

The routing of the power transmission line will need to consider sensitive areas, especially the “Degraded Forest” and “Freshwater Habitat” areas (including the riverine systems, valley bottom wetland systems, “dambos” and floodplain wetland systems).

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Aquatic ecology

The aquatic features on the Project Site are considered very important for the provision of indirect (ecological) benefits including flood attenuation, erosion control, recharge of downstream systems, trapping of sediment and assimilation of nutrients, and biodiversity maintenance.

The aquatic ecology could also be affected by erosion, fires and improper handling of waste and other hazardous materials.

Buffer zones around the watercourses have been recommended, with the intention of guiding the layout of the power transmission line route. Establishment of masts/poles within the delineated wetlands must be avoided, and crossing of any wetland area will need to be carefully considered, designed and controlled.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Birds

The construction activities may have some impacts on the birds (especially nesting sites) as a result of vegetation clearance, noise from equipment and vehicles and increased human presence as results of construction workers along the power transmission line route.

The main expected impacts on birds during the operational phase include electrocution, collisions with the powerlines and pole anchor wires and clearing of nesting sites during line maintenance. At this of the bird monitoring programme the small bird species diversity on site does not seem to be very high. This might be an indicator of the impacted state of the natural vegetation and woodland. In addition, the large terrestrial bird and waterfowl diversity and abundance on site is low, while the raptor species diversity on site is reasonably good. No sensitive avifaunal features have been identified on or near site

to date, and none of the species recorded to date are Red Listed either in Zambia or Globally (IUCN, 2019).

At this stage the data points towards a relatively low risk to birds; however, this will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Bats

As with birds, the construction activities may have some impacts on the bats (especially roosting sites) as a result of vegetation clearance, noise from equipment and vehicles and increased human presence as results of construction workers.

The main expected impacts on bats during the operational phase include electrocution, collisions with the powerlines and collisions with the pole anchor wires.

Bat monitoring is currently underway, and this will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

Protected Areas and Critical Habitats

Parts of the current preferred power transmission line route run through the Chiulukire West Forest Reserve (for approximately 8 km) and the Chivuna Hills Forest Reserve (for approximately 2 km), but mainly along the road where some extent of deforestation has already taken place.

It will be confirmed during the ESIA stage if there are any “critical habitats” as defined by the IFC Performance Standards present on the Project site or along the power transmission line route. Based on the available information to date the Project is not expected to impact any “critical habitats” as defined by the IFC Performance Standards, and the Project Site does not fall within a Key Biodiversity Area according to the World Database of Key Biodiversity Areas ™.

However, the *Global Critical Habitat screening layer* shows some areas as “Potential Critical Habitat” around the general area.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

6.3.7 Build Environment

There are existing power transmission lines in the area. The new 132 kV power transmission line is not expected to negatively impact existing community structures or the urban and peri-urban settlement at Katete Town, therefore the potential impacts of the new power transmission line on the build environment is not considered to be as significant. Some positive impacts on the build environment could be the expansion of public services and improvement in electricity supply. Standard mitigation measures will be included in the ESMP.

7. ANALYSES OF PROJECT ALTERNATIVES

7.1 TECHNOLOGY, DESIGN AND LAYOUT ALTERNATIVES

In this case wind power is preferred over solar power, hydropower and thermal power.

The hilly terrain is not really conducive for solar power and according to the World Bank/IFC Photovoltaic Power Potential Map for Zambia the south-eastern area of Zambia has an average to low potential.

Hydropower is dependent on water, and due to the location of the Project Site this option is not favourable as the closest major river is the Luangwa River located approximately 70 km north-west of the Project Site, and outside the project land consent area. There were reports in 2017 of proposed project to build a hydro-power plant on the Luangwa River already.

Thermal power plants are not considered a feasible alternative for this Project mainly due to the need for alternative power generation in Zambia, the reliance on fossil fuels, the greenhouse gas emissions associated with such projects, and the cost of establishing a thermal power plants.

Other alternatives that have been considered, and will be considered further during the ESIA Phase include:

- Availability of wind resource;
- Turbine size, make and model;
- Number and layout of turbines and connection routes;
- Sources of raw materials required for construction;
- Routes of the power transmission line corridor between the Project Site and Msoro substation;
- Routes for new access roads;
- Ports to deliver project components and construction materials;
- Transport routes from the port to the Project Site to deliver components, equipment and construction materials;
- Grid capacity and distance to grid connection;
- Availability of space;
- Land use;
- Topography/Site gradients;
- Existing infrastructure;
- Geotechnical aspect; and
- Inputs from the turbine design teams, wind monitoring data, bird and bat monitoring data and various specialist investigations currently underway (including social, visual, terrestrial ecology, aquatic ecology, botanical and heritage investigations).

7.2 POWERLINE ROUTE ALTERNATIVES

As indicated in Figure 3 there are currently three powerline route alternatives being considered. Currently the yellow line (“Powerline - Preferred Route”) is the preferred option mainly due to fact that it runs along the existing road for most part of the route where some extent of deforestation is already present.

Route Alternative B goes through an area for which Mphepo does not have consent, so this is not preferred. Route Alternative C is significantly longer and financially this is not preferred.

7.3 NO-GO ALTERNATIVE

The no-go alternative is for the Project not to be developed. Should this be the case, then the Project site area would remain the same. The land area would remain with its current environmental and social characteristics as described in Section 4 above.

Should the Project not move forward, then the Project-related negative environmental impacts discussed would be averted. Should the Project not move forward, then the significant and crucial positive environmental, social and economic benefits would not be realised.

In conclusion, the ESIA will investigate all the potential positive and negative impacts as a result of the Project development. In the case of this Project, it is important to weigh the significant positive environmental, social and economic impacts incurred from the Project, against the negative environment and social impacts anticipated at the Project Site specific level.

The ‘no project’ alternative is not a preferable option.

8. CONSULTATION AND PUBLIC PARTICIPATION

In the summary, the key stakeholder engagement/public participation activities as part of the ESIA process undertaken to date include the following:

Date	Description	Reference
12 February 2018	Initial meetings with the Katete council and local traditional leaders of the Project Site.	Annexure C
18 – 23 March 2018	Focus group meetings with village leaders to inform the social baseline conditions and land uses.	As part of the social baseline investigations
09 April 2018	Meeting with District Joint Operations Committee (DJOC) members, Heads of Department from Government agencies and District Council Members.	Annexure C
05 – 10 June 2018	Preparation and distribution of notice letters (in Lusaka and Katete) and Background Information Document (BID) via hand, email and sms to identified stakeholders to inform them of the Project and the Public Scoping Meeting.	Annexure C
05 & 12 June 2018	Advertisements of the project and invitation to Public Scoping Meeting were published twice in the Daily Mail and Daily Nation newspapers.	Annexure C
19 June 2018	Public meeting for the Scoping Phase of the Project was held in Katete.	Annexure A

A report detailing the minutes of the Public Scoping Meeting (as presented by DH Engineering Consultants), including issues raised, responses given, a list of stakeholder who were invited and a list of the attendees, is presented under Annexure A.

A summary of the issues raised during the Scoping Meeting is presented in Table 22 below.

There will be another opportunity for stakeholder engagement/public participation during the ESIA Phase and all reports will be made available to identified stakeholders (and the community) for review and commenting. Comments and responses will be incorporated into the reports prior to submission to ZEMA for decision making.

A Community Liaison Officer (CLO) has been appointed by Mphepo, and is responsible for disseminating information and coordinating community communications through the course of the Project (in particular the Chewa Development Trust and local community leaders).

An External Grievance Mechanism will be developed and implemented prior to construction to enable community members and other stakeholders to raise issues of concern. This will serve to receive and facilitate resolution of affected communities' concerns and grievances about the Project.

Table 28: Summary of Issues raised at the Public Scoping Meeting

Type of Issue	Issue /question raised	Issue raised by:		
		Government Rep.	Industry	NGOs
Jobs/employment availability and recruitment	**Q1.** How will the people benefit from the power generation plant?		**Q1.** Mr. Sakala J. from ZESCO	
Safety risks / electrocution on electricity lines	**Q1.** What will be the distance in between the turbines? **Q2.** Do you have fire prevention measures in place? **Q3.** What are some of the occupational health and safety arrangements on workers who are helping in the erection of the met mast?	**Q1.** Mr. Esau Mumba from Judiciary. **Q3.** Mr. Kakisa Stanley from Zambia Police.		**Q2.** Mr. Arend Van Der Goes from SNV
Consultation process	**Q1.** Katete District Commissioner offered his office to be used for effective communication to avoid the omission of key stakeholders in future.	**Q 1.** Mr. Makukula Joseph D. District Council Administrator		
Understanding of project	**Q1.** What is the total voltage that will be generated and supplied to Msolo Substation? **Q2.** How are people going to be protected and supporting daily activities simultaneously? **Q3.** What is the Met Mast construction time frame? **Q5.** How much are you going to be charging ZESCO for electricity on their grid? **Q6.** Apart from CDT which other three trustees are partnered with Mphepo in the implementation of the proposed project? **Q7.** Have you already measured the total volume of wind available on	**Q5 & 6.** Bwalya Hope from ZANIS **Q10.** Mr. Makukula J. District Council Administrator **Q13.** Lupiya Astridah from Council **Q14**. Kanonkola Jones from the Forestry Department	**Q1, 2, 7, 9 & 12.** Mr. Mwanza S. From ZESCO.	**Q3, 8 & 11.** Mr. Munalula Akayombokwa from SNV

Type of Issue	Issue /question raised	Issue raised by:		
		Government Rep.	Industry	NGOs
	the proposed site? **Q8.** What is the spatial extent of the project site? **Q9.** In his presentation, Mr Phiri mentioned that the coming project is purely based on developing the Chewa Community. Don't you think we will be quoted for promoting tribalism? **Q10.** Can you share the local Company's experience with ZESCO? What are they promising? Is this project Achievable? **Q11.** By when do you think the actual position of the turbines will be installed? **Q12.** How long will it take you to construct the wind farm? **Q13.** The starting of an EIA process is a signal that the area has the adequate wind or we still have to wait for the met must to give us the accurate data? **Q14.** Are there adjustment made related to were the Met Mast is been constructed because I believe the Met mast is in the forested area?			

9. SOCIAL ANALYSES

The community in the Project Site does not have the capacity to pay or shoulder the necessary cost or impact of environmental conservation; however, the Chewa Development Trust (CDT) has been established. This is a legal constituted trust that will function as the primary community development vehicle, which will be funded by the Project. The CDT owns 10% of the Project and will manage their own investments, including Enterprise Development (ED) and Socio-Economic Development (SED) initiatives (which are yet to be identified).

The financial feasibility of the Project is under investigation and depends significantly on the rates that will be established by ZESCO. The Project will not go ahead if it's found to be financially unfeasible.

The Project will be the first major development project in the Project Site and as well as within Katete District. It therefore has the potential to support local economic development directly via (1) local employment and (2) local content (defined as use of local good and services), and (3) via community development plans.

It is expected that the Project would drive demand for local goods and services, notably from Katete Town and surrounding major urban areas (e.g. Chipata). This may specifically include goods and services required for the construction and workforce over the duration of the construction phase. This demand could provide substantive opportunities for formal business development in the area over the short to medium term.

While the operational phase will have a relatively small workforce, they are expected to be resident in the town or surrounding villages. In addition to the permanent workforce, the Project will likely include regular visits by consultants, maintenance teams, engineers throughout its operational life. The workforce will require accommodation, goods and services, and will likely generate moderate benefits for local businesses over the long-term.

This will be further assessed during the ESIA Phase and standard mitigation measures will be included in the ESMP.

10.POSSIBLE ANALYSIS INFORMATION GAPS

Information reported herein may be based on the interpretation of public domain data collected by SLR, the specialists and/or information supplied by the Client and/or its other advisors and associates. The data have been accepted in good faith as being accurate and valid.

Certain limitations that apply to the baseline studies conducted to date include the following:

- Not all the areas within the larger Project Site were accessible and as such conditions and habitat for these areas have been inferred from satellite imagery and data collected whilst on site.

- Terrestrial ecosystems are dynamic and complex. It is likely that aspects, some of which may be important, could have been overlooked.

- During field assessments, it is not always feasible to identify or observe all faunal species within a given Project Site, largely due to the secretive nature of many faunal species, possible low population numbers, varying habits of species and dense vegetation cover

- Most areas in the Project Site that were accessible were located along roads and pathways where increased human disturbance and human use occur, which in turn may have some impact on the results obtained. Furthermore, due to the deteriorated state of the roads and large size of the Project Site, it was not always possible to get to some areas. However, the results obtained at the various assessment points were consistent and hence it is deemed likely that the results obtained are largely representative of the system as a whole, and deemed adequate to provide the required level of understanding of the systems.

- The freshwater resource delineations are regarded as a best estimate of the freshwater resource boundaries based on the site conditions at the time of the assessment. Limitations in the accuracy of the delineation due to limitations in access in the dense vegetation and Project Site size are, however, considered acceptable. Due to the reasonably high quality, high resolution digital aerial imagery of the site, accurate delineation of features using desktop mapping methods was possible in combination with site observations and field mapping exercises.

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind).

11. PROPOSED MITIGATION MEASURES

Standard mitigation measures will be applied to minimise negative environmental and social impacts. Mitigation measures will documented in an Environmental & Social Management Plan (ESMP) for implementation by contractors and developers.

Preliminary and high level mitigation measures proposed for the Construction Phase include the following:

- **Air–emissions**: dust suppression.
- **Noise**: equipment maintenance and servicing; site noisy infrastructure away from adjacent communities, use of insulation materials.
- **Biodiversity**: minimise construction footprints; store and replace topsoil; cover bare areas with brush or mulch. Avoid development in high sensitivity areas.
- **Alien invasive plants**: wash vehicles and equipment; source soil from weed free areas; monitor and remove alien plants.
- **Aquatic habitat**: Design drainage to minimise risk of contaminated water entering stream course or seasonal pans; no use or storage of chemicals within 150 m of aquatic features.
- **Bird and Bat collision/electrocution**: Design location of wind turbines and operational guidelines to minimise impact on birds and bats. Design powerline configuration to minimise electrocution risks to birds perching on the pylon structures.
- **Site restoration:** grade to natural profile, de-compact soils, spread with topsoil and natural recovery. If required, seed the area with natural grass seed and irrigate appropriately.
- **Visual impact**: avoid placing turbines on prominent hills.
- **Land use and livelihoods**: implement land acquisition and compensation with national law and policies and IFC Performance Standards.
- **Cultural heritage**: develop chance finds procedure for land clearance.
- **Community health and safety**:
    - restrict public access to active construction areas;
    - implement traffic speed control, other safety and awareness measures;
    - establish emergency response plans for incidences that might arise;
    - establish and include a Code of Conduct in contractor and employee specifications relating to working or interacting in local communities;
    - establish a worker health programme that targets risky behaviours; and
    - training and voluntary screening of HIV and other sexually transmitted diseases.
- **Recruitment**: Prioritise hiring of local labour and goods and services.
- **CLO & Grievance Mechanism**: implement an external grievance mechanism and resolve issues.

Preliminary and high level mitigation measures proposed for the Operational Phase include the following:

- **Alien invasive plants**: monitor and remove alien invasive species on a regular basis (before flowering or seeding occurs).
- **Monitor restoration success**: regularly monitor natural plant regrowth and presence of erosion in reinstated construction areas.
- **Monitor bird and bat mortalities**: regular monitoring of bird and bat mortalities and adjustment of operational requirements where necessary.
- **Herbicides**: avoid or minimise use of herbicide. If necessary herbicides should be environmentally-approved and comply with Zambian legal requirements and relevant international conventions.
- **Pollution prevention**:
    - inspect site for oil spills / leaks on soil and water bodies and implement corrective measures;

  - maintenance work on equipment and vehicles must be undertaken in designated areas on impermeable surface at least 150 m from water features;
  - store chemical containers in an enclosed restricted access area; and
  - dispose of hazardous waste at an approved waste facility or by approved service providers.
- **Community engagement**: ongoing engagement with local communities to understand issues and to implement community projects.

Mitigation measures will be added to and refined during the ESIA Phase, and will be included on the ESMP.

12. DRAFT TERMS OF REFERENCE FOR THE ESIA

The Draft Terms of Reference (ToR) for the ESIA is presented under Annexure B. The draft ToR describes the scope of the ESIA to be carried out in respect of the proposed Project. The ESIA report shall be prepared accordance with the final Terms of Reference prepared in consultation with ZEMA.

13.CONCLUSION AND RECOMMENDATIONS

Considering the potential environmental and social impacts identified, screened and preliminary assessed in the preceding chapters, key issues warranting further assessment have been identified.

The key potential environmental and social impacts associated with the Project include the following:

- Social and socio-economic impacts (negative and positive), including impacts affecting land-use, local economy, livelihoods (particularly areas affected by the turbine locations, access roads, powerline transmission route and ancillary Project infrastructure) and impacts relating to community safety;
- Impacts relating to occupational health and safety of the workforce;
- Potential impacts on birds and bats, including impacts associated with the collisions with wind turbines and the power transmission line.
- Potential impacts on terrestrial and aquatic ecology, including impacts associated with vegetation clearing, erosion, fire, waste management, hazardous materials management, general construction activities and placement of Project infrastructure;
- Potential impacts on the visual landscape as result of the construction of new access roads and the wind turbines (once erected);
- Potential impacts on ambient noise as a result of general construction activities and the noise emanating from the operational wind turbines; and
- Potential impacts on cultural heritage as a result of general construction activities (including the presence of the workforce) and placement of infrastructure.

ANNEXURE A: PUBLIC SCOPING MEETING REPORT

DH ENGINEERING CONSULTANTS

Consulting Engineers and Project Managers

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Scoping Meeting Stakeholder Engagement

As part of the ESIA, the Scoping process was done and this included:

- Delivery of Invitation letters and Brief Information Documents (BID), to identified stakeholders' offices both in Lusaka and Katete.
- Invitation letters and BID emails to identified stakeholders
- Bulk SMS's sent to identified stakeholders on the date and place of Scoping meeting
- Manage and document proceedings of the scoping meeting.

In summery stakeholders received correspondence itemized below:

Action	Number
Physical Invitation and BID Sent	32
Total Emails Sent	37
Emails sent and replied to	16
Emails sent and read with no reply	9
Emails bounced	8
Total Attendance	27

MINUTES OF THE STAKEHOLDER ENGAGEMENT PROCESS MEETING FOR THE PROPOSED UNIKA WIND FARM FOR MPHEPO POWER LTD IN KATETE, ZAMBIA.

Venue: Pangani Lodge, Katete

Date: 19th June, 2019.

Time: 10:30 hrs.

Agenda:

1. Registration-All
2. Opening remarks by Chair by Mr. Tobias Muyaba
3. Introductions by Mr. Tobias Muyaba
4. Project overview by Mr Tobias Muyaba
5. Environmental presentation by Mr. Tobias Muyaba

6. Question and answer session
7. Closing remarks
8. List of Invited Stakeholders
9. Pictures & Attendance: As per Attendance lists below

MEETING MINUTES

1 Opening Remarks by Chairperson

The meeting was called to order at 10:30hrs by Mr. Tobias Muyaba who chaired the meeting. He welcomed everyone present and introduced the agenda of the meeting as follows:

- Welcome
- Health and Safety
- Introduction of team and client members
- Purpose of the Meeting
- Project Description
- EIA process and outcomes

Questions

2 Introductions by Mr. Muyaba

Mr. Muyaba, from DH Engineering Consultants introduced himself; he then introduced the Developers Team, the Environmental Consultants Team. He then acknowledged the presence of His Royal Highness, Chief Mbangombe, the District Commissioners, all heads of department present as well as all invited guests.

Developers Team

Table 1: Developers Team

Name	Affiliation	Position
Ms. Linda Thompson	Mphepo Power Ltd	Managing Director
Mr. Dismus Banda	Mphepo Power Ltd	Project Liaison Officer
Raphael Phiri	Chewa Development Trust	National Secretary

Environmental Consultants Team

Table 2: Environmental Consultants Team

Name	Affiliation	Position
Mr. Tobias Muyaba	DHEC	Environmental Officer
Mr. Godfrey Mulenga	DHEC	Environmental Officer
Mr. Abbey Jr. Kayumba	DHEC	Environmental Officer

Government Representatives and Other Organizations Present

Table 3: Government Representatives & Other Organizations

Name	Affiliation	Position
Essau Mumba	Judiciary	Clerical Officer
John Sakala	ZESCO	Branch Manager
Stainley Mwanza	ZESCO	Branch Manager
Chief Mbangombe	Mocta	Chief
Mushinka Chipamina	Office of the President	Officer
Joseph Tembo	Defence	BCO
Lungu John	Education	Caligrapher
Munalula Akayombokwa	SNV	Project Officer
Areud Van Dee Goes	SNV	Project Manager
Major K. Mujiwa	ZNS	C/DJOC
Stainley Kakisa	Zambia Police	DJOC
Astridah Lupiya	Council	Environmental Planner
Joseph Makukula	District Administration	District Commissioner
Philip Ngoma	District Administration	Massenger
Noel Banda	Mocta	Massenger
Jones Kanonkala	Forest Department	Forest Tech
Banda Christine	Immigration	Deputy O.I.C
Dornard Kasofu	REA	HR
V. Moonga	REA	DSS
Dickson Ngulube	Mphamgwe FM	Reporter
Hope Bwalya	ZANIS	DIO

3 Project over view by T. Muyaba

Mr. Muyaba from DH Engineering Consultants (DHEC) introduced himself and mentioned that his company had been sub-contracted by SLR to assist in carrying out the Scoping process and in particular the Scoping meeting. In this instance, the Scoping stakeholder engagement meeting was being handled by DHEC. He gave a brief background of the project. He explained that due to the size of the wind farm project, there was need to undertake an Environmental Impact Assessment as prescribed by the EMA ACT. No. 12 of 2011. With reference to a map displayed, he talked about the proposed wind mills and power line routes. He pointed out the need for a public Scoping meeting according to international standerds like the IFC, World Bank and particularly ZEMA standards. He explained the project components and how they are integrated

into the ESIA process and highlighted that discussions between ZESCO and MPHEPO on a memorandum of understanding are currently underway. Mr. Muyaba also mentioned that the project would bring about employment opportunities amongst other positive imacts as well as negative impacts that will be studied and plans of mitigation explained.

Mr. Muyaba mentioned that the projected construction period is likely to be 18 months to 2 years. Before the commencement of the construction, there will be an interaction with all relevant state holders including ZESCO, Katete Council, Town Planners etc. Mr. Muyaba highlighted that the farm will be built on an 8 000-ha piece of land with each wind mill standing at a height between 120 to 150 meters. The farm will be located in His Royal Highness's Chief Mbangombe of the Chewa people area.

Mr. Muyaba mentioned the three identified and screened transmission line alternatives and also pointed out the proposed transmission line and that will be handed over to ZESCO as soon as it is approved.

He also highlighted that the road networks will require grading and widening as it is in a dilapidated and narrow state.

Mr. Muyaba also elaborated on stages of the project and the activities that will take place from its commencement where he stated that there will be an arrival of wind mill parts that will be assembled on site. With reference to the sequence of activities displayed on the presentation, he explained how power will be generated and transferred to the ZESCO sub-station once the project starts running. He highlighted that once power reaches the ZESCO sub-station it will change hands from them (the developer) to ZESCO. He added that this power produced will be an addition to ZESCO national power supply capacity and it will be used to power households and organizations within Katete and other parts of Zambia.

He also talked about the activities currently observed in the proposed transmission line which include grazing, mice hunting and farming.

Mr. Muyaba mentioned that feasibility studies on wind capacity have been conducted by independent organizations like the World Bank in many areas of the country and Katete emerged as one of the accepted sites with good wind capacity. Although there is need to conduct studies at the proposed site to confirm these baseline studies obtained mostly from satellite and desktop studies. He highlighted that a Met Mast is currently being constructed on site to help obtain accurate data to guide eventual placement of wind turbines. He stated that geotechnical studies, site surveys and environmental screening will be conducted to get the best details on positions, height etc. of the wind mills on sites.

4 EIA Presentation by T. Muyaba

Mr. Muyaba presented on the ESIA process by way of a power point presentation projected on the screen. He began his presentation by stressing the need to comply with relevant regulatory and standardization bodies involve in the process and their role explained. He clearly stated the stage at which the project is running which is the scoping and public consultation. He went further and highlighted on the stakeholder engagement process to date and the future stakeholder engagement.

Mr. Muyaba then presented the main project components, these included widening of the road to the site and other activities during the operation phase of the project. He went further to highlight on the possible impacts of the project which lay under headings of; biophysical, ecological and socio-economic impacts.

Mr. Muyaba distinctly talked about the project in two phases namely the construction and operation phase. During the construction and in reference to the presentation, he talked about impacts such as air pollution, noise, biodiversity, alien invasive plants, birds etc. and the mitigation measures to be put in place to minimize the impacts on the environment. He also highlighted on some mitigation measures to be implemented during the operation phase for these impacts.

Mr. Muyaba talked about the social economic aspect of the project where he stated that jobs will be equitably allocated to applicants who meet the requirements. He added that no applicant will be favored over the other and that proper channels will be observed in the employment process. He also stated that the liaison officer will also address any issues that locals have over the proposed project.

Mr. Muyaba stated that the meeting was the very first stage in the EIAS process, to present the project to key affected parties and get their general views, concerns of the project. Thereafter, the general views and concerns will be documented for further public review where interested and affected parties (people) can determine whether the concerns have been addressed adequately before it goes to ZEMA the over-riding body.

5 Question and Answer Session

Type of issue (question)	Response

Q1. Mr. Stainley Mwanza from ZESCO (Branch Manager): What is the total voltage that will be generated and supplied to Msolo Substation?	**Ms. Linda Thompson**: In relation to amount of voltage to be produced we are not certain; this is because we are still conducting some feasibility studies. Nevertheless, once the studies are finalized, we expect to produce 330kv that will be deposited at Msolo Substation.
Q2. Mr. Stainley Mwanza from ZESCO (Branch Manager). In your presentation you stated that during operation phase, the coming project will permit various communal activities. How are people going to be protected and supporting daily activities simultaneously?	**Ms. Linda Thompson:** All electrical equipment will be in the tower, and the cables will be covered and lay down deep in the soil to avoid adverse impact on the local residents conducting various activities. She further said that the cables will run from the tower to onsite substation then connect to Msolo Substation. **Mr. Dismus Banda:** He stressed that hunting mice is the popular activity that Chewas mainly practice. And this activity involves digging of the ground. Will therefore extend the information to the design team to ensure that there is massive awareness being raised. For protection and safety of the local people.
Q3. Mr. Esau Mumba from Judiciary. What will be the distance in between the turbines?	**Ms. Linda Thompson:** 350m in between is the expected distance.
Q4. Mr. Areud Van Der Goes from SNV: Met Mast construction time frame?	**Ms. Linda Thompson:** Three to four weeks.
Q5. Mr. Munalula Akoyombokwa from SNV: The proposed project site it seems to be on the forested part of Katete. Can you please clarify?	**Ms. Linda Thompson:** It is not in the forested area; the question was responded to via the use of a chart were demarcations where been demonstrated. Environmental process is there to guide us where to build and the feasibility to help identifying places with adequate wind. If by any chance feasibility study indicates that the forest reserved has adequate volume of wind, then environmental assessment will be conducted on the same.
Q6. Mr. Areud Van Der Goes from SNV: Us Chewas we enjoy putting up fire, I was wondering if you have fire prevention measures in place	**Ms. Linda Thompson:** Fire brakes will be available both on the Infrastructures and around the turbines.

Q7. Mr John Sakala from ZESCO (outgoing Branch Manager): How will the people benefit from the power generation plant?	**Mr. Tobias Muyaba:** We have the CDT who is the key shareholders in this project. Hence the money to be generated will be used to facilitate communal project. That's one benefit. The local residents will have a better road network which will help them to have easy access to social amenities.
Q8. Mr John Sakala: Will there be a provision where power will be supplied to local community?	**Ms Linda Thompson:** Electrification of residences can only be done by ZESCO as they are legally mandated to distribute power at a household level in Zambia. We will only be given a production license. She emphasized that no one is allowed in Zambia to produce electricity except ZESCO.
Q9. Ms. Hope Bwalya from ZANIS: How much are you going to be charging ZESCO for supplying electricity on their grid? Can you kindly share your experience and cite out where you have done a similar project? Because we do not want you to just excite.	**Mr Tobias Muyaba**: I mentioned in the preamble that there is a vital part that has to be done, and this is the signing of an agreement between Mphepo and ZESCO. Once the Memorandum of Understanding (MoU) is reached then the project will definitely take off. **Ms. Linda Thompson:** Our biggest fear is to create expectations with yourself and the local community, and at the end we fail to deliver. As Tobias Mentioned earlier, the key players in this project are ZESCO and World Bank. We have to sign a contract with ZESCO. Once the terms of agreement meet the required standards then the Bank will fund the project. **Ms. Linda Thompson:** I have been in this renewable energy for 15 years and I have worked with the energy company in South Africa for 9 were the projects of this nature are being successively.
Q10. Ms Hope Bwalya: Apart from CDT which other trustees are partnered with Mphepo in the implementation of the proposed project?	**Ms. Linda Thompson:** She mentioned a local company which is involved in Hydro-Power project in Western Province. She then revealed that the Company has done various negations with ZESCO. Hence, they have experience to put in. All in all, we all have pieces of experience to add up to the project.
Q11. Mr. Stainley Mwanza from ZESCO (Branch Manager): In the presentation, Mr. Phiri you mentioned that the coming project is purely based on developing the Chewa Community. Don't you think will be quote for promoting tribalism?	**Ms. Linda Thompson:** All unskilled labor will be given to the affected communities (local residents) and skilled labor will be sourced around Zambia and will also import where possible. She then added that they look forward to empower women

	hence; Women Engineers are likely to be engaged. **Mr Raphael Phiri:** He clarified his statement by stating that the proposed project will come along with various benefits and one of the benefits is job creation for local community. He then added that surely is it reasonable to get security personnel from Kasama or a construction worker from another District. Hence, he said manual work is specifically for Chewa (Local) Community. He thereafter, itemized the benefits which includes; • Women empowerment, • Accessibility to better road network, and • General change of Katete Township. He concluded by stating that at the end is one Zambia one Nation. **Mr Dismus Banda:** He further clarified on the benefits and employment criteria. The engagement of the Chief or local leaders is to help the Developer to easily source unskilled labor in the project area. Strong involvement of the Chief Mbangombe will help to promote communal projects. He concluded by stating that the King is against giving monies to individuals.
Q12. Mr. Stainley Mwanza from ZESCO (Branch Manager): Have you already measured the total volume of wind available on the proposed site?	**Ms. Linda Thompson:** We have not yet measured the total volume of wind present on site. However, Katete is selected based on the feasibility studies conducted by World Bank and also desk analysis. She further revealed that there is an existing met mast in Pewaukee District. But we cannot solely rely on it because it is located far enough from the proposed site. Hence, we are currently mounting our own met mast that will help us to capture the direction and amount of wind present on site.
Q13. Katete District Commissioner: Linda can you share the local Company's experience with ZESCO? What are they promising? Is this project achievable?	**Ms. Linda Thompson:** I am not fully involved in their project hence; it is hard to speak on their behalf. But I think their experience is overwhelming, this is because they are having productive discussions with ZESCO and finalizing Environmental Studies. She responded to the follow up questions by stating that the project they are implementing (Hydro-Power) is slightly different from the one we are proposing. As they have their own advantages and disadvantages.

Q14. The proposed project will be established in a rural area hence the employment levels that will come along are too low. It is expected that the local people will not even benefit much from the power which will be generated in their neighborhood; this is because majority are not on ZESCO-grid. My request is that since the MoU and other agreements are not yet signed. Why can't you include the local people in the agreement so that they are connected and access electricity at a subsidized rate?	**Katete District Commissioner:** Linda has clearly stated that the license that they will actually have is specifically for power generation. After power is being generated, they will therefore handle over to ZESCO, who have a legal mandate to distribute power at household levels in Zambia. **Ms. Linda Thompson:** My experience of being in the community and witnessing how people live. I feel the employment that will create to the local people will make a difference. **Mr. Tobias Muyaba**: Explained ZEMA process and what the developer is expected. He then appealed to all stakeholders present to be consistence in the participation and monitoring of the project. Let us work closely with the Developer to ensure that the community is not neglected he added.
Q15. Mr. Munalulu Akayombokwa from SNV: What is the spatial extent of the proposed project site?	**Ms. Linda Thompson:** 8000 Ha
Q16. Mr. Munalulu Akayombokwa from SNV: I want also to find out the total turbines that will be installed and how many Megawatts are they expected to produce? Q15. Related to the road network, how many kilometers do you intend to construct or upgrade?	**Ms. Linda Thompson:** We are still conducting some studies; once the studies are finalized will be able to know the actual number of turbines to be installed and the megawatts to be produced. However, in the first phase we expect to generate 80-200MW. From Great East (T4) Road to the project site is approx. 15km. Other roads in the project area are bad, hence some of the roads will be widened, graded and bridges to be reinforced in order to support the transportation of the machinery.
Q17. Mr. Munalulu Akayombokwa from SNV:	**Ms. Linda Thompson:** Hoping third quarter of 2020, this is due to ongoing feasibility and environmental studies. **Mr. Tobias Muyaba:** Added that ultimately the EIA studies have to be done and report compiled and thereafter ZEMA has to approve the project.
Q18. Mr. Stainley Mwanza from ZESCO (Branch Manager): What is the construction timeframe?	**Ms. Linda Thompson:** For a small project is 18 months while bigger one is 2 years. We are hoping

	for 2 years, which is a bigger project.
Q19. Ms. Astridah Lupiya from Council: The starting of an EIA process is it a signal that the area has adequate wind or we still have to wait for the met mast to give us the accurate data?	**Mr. Tobias Muyaba:** Yes, we have to wait for the met mast to capture wind data because Katete is selected based on the feasibility findings that were disseminated by World Bank. And the developer cannot solely rely on wind data shared to capture accurate wind available on site. Hence, they are mounting an onsite met mast to determine the direction where wind is sufficient and consistence.
Q20. Mr. Stainley Kakisa from Zambia Police: How are the wages and Occupational Health and Safety arrangements for workforce which is on site?	**Mr. Raphael Phiri:** Mphepo Power Limited has engaged a qualified company to do some construction works. The Contractor operates in compliance with Employment and occupational Health and Safety Standards. Additionally, they also adhere to International Standards. The D.C also added that he will be visiting the site to find out what is obtaining on the ground specifically on the wages and the type of PPE being provided to workers. This is because life is more precious, he added. **Ms. Linda Thompson:** Further said that the Contractor meets the Occupational Health and Safety Standards, she then narrated how they were kicked out of the site for not being in a protective gear (not compliant with safety standards). She therefore assured Mr Kakisa that the engaged contractor is fully compliant with Occupational Health and Safety Standards.
Q21. Mr Jones Kanankola from Forest Department: Are there adjustment made related to were the met mast is been constructed? Because I believe it is on forest reserve.	**Mr Tobias Muyaba:** Various environmental studies for the met mast were conducted and ZEMA approved the EPB for the met mast. This indicates that the must is not in a forested area. **Ms. Linda Thompson**: She further added that the forest is zero tempered with; this is because the met mast is purely being constructed on a former crop land. **Mr. Dismus Banda:** The forest is not yet affected. What will affect the forest is the transmission line that is expected to pass through the forested area to Msolo substation. And your office will be fully involved to conduct some forest assessments. Contribution **Ms. Astridah Lupiya**: Attested that the EPB was circulated to all relevant departments for

	comments. I must confirm that forest department is one of the departments that acknowledged receipt. And on the document being disseminated it clearly shows that the met mast is not on the forested land. **Mr Tobias Muyaba:** Thank you so much for that confirmation. It's exciting that the document was actually been circulated and relevant departments acknowledged receipt.

Comment

DC. The D.C expressed excitement towards the coming wind farm in his district, this is because the project will help ZESCO to meet the ever-growing power demand and also help curbing load shedding which is a current burning issue. He further added that the incoming project will result in job creation, boosting of the local economy and also positively change the face of Katete District. He thereafter invited the chief to comment on the project.

Chief Mbangombe: I have no comment because the first time this project came under our head; we were asking similar questions that you have been asking. Fortunately, all our questions were answered; we now look forward to it take off. I must attest that this project is the best for our community and Zambia as whole.

Concern

Major K. Mujikwa from Defence: He urged the audience present to always read about the project before attending the meeting. His concern was raised based on the repetition of the issues raised.

6 Closing remarks

DC. Us the residents of Katete Township, we will be excited to witness the implementation and operation of this project. This is because it is envisaged that this project will create job opportunities, business development, meeting the ever-growing power demand, helping ZESCO to end load shedding and generally change the face of Katete Township. I encourage you all let us support the Developer disseminating the information so that this project turns into a reality. Cause at the end we (Zambian) are the primary beneficiary.

He concluded by assuring the Developer that they have a full support from his office, he then extended gratitude to them, Consultant team and all stakeholders present, for sacrificing their precious time and energy to attend and for being participative.

7 List of Invited Stakeholders

DISTRIBUTION OF INVITATION LATTER AND BACKGROUND INFORMATION DOCUMENT (BID) IN KATETE AND LUSAKA							
Project Name		UNIKA WIND FARM (PHASE 1) PROPOSED BY MOPEPO POWERLIMITED IN KATETE					
SCOPING Meeting With		Stakeholders					
Main Purpose of the Meeting		ESIA SCOPING FOR THE PROPOSED UNIKA WIND FARM (PHASE 1) PROPOSED BY MPEPO POWER LIMITED IN KATETE					
DATE:	10-15 JUNE 2019			VENUE:	KATETE & LUSAKA		
STAKEHOLDERS (KATETE)							
SN	Name	Organization/Township	Title/Position	Contact (+260)	Address/Email	Received INV & BID	Attended
1	Simbao M.K.	Katete Counsil	CS	966785128	katete2013@yahoo	Yes	
2	Mbewe Prudence	Zambia News Informetion System (ZANIS)	OD	971734799		Yes	
3	Mbewe Senala	Ministry Of Chiefs & Traditional Authority (MOCTA)	OD	976762719	senalambewe2017@gmail.com	Yes	
4	Banda C.	Zambia Revenue Authority (Immigration)	Deputy O.I.C	979729531	chriscmfrt@gmaul.com	Yes	
5	Dudya F.	Ministry of Agriculture	DACO	979726454		Yes	
6	Chilala Gibson	Ministry of Commerce Trade & Industry (MOCTI)	DCDO	977686063	gibsonchilala@gmail.com	Yes	
7	Maswau Ian	Zambia Police (Katete)	Police	971505810	maswauian@gmail.com	Yes	
8	Banda Josphat	District Health Office	AGSCCO	977696858	josphatbanda33@gmail.com	Yes	
9	Jones Kanonkefa	Forestry Department	Forest Technician	977249121	jkanonkefa.jk@gmail.com	Yes	
10	Tembo C.	Mpahngwe FM.	Producer	977595265		Yes	
11	Banda R.	District Commisioner's Office		976164607 (DC)		Yes	
12	Ndhlovu Quabaniso	Ministry of General Education (DEBS Office)	ESO-GI	978939922	gndh33@yahoo.com	Yes	
13	Tembo J.	Eastern Water & Sewerage Company (EWSC)	CSO	977916373	katete@ewsc.co.zm	Yes	
14	Muba Musenge	Office Of the President (SD)	SSP	964617192	musengemumba99@gmail.com	Yes	
15	Lungu Joseph	Zambia Telecomunications Company (ZAMTEL)	CSL	950003464	josephlungu@zamtel.co.zm	Yes	
16	Banda Lawrence	Vision Fund Zambia	BM	963897754	lawrence_banda@visionfundzambia.org	Yes	
17	Banda Blessings	World Vision	Security	964099914		Yes	
18	Phiri Precious	ZESCO	Cashier	978003553	pcphiri@zesco.com	Yes	
19	Phiri Ismail	Muslim Association	Teacher	968335997		Yes	

DH ENGINEERING CONSULTANTS

STAKEHOLDERS (LUSAKA)							
SN	Name	Organisation/Township	Title/Position	Contact (+260)	Address/Email	Received INV & BID	Attended
20	Mubita	IAPRI		977771079		Yes	
21	Anita	Musika		969250355		Yes	
22	Elizabeth	Ministry Of Health (MOH)		979172491	lyzzgray@gmail.com	Yes	
23	Margret	World Wide Fund for Nature (WWF)		972478034	wwfzam@org.zm	Yes	
24	Chimbwe Clement	WECSZ	EE Officer	979005836	clementchimbwe201@gmail.com	Yes	
25	W. Ngulube	ZEMA	R. Officer	254023		Yes	
26	Munalula m.	ZDA	OA	97744667	mmunalula@gmail.com	Yes	
27	Phiri Rafael F.M.	CHEF-ZC	National Secretary	977679242	rfm.phiri@gmail.com	Yes	
28	Banda K. Patience	DPNPW	Registry Officer	979581910		Yes	
29	Sichilongo M.	ICF/BWZ	Manager	966442540	mwapes@savingcranes.org	Yes	
30	Aggie	ZESCO	Security	211362721	anambao@zesco.co.zm	Yes	
31	Zulu R.	WARMA	Receptionist	211251934		Yes	
32	Zulu Merina	Civil Aviation Authority (CAA)	Executive Assistant	211251861	civilaviation@caa.co.zm	Yes	

DH ENGINEERING CONSULTANTS SLR

ATTENDANCE LIST FOR MEETING PARTICIPANTS

Project Name	UNIKA Wind Farm (Phase 1)
Consultation Meeting With	Government/Organisation Representatives
Main Purpose of the Meeting	Create Awareness about the Project and Provide Opportunity for Stakeholders to ask Questions and Raise Concerns

Date: 19th JUNE 2019 **Venue:** PANGANI LODGE

SN	Name	Organization/Township	Title/Position	Contact	Address/Email	Signature
1.	Godfrey Mukuyu	DHEC	Environmental Officer	0972530727	[illegible]	[illegible]
2.	Abbey Kayumba J.	DHEC	Environmental Officer	0971790128	[illegible]	[illegible]
3.	[illegible] Mumba	JUDICIARY	CLERICAL OFFICER	0965-322991	[illegible]	[illegible]
4.	L. Thompson	Mphepo Power	MD	0960707388	lindo.thompson@mphepopower.com	
5.	J. Sakala	ZESCO	Branch Mgr	0977942495	[illegible]	[illegible]
6.	S. Mwanza	ZESCO	Branch Manager	0977573311	[illegible]@zesco.co.zm	[illegible]
7.	Raphael FM Phiri	CHEFO-ZC	NATIONAL SECRETARY	0977679242	rfm.phiri@gmail.com	[illegible]
8.	Chief [illegible]	[illegible]	Chief	0978774207	—	[illegible]
9.	NUSHIMA CHIPANKA	OFFICE OF THE PRESIDENT	OFFICER	[illegible]65377605	[illegible]@gmail.com	[illegible]
10.	JOSEPH TEMBO	DEFENCE	BCO	097[illegible]483761	[illegible]@yahoo.com	[illegible]
11	LUNGU JOHN	EDUCATION	CALLIGRAPHER	0964 661480	johnlungu124@gmail.com	[illegible]

DH ENGINEERING CONSULTANTS

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No.	Name	Organisation	Position	Phone	Email	Signature
	Tobias Muyuka	DHEC	Soc Econ	0977969768	muyuka@gmail.com	
12	Mwanalula Akayombokwa	SNV	SILMS Project Officer	0977500047	makayombokwa@snv.org	
13	Arend van der Goes	SNV	Project Manager	0966770086	avandergoes@snv.org	
14	Major K Muziwa	ZNS	C/DJOC	0972113157		
15	Stanley Kakisa	ZP	DJOC	0975646492	stanleykakisa@...	
16	Asmidah Lyapa	Council	Env. Planner	0976537902	asmilupyao@gmail.com	
17	Joseph O. Musukwa	Dist Admin.	OC	0976164601	jmusukwa@yahoo.com	
18	Phillip Ngoma	Dist. Admin	D/Messenger	0975-003444	Pngoma@gmail.com	
19	(Mphangwe) Noel Banda	MOCTA	For Chief Messenger	0977362535	noelbanda958@...	
20	Jones Kasonkela	Forestry	Forestry Tech	0977249121	jkasonkela@gmail.com	
21	Banda Christine	Immigration	Deputy O.I.C	0979729531	chrisconfort@gmail.com	
22	David Kasoka	REA	HR	0977989278	dkasoka@rea.org.zm	
23	Mr V. Mbanga	REA	DSS	0966782889	vmbanga@rea.org.zm	
24	Dickson Ngulube	Mphangwe FM	Reporter	0974717979	dicksonngulube@gmail.com	
25	Hope Bwalya	ZAWS	DIO	0976616521	[illegible]	
26	Dismus Banda	Mphepo Power	CLO	0977275704	dismus.banda@mphepopower.com	

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226A Nasser Housing Complex, Nyumba Yanga, Off Leopards Hill Road,
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8 Pictures & Attendance: As per Attendance lists below







9 Attendance Lists

DH ENGINEERING CONSULTANTS SLR

ATTENDANCE LIST FOR MEETING PARTICIPANTS

Project Name	UNIKA Wind Farm (Phase 1)
Consultation Meeting With	Government/Organisation Representatives
Main Purpose of the Meeting	Create Awareness about the Project and Provide Opportunity for Stakeholders to ask Questions and Raise Concerns

Date: 19th JUNE 2019 **Venue:** PANGANI LODGE

SN	Name	Organization/Township	Title/Position	Contact	Address/Email	Signature
1.	Godfrey Mukanzi	DHEC	Environmental Officer	0972530729	[illegible]	[signature]
2.	Abbey Kayumba Jr	DHEC	Environmental Officer	0971790128	[illegible]	[signature]
3.	Jason Muwiza	JUDICIARY	CLERICAL OFFICER	0965-322471	[illegible]	[signature]
4.	L. Thompson	Mphepo Power	MD	0960707388	linda.thompson@[illegible]	
5.	J. Sakala	ZESCO	Branch Mgr	0977942195	[illegible]	[signature]
6.	S. Mwanza	ZESCO	Branch Manager	0977573311	[illegible]@zesco.co.zm	[signature]
7.	Raphael FM Phiri	CHEFO-ZC	NATIONAL SECRETARY	0977679242	rfm.phiri@gmail.com	RFM
8.	Chief [illegible]	[illegible]	Chief	0978774207	—	[signature]
9.	NLUSHINKA CHIPAMINA	OFFICE OF THE PRESIDENT	OFFICER	0965276005	[illegible]@gmail.com	[signature]
10.	JOSEPH TEMBO	DEFENCE	BCO	0978483361	tembo[illegible]@yahoo.com	[signature]
11	LUNGU JOHN	EDUCATION	CALIGRAPHER	0964 601450	johnlungu124@gmail.com	[signature]

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12	Mukaalula Akayombokwa	SNV	SILMS Project Officer	0977500047	makayombokwa@snv.org	
13	Arend van der Goes	SNV	Project Manager	0966770786	avandergoes@snv.org	
14	Major K Mujiwa	ZNS	C/DJOC	0977213157		
15	Stanley Kahisa	ZP	DJOC	0979666492	stanleykahisa@...	
16	Astridah Lupiya	Council	Env-Planner	0976537902	astridlupiya@yahoo.com	
17	Joseph O. Mwakalida	Dist-Admin.	OC	0976164601	jmwakalida@yahoo.com	
18	Phillip Ngoma (Mpangwe)	Dist. Admin	D/Messenger	0975-003444	phngoma68@gmail.com	
19	Noel Banda	MOCTA	For Chief Messenger	0977362585	noelbanda958@...	
20	Jones Kandakema	Forestry	Forestry Tech	0977249121	jkandakema@gmail.com	
21	Banda Christine	Immigration	Deputy OIC	0779729531	chriscmfct@gmail.com	
22	David Kasofu	REA	HR	0977989232	dkasofu@rea.org.zm	
23	Mr V. Mooenga	REA	DSS	0966-766667	vmooenga@rea.org.zm	
24	Dickson Ngwenge	Mphangwe FM	Reporter	0974712979	dicksonngwenge@gmail.com	
25	Hope Bwembya	ZAMS	OIO	0976616521	bwembyahope@gmail.com	
26	Dismus Banda	Mphepo Power	CLO	0977275704	dismus.banda@mphepopower.com	

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ANNEXURE B: DRAFT TERMS OF REFERENCE FOR THE ESIA

DRAFT TERMS OF REFERENCE

40 MW - 200 MW UNIKA I WIND FARM

Katete, Eastern Province, Zambia

Prepared for: Mphepo Power Limited

MPHEPO POWER

SLR Project No.: 710.13089.00001
Report No.: 002
Revision No.: 006
November 2019

SLR

DOCUMENT INFORMATION

Title	Draft Terms of Reference for Unika I Wind Farm, Zambia
Project Manager	Conroy van der Riet
Project Manager Email	cvanderriet@slrconsulting.com
Author	Conroy van der Riet
Reviewer	Stuart Heather-Clark
Keywords	Mphepo, Wind, Renewable, Zambia
Status	Client Draft
Report No.	002
SLR Company	SLR Consulting (Africa) (Pty) Ltd

DOCUMENT REVISION RECORD

Rev No.	Issue Date	Description	Issued By
000	08-07-2019	Internal Draft for review	CvdR
001	16-07-2019	Client Draft for review	CvdR
002	29-07-2019	Revised Client Draft for review	CvdR
003	01-08-2019	Final Client Draft for review	CvdR
004	16-08-2019	Final Report (for ZEMA review)	CvdR
005	18-10-2019	Revised draft for ZEMA Review	CvdR
006	18-11-2019	Final Report	CvdR

BASIS OF REPORT

EXECUTIVE SUMMARY

Mphepo Power Limited ("Mphepo") proposes to develop a wind farm facility near Katete, Eastern Province, Zambia. The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid.

Mphepo Power Limited is a registered company in Zambia consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People).

Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the Zambia Electricity Supply Corporation Limited (ZESCO) and grid connection. Phase 1 ("Unika I") will include the development of a 40 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW. It is also proposed to build an on-site substation for Phase 1, and power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site.

Once ZESCO's electricity supply needs increase, and there is further appetite for more power procurement then Phases 2 and 3 will be developed.

The Environmental and Social Impact Assessment (ESIA) process seeks to obtain approval from ZEMA for Phase 1 of the Unika I Wind Farm.

The Terms of Reference (ToR) describes the scope of the ESIA to be carried out in respect of the proposed Project.

This Draft Terms of Reference (ToR) has been prepared by SLR Consulting (Africa) Pty ltd on behalf of Mphepo Power Limited. This ToR as is applicable to the Unika I Wind Farm Project and should be read in conjunction with the Scoping Report for the Project.

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1. INTRODUCTION

Mphepo Power Limited ("Mphepo") proposes to develop a wind farm facility near Katete, Eastern Province, Zambia. The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid.

Mphepo Power Limited is a registered company in Zambia consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People).

Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the Zambia Electricity Supply Corporation Limited (ZESCO) and grid connection. Phase 1 ("Unika I") will include the development of a 40 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW. It is also proposed to build an on-site substation for Phase 1, and power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site.

Once ZESCO's electricity supply needs increase, and there is further appetite for more power procurement then Phases 2 and 3 will be developed.

The Environmental and Social Impact Assessment (ESIA) process seeks to obtain approval from ZEMA for Phase 1 of the Unika Wind Farm (Unika I).

This Draft Terms of Reference (ToR) has been prepared by SLR Consulting (Africa) Pty ltd on behalf of Mphepo Power Limited. This ToR as is applicable to the Unika I Wind Farm Project and should be read in conjunction with the Scoping Report for the Project.

In terms of the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997 the Scoping Report precedes the preparation of an "Environmental Impact Statement" (EIS). As this process is required to follow local as well as international standards in order to access funding, the EIS will be referred to as an "Environmental and Social Impact Assessment" (ESIA) and be aligned with local legislation as well as the International Finance Corporation (IFC) Performance Standards (PSs).

The Terms of Reference (ToR) describes the scope of the ESIA to be carried out in respect of the proposed Project. The purpose of the ToR is to describe the scope of the ESIA to be carried out in respect of the proposed Project. The ESIA report shall be prepared accordance with the final Terms of Reference prepared in consultation with ZEMA.

Please refer to section 3.1.(Location of the Project) for a description of the Project location.

1.1 PROJECT BACKGROUND

1.1.1 Company Overview

Mphepo is a Zambian renewable energy company (Company Number 120170003750), focussed on the development of wind power in the Eastern Province of Zambia. Mphepo is a Special Purpose Vehicle (SPV) consisting of a consortium of companies (as shown in Figure 1 below) including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People).

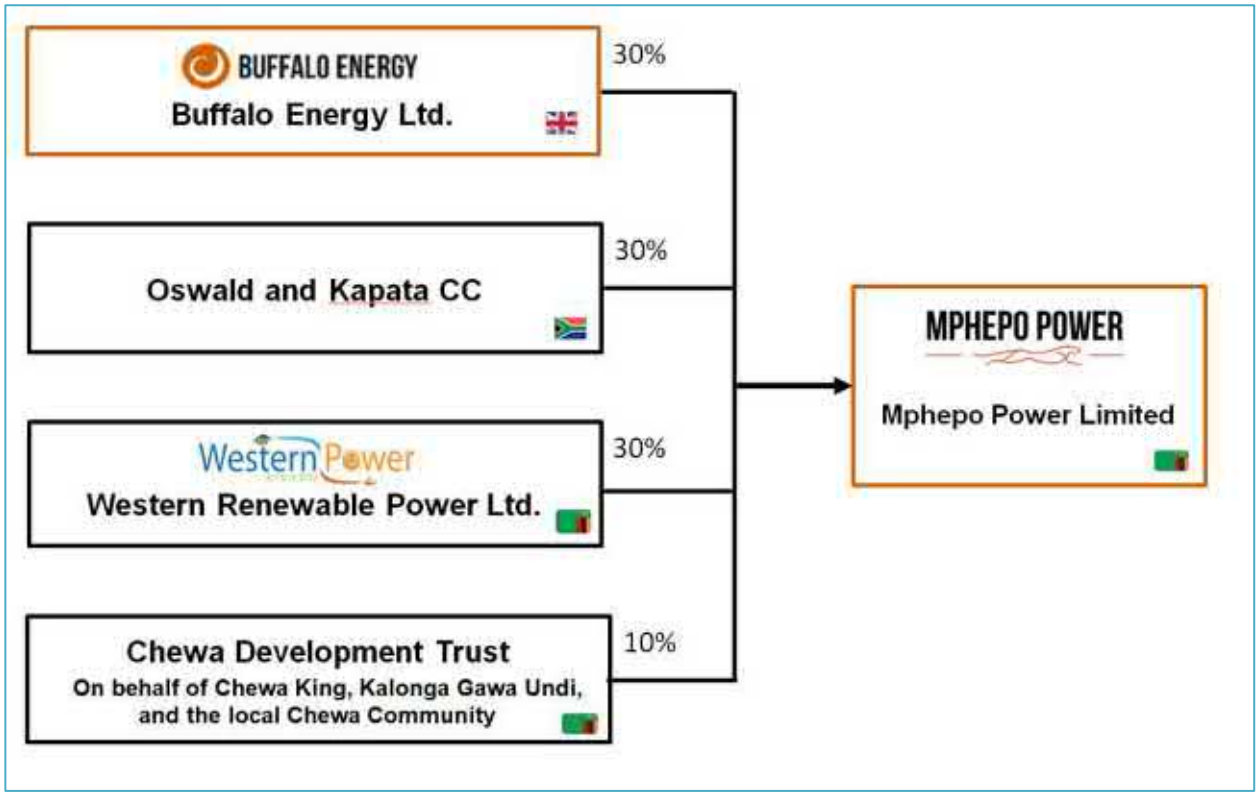


Figure 1: The structure of Mphepo Power Limited

Mphepo's office is located at Figtree Office Park, 17 Warthog Road, Lusaka, Zambia. The contact person's details at Mphepo are as follows:

Name: Ms. Linda Thompson

Title: Managing Director

Tel: +260 96 070 7388

Email: linda.thompson@mphepopower.com

1.1.2 Major Project Components

Wind Turbine Generators

For Phase 1 there could be between 20 and 60 wind turbines, with an individual capacity of between 2.8 and 5.5 MW. The turbines will range in hub height from 60 m to 165m, with a rotor diameter range of between 70 m and 165 m. Each turbine will have a concrete foundation of approximately 400 - 900 m^2, to a depth of approximately 2.5 – 5 m.

There will be a circular gravel hard standing area of approximately 800 m^2 around each turbine that will be used during construction and for maintenance during the life span of the project.

Each turbine will have an electrical transformer, either on the inside or beside it outside.

Each turbine might have to be fenced off for safety reasons, but the land-use surrounding the turbines may continue, depending of the relative distances from the turbines.

Electrical Connections

The wind turbines will be connected to each other by means of medium voltage cables. The cables will be buried approximately 1 - 2 m below ground level.

A substation (typically 80 m X 90 m) will be constructed within the site for collection of power from the wind turbines.

The substation will then be connected to the National Grid through a new 132 kV power transmission line to be constructed above ground between the wind farm substation and the existing Msoro Substation.

Access Roads

The Project Site will be accessed from the T4 main road running between Lusaka, Katete and Chipata. An internal gravel road network will need to be constructed to facilitate movement between turbines during construction and operation. This will include upgrading of existing roads within the area as well as constructing new access roads.

Roads will be 10 - 13 m wide including drainage, turning circles, passing points and cabling. Some existing public roads and bridge structures may also need to be upgraded to facilitate the heavy loads and vehicle sizes associated with the turbine equipment transport, especially the mast sections and the blades.

The main access roads and internal service roads would be constructed or upgraded from material sourced from quarries or borrow pits within and around the area (if available). The exact location and number of quarries and borrow pits required are not known at this stage. All material will need to be sourced from quarries and/or borrow pits approved from the Ministry of Mines and Minerals Development.

Additional Infrastructure

A single story Operations and Maintenance (O&M) building of up to 5 000 m^2 with a warehouse/workspace, office, telecoms, security and ablution facilities will be constructed.

Buffers will be implemented around each of the wind turbines in order to exclude certain activities (e.g. building of houses) and to avoid impacts as much as reasonably possible. These buffers have not been completely defined yet, but will have to be based on good international practice. These buffers will be further refined during the ESIA phase.

1.1.3 Brief History and Current Status

During 2017/2018 Mphepo Power Limited (Mphepo) initiated pre-feasibility investigations to identify suitable wind power sites in Zambia, and identified a number of sites in the Eastern Province of Zambia. This Project

Site is the first planned site targeted for development. Following the successful completion of this first Project, referred to as the Unika I Wind Farm Project, Mphepo plans to construct other similar sized wind farm projects elsewhere in Eastern Province.

A pre-feasibility study was completed in 2017, and the current ESIA process is part of the feasibility stage of the Project.

2. REGULATORY FRAMEWORK AND CORPORATE REQUIREMENTS

2.1 NATIONAL LEGAL FRAMEWORK

2.1.1 Environmental Management Act, 2011

The Environmental Management Act (EMA) is the principal law on integrated environmental management and was enacted in April 2011 following adoption of the NPE. The EMA replaced and repealed the Environmental Protection and Pollution Control Act (EPPCA) of 1990, which was established under the NCS.

Relevant sections of the Act include:

- Part III: Integrated Environmental Management which requires the carrying out of Environmental Impact Assessment for certain types of projects;
- Part IV: Environmental Protection and Pollution Control which provide for conservation of natural resources; and
- Part VII: Public Participation which gives the public the right to be informed and participate in environmental decision making.

Part IV, Division 6 of the EMA deals with Noise. According to the EMA "noise" means any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. It prohibits the emission of noise in excess of the noise emission standards. It also allows the grating of a permit allowing excessive emission of noise.

2.1.2 The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997

As part of the implementation process the government through the EPPCA adopted a framework for environmental impact assessment for developmental projects in Zambia and the Environmental Impact Assessment (EIA) Regulations were established in 1997. These regulations continue to be in force under EMA.

2.1.3 Environmental Management (Licensing) Regulations, SI No. 112 of 2013:

Under this statutory instrument established in accordance with Section 43, the EMA controls and regulates the following areas relevant to the project:

Air and Water Pollution: Part II (Regulations 3-9) of SI 112 (2013):

These regulations (Statutory Instrument No. 72 of 1993) provide for the ZEMA to regulate the treatment and discharge of sewerage and other effluents into the natural aquatic environment.

Waste Management: Part III (Regulations 10-15) of SI 112 (2013):

These regulations provide definitions of waste and sets out the licensing requirements for transporters and waste disposal sites.

Hazardous Waste: Part IV (Regulations 18-30) of SI 112 (2013):

These regulations provide for the control of generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and transboundary movement of hazardous waste as listed in Fifth Schedule or any waste specified in Sixth Schedule, if that waste exhibits characteristics found in the Seventh Schedule to these Regulations.

2.1.4 Natural Resources Management

Provision is made by the EMA for ZEMA to develop regulations for the conservation and protection of natural resources (Part IV Division 8 of EMA).

Use of natural resources will need to be managed sustainably in order to avoid their degradation or depletion and ensure the viability of the project.

In accordance with section 77 of the EMA the project shall not introduce any invasive alien species into any element or segment of the environment. Should any land dereliction or contamination occur as a direct result of project activities, the project will be responsible for carrying out rehabilitation works within such period as the ZEMA inspectorate may specify.

In addition, and subject to the provisions of the EMA, various natural resources shall be managed in accordance with specific Acts pertaining to environmental protection and management of these elements. For example, in relation to the present project, water resources shall be managed in accordance with the *Water Resources Management Act, 2011*; regional and urban planning shall be managed in accordance with the *Town and Country Planning Act*, etc. These and other relevant acts relating to environmental protection and management with regards to the project, and the compliance thereof, are discussed further in below.

Under the Act an inspector may carry out survey to assist in the proper management and conservation of natural resources, inspect land uses to determine their impact on the quality and quantity of natural resources; and publicise land use guidelines and natural resources conservation regulations.

2.2 OTHER RELEVANT NATIONAL LEGISLATION

The Acts outlined in Table 1 below have also been reviewed in order to assess Project alignment with other relevant existing laws that have a bearing on environmental management and the project.

Table 1: Other relevant legislation

Ref	Legislative Instrument	Description	Relevance and/or Compliance
Constitution			
1	The Zambian Constitution	The Constitution of Zambia Act (as amended by Act No. 2 of 2016) is the fundamental law of the land and provides the framework on which all other laws stand. In particular, *Part IV – Bill of Rights* of the Constitution which enshrines fundamental human rights and protection of property, and *Part XIX: Land, Environment and Natural Resources* which establishes the principles of environmental and natural resources management and development and the protection and utilisation of environmental and natural resources. The Zambian Constitution recognises certain fundamental rights of relevance to the project: **Article 11:** states that every person in Zambia irrespective of race, place of origin, political opinions, colour, creed, sex or marital status, is entitled to fundamental right to life, liberty, security of the person and the protection of the law, freedom of conscience, expression, assembly, movement, association, protection of young persons from exploitation, protection for the privacy of his home and other property and from deprivation of property without compensation. **Article 16:** provides that property of any description shall not be compulsorily taken possession of, and interest in or right over property of any description shall not be compulsorily acquired, unless by or under the authority of an Act of Parliament which provides for payment of adequate compensation for the property or interest or right to be taken possession of or acquired. **Article 23:** guarantees protection from discrimination on the ground of race, tribe, sex, place of origin, marital status, political opinions, colour or creed. **Article 24**: guarantees protection of young persons from exploitation including employment which interferes with their education and well-being, physical or mental ill treatment, all forms of neglect, cruelty or exploitation	The project should not require the acquisition of land which will result in displacement and possible resettlement of persons or communities. However some compensation may be required for land occupied by the project (e.g. turbines, roads, powerlines, etc.). In line with Article 16 (and international guidelines) there must be adequate compensation before any personal property is compulsorily acquired. In this context Article 23, which protects against all forms of discrimination, is also very important with regards to women or the vulnerable who may not have any title to land (and therefore not entitled to any compensation) in a traditional society.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		and trafficking.	
Natural Resources/Heritage			
2	The Water Resources Management Act, 2011	This Act establishes the Water Resources Management Authority and provides for the integrated management, development, conservation, protection and preservation of the water resource and its ecosystems; the Act ensures the right to draw or take water for domestic and non-commercial purposes, and that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges; provides for the constitution, functions and composition of catchment councils, sub-catchment councils and water users associations; repeals and replaces the Water Act, 1949; and provides for matters connected with, or incidental to, the foregoing.	The project may involve the abstraction of ground water or surface water. A "Permit to Access Water" may be required. Section 46(2) of the Act requires a developer to discharge any trade or other effluent (e.g. in this case run-off from workshops and bulk fuel storage areas) in accordance with the provisions of the EMA (2011), and steps must be taken by a developer to control or prevent any water pollution as may be required by the Water Authority (section 49).
3	Forestry Act (No. 4 of 2015)	This Act repeals and replaces the Forests Act, 1999. The Act provides for the establishment and declaration of National Forests, Local Forests, joint forest management areas, botanical reserves, private forests and community forests; provides for the conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity; provide for the implementation of the United Nations Framework Convention on Climate Change, Convention on International Trade in Endangered Species of Wild Flora and Fauna, the Convention on Wetlands of International Importance, especially as Water Fowl Habitat, the Convention on Biological Diversity, the Convention to Combat Desertification in those Countries experiencing Serious Drought and/or Desertification, particularly in Africa and any other relevant international agreement to which Zambia is a party.	The Forestry Act is relevant to this project because parts of the powerline are proposed to run through some Forest Reserves. This will involve the removal of trees and must adhere to the general principals of the Act in the conservation of trees and forest resources, and obtaining consent.
4	The Noxious Weeds Act, Cap 343	This Act provides for the declaration, control and eradication of noxious weeds.	Under this Act the project will be responsible for preventing the introduction and/or controlling the spread of common weeds on the site. In addition undesirable invasive species must not be introduced under any landscaping activities. Species declared as noxious weeds under the act (such as *Lantana camara*) are prohibited. ZEMA have an active project seeking to eliminate alien and invasive species.
5	Mines and Minerals Act,	The Mines and Minerals Act of 1997 regulates the law relating to mines and	Material sources (e.g. borrow pits and/or quarry) will be

Ref	Legislative Instrument	Description	Relevance and/or Compliance
	Cap 213	minerals. The Act provides for the granting of or, renewal and termination of mining rights. It also provides for the control mining activities with regard to environmental protection. The Act repeals the Mines and Minerals Act of 1976.	required for various activities, including construction of new access roads and upgrading of existing access roads.
6	National Heritage and Conservation Commission Act, 1989	The Act of 1989 provides for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, prehistoric, archaeological or scientific interest by preservation, restoration, rehabilitation, reconstruction, adaptive use and good management. The Commission also provides regulations for archaeological excavation and export of relics. If a development is unable to proceed without affecting an item of heritage, permission must be sought from the NHCC as outlined in Sections 35 and 36 of the National Heritage Conservation Commission Act.	All measures will need to be undertaken to protect and conserve the cultural and natural heritage of the Project Site. For any new discoveries made of items of historical or archaeological interest during implementation of the project, the provisions of the NHCC Act shall apply, and the required procedures for the reporting of such discoveries shall be followed.
Energy Regulation, Investment and Standards			
7	Energy Regulation Act, Cap 436	The Act of 1995 makes provision with respect to the production and distribution of energy in Zambia and establishes the Energy Regulation Board for purposes of control and licensing of energy undertakings. The Board shall, in conjunction with other Government agencies, formulate measures to minimize the environmental impact of the production and supply of energy and the production, transportation, storage and use of fuels and enforce such measures by the attachment of appropriate conditions to licences held by undertakings.	The Project will undertake to generate electricity; the Developer shall apply for a licence for energy generation in accordance with provisions of this Act prior to the commencement of the development. Permits will be required for the bulk storage of fuel on site during construction and operational phases.
8	Petroleum Act, Cap 439	The Act provides for the regulation of the importation, conveyance and storage of petroleum products and other inflammable oil and liquids (e.g. petrol and diesel) for the protection of the public and the environment.	Bulk fuel storage facilities will be required to be constructed and operated in accordance with regulations as set out in the Act.
9	The Zambia Development Agency Act, 2006	The Act provides a legal framework for investment in Zambia and recognises the role of other agencies, including those responsible for environmental protection, in authorizing specific projects. In considering an application from an investor for a licence, permit or certificate of registration, the Act stipulates that the Board shall have regard to the impact the proposed investment is likely to have on the environment and, where necessary, the measures proposed to deal with an adverse environmental consequence in accordance with the Environmental Protection and Pollution control Act	The developer may apply for an investors licence from the Zambia Development Agency (ZDA).

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		(Section 69d). The Zambia Development Agency Act has replaced the Investment Act of 1993.	
Land Use, Land Acquisition and Regional Planning			
10	The Urban and Regional Planning Act (Number 3 of 2015)	The Act provides for development, planning and administration principles, standards and requirements for integrated urban and regional planning processes and systems so as to ensure multi-sector and level cooperation and coordination; the Act endeavours to ensure sustainable urban and rural development by promoting environmental, social and economic sustainability in development initiatives and controls at all levels of urban and regional planning. The Act repeals the Town and Country Planning Act, 1962, and the Housing (Statutory and Improvement Areas) Act, 1975.	The development cannot proceed without planning permission from the local authorities. The necessary documentation will be submitted to the relevant authorities for approval for project implementation in accordance with the terms of the Act.
11	The Lands Act, 1995	The Act provides for the alienation, transfer, disposition and charge of land. Although the Act does not refer to matters of conservation this Act is important in that land is one of the basic natural resources. The Act also provides for compulsory acquisition of land by the president whenever he/she is of the opinion that it is desirable or expedient to do so in the interest of the republic.	All land located within the Project Site falls under Customary Land which is legally recognised and protected under the Lands Act, Chapter 184, and any customary land vested in or held by any person under customary tenure is similarly recognised.
12	Local Government Act, Cap 281, 22 of 1991	The Act provides for the establishment of Councils in districts, the functions of local authorities and the local government system. Some of its functions relate to pollution control and the protection of the environment in general.	Implementation and operation of new development will be subject to the procedures laid out by the local authorities; all applicable by-laws will be adhered to.
13	The Electricity Act No.433 of 1995	The Electricity Act (EA) regulates the generation, transmission, distribution and supply of electricity. The EA authorizes the compulsory acquisition of land by the state whenever necessary for the generation, transmission, distribution or supply of electricity by an operator of any undertaking (Section 14.1). Before such an order is given, however, the operator shall have taken all reasonable steps to acquire the land intended to be used on reasonable terms by agreement with the owner of the land (Section 14.2). The Act states that adequate compensation shall be paid to any person who suffers loss or damage through the exercise of the powers conferred by this	The project will require some compensation for land occupied by the project components. A Livelihoods Restoration Framework will need to be prepared in line with the provisions of the Act.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
		section in accordance with the provisions of the Lands Acquisition Act (Section 14.4).	
Employment, Health, Safety and Human Rights			
14	The Employment Act, Cap 268	The Employment Act provides legislation relating to the employment of persons and makes provision for the engagement of persons on contracts of service and for the enforcement of contracts. It also makes provision for the protection of wages of employees. The Employment Act has added a chapter on HIV and AIDS which will compel employers to respond to HIV and AIDS in the workplace, recognising that HIV and AIDS is a disease that undermines production. The Chapter also makes it mandatory by law for companies to formulate comprehensive HIV/AIDS Workplace Policies. The Employment of Young Persons and Children's Act regulates the employment of young persons and children.	The developer must ensure that all recruitment procedures and conditions of employment of persons under the project will comply with the provisions of the Act. The developer must also ensure that the contractors promote STDs & HIV/AIDS awareness among construction workers during project implementation.
15	Workers Compensation Act, Cap 271	The Act provides for the establishment and administration of a Fund for the compensation of Workers disabled by accidents to, or diseases contracted by, such workers in the course of their employment, and for the payment of compensation to dependents of Workers who die as a result of such accidents or diseases.	There is a possibility that some workers employed on this project, might be involved in accidents. In case of any accidents occurring to any worker, the developer and appointed contractors must treat such employees in accordance with these regulations.
16	Factories Act, Cap 441	The Factories Act provides a framework for the setting of regulations to ensure the safety, health and welfare of persons employed on construction work sites and in factories.	The project during operation and as a construction site is subject to provisions of the Act as a place of work. All work procedures and workers Personal Protective Equipment (PPE) will be required to meet the provisions of this Act. Inspection procedures for the operation of all plant and equipment during construction and operation will be governed by this Act.
17	Occupational Health and Safety Act, No. 36 of 2010	An Act to establish the Occupational Health and Safety Institute and provide for its functions; provide for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work; provide for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; provide for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work; and provide for matters connected with, or incidental to, the foregoing.	The project will involve procedures and activities with inherent risks to the occupational health and safety of employees and other persons (e.g. community members). The developer and appointed contractors shall be obliged to comply with the provisions of the Act.

Ref	Legislative Instrument	Description	Relevance and/or Compliance
18	Public Health Act, Cap 295	The Act provides for the prevention and suppression of diseases and general regulation of all matters connected with public health in the country under the local authority of each district as the enforcement agency.	For the proposed development, this will cover such matters as solid waste management, levels of hygiene and the standards of the general working environment. Good housekeeping and proper waste management and disposal protocols must be adhered to by the contractor and the developer to avoid the spread of vermin and diseases.
19	Public Roads Act (No. 12 of 2002)	This Act provides for the care, maintenance and constriction of public roads in Zambia, and for the regulation of inter alia road signage (including temporary signs) and storm water disposal structures	The designs of project access roads must adhere to the requirements of this Act, including the use of temporary safety signage. It is proposed that the ownership of any new access roads be handed-over to the Roads Authority or District Authority and be open to Public use for the life of the Project. The hand-over should include an agreement on long-term maintenance and care of the roads between the Project and the public entity.
20	Human Rights Commission Act (No. 39 of 1996)	The Act covers the functions, powers and composition of Human Rights Commission which include investigation of human rights violations; investigation of any maladministration of justice; and proposing effective measures to prevent human rights abuse.	The project will adhere to all laws and guidelines (including international standards) with regards to land acquisition, compensation and employment.

2.3 INSTITUTIONAL FRAMEWORK

The Zambia Environmental Management Agency (ZEMA) is a statutory body under the Ministry of Water, Sanitation and Environmental Protection (MWSEP) which facilitates at the national level the coordination of the various Ministries and regulatory bodies that play a role in in the management and conservation of the environment.

Government ministries, departments and local authorities work on behalf of the public to ensure that ecological, cultural, social and economic issues are addressed in line with existing government policy and legislation. Institutions with a supervisory and monitoring role relevant to the Project are described in Table 2.

Table 2: Institutions with a supervisory and monitoring role relevant to the Project

Institution	Responsibility
Zamia Environmental Management Agency (ZEMA)	ZEMA is responsible for the enforcement of the provisions of the EMA on environmental impact assessment, pollution control, natural resources management and solid waste management which includes establishment of landfill sites. The services provided by the ZEMA specifically in relation to EIA studies include: • Assisting the developer to determine the scope of EIA studies; • Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making; • Disclosure of the EIS to the public through the media; • Holding public hearing meetings to discuss the EIS with stakeholders; • Conducting verification surveys of the affected environment; • Monitoring the project once implemented; • Conducting compliance audits of the project between 12 and 36 months after implementation; and • General administration of all the Regulations under the EMA. In addition to the Project Environmental Permit, ZEMA is responsible for the issuing of licenses relating to: • Emissions (air and waste water), • Waste management and • Hazardous waste management.
Water Resources Management Authority (WARMA)	A statutory body under the Ministry of Water, Sanitation and Environmental Protection which is responsible for the management of water resources and liaises with ZEMA on issues relating to water pollution. In accordance with the provisions of the Water Resources Management Act, WRMA will regulate and control the rates of water abstraction to ensure that available surface and underground water resources are not depleted and is responsible for issuing of water permits (previously known as 'water rights').
Department of National Parks and Wildlife (DPNW)	The research permit requires supervision by an Area Ecologist during research fieldwork.
Ministry of Lands and Natural Resources: Forestry Department	Consent will be required from the Forestry Department for the construction of the power transmission line as parts of the current preferred route run through the Chiulukire West and Chivuna Hills Forest Reserves.

Institution	Responsibility
The National Heritage Conservation Commission (NHCC)	The NHCC, which falls under the Ministry of Tourism and Arts (MOTA), is responsible for the identification of sites of cultural and historical interest and their conservation. In the case of new discoveries of cultural or historical sites, the NHCC will be the first agency to be notified and give guidance on how to handle and preserve them. The NHCC is responsible for issuing permissions to Remove/Alter/Destroy heritage sites and for establishing concession agreements for the management of heritage sites. The NHCC has undertaken a heritage impact assessment (HIA) as a component of the ESIA.
Ministry of Health (MoH)	The Ministry of Health is concerned with issues of health of the human population. This ministry works hand in hand with local authorities to ensure quality good health of the residents through provision of health services and health risks awareness. As such the MoH is responsible for monitoring the health status and trends of the communities in the Project Site through the Health Management Information System.
Ministry of Mines and Minerals Development	The main access roads and internal service roads would be constructed or upgraded from material sourced from quarries or borrow pits within and around the area (if available). All material will need to be sourced from quarries and/or borrow pits approved from the Ministry of Mines and Minerals Development.
Department of Energy (DOE)	The DOE falls under the Ministry of Energy and its functions, among others, are to develop and implement a Policy on Energy, integrate the Energy sector into Zambia's national and regional development strategies; to regulate the Energy sector through appropriate legislation including the development of new laws and bye-laws.
The Energy Regulation Board (ERB)	The ERB is the statutory body under the Ministry of Energy which has the mandate of regulating the energy sector in line with the provisions of the Energy Regulation Act of 2003. In order to carry out this role, the ERB, among other functions, ensures that all energy utilities in the sector are licensed, monitors levels and structures of competition, and investigates and remedies consumer complaints. The unit price of that electricity generated by the Project and sold to the national grid will be regulated by the ERB. ERB issues licenses for electricity generation plants and energy related facilities such as bulk fuel storage facilities.
Provincial Planning Office	Planning permission for the Project will be sought through the Provincial Planning Office (Eastern Province)
District Councils	The district councils are responsible for issuing Building Permits, Fire Permits and permissions for establishment of waste disposal sites (landfills).

2.4 INTERNATIONAL AGREEMENTS AND CONVENTIONS

Zambia is a party to a number of international and regional conventions related to the environment and natural resources management which influence the country's policies and legislation.

The environmental treaties and conventions most relevant to the project are set out in Table 3.

Table 3: International treaties and conventions of relevance to the Project

Name of Convention (Date of ratification)	**Description**	**Aspects related to the Project**
Convention on Biological Diversity (1992)	The Convention is relevant in that land clearing activities have potential to cause loss of habitat and associated biodiversity and habitat disturbance. In addition, the IFC Performance Standard 6 (Biodiversity Conservation and Sustainable Natural	The Project will be executed sustainably in such a way as to conserve natural aquatic, woodland and wildlife habitat as far as possible and minimize disturbance to the site ecosystem.

Name of Convention (Date of ratification)	Description	Aspects related to the Project
	Resource Management) reflects the objectives of the Convention to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.	
United Nations Framework Convention on Climate Change (1996)	The Convention is relevant as the clearing of land for the Project has the potential to contribute to climate change since loss of vegetation deprives the earth of the carbon sink which help mitigate global warming.	The Project will ensure a conservative approach to vegetation clearing so as to limit loss of vegetation.
African Convention on the Conservation of Nature and Natural Resources (1968)	This convention aims at enhancing environmental protection, to foster the convention and sustainable use of natural resources and to harmonies and coordinate policies in these fields.	This convention is relevant to the planning, construction and operation phases of the Project.
Convention on the Protection of World Cultural and Natural Heritage (ratified 1984)	Provides for the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage which are of outstanding universal value from the point of view of history, art or science.	The Project will implement the necessary procedures to protect cultural and natural heritage.
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage	The purposes of this Convention are to safeguard the intangible cultural heritage; to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; and to provide for international cooperation and assistance.	The Project will implement the necessary procedures to protect cultural and natural heritage.
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) (ratified 1993)	This is an international agreement between governments to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Protection of the biodiversity in the surrounding area of the Project.
Basel Convention on the control of transboundary movements of hazardous wastes and their disposal (1999)	International treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries	Waste management during the construction and operation of the Project will be managed accordingly

In addition, Zambia is a signatory to various **International Labour Organisation (ILO) Conventions** which are relevant to working conditions and regulation on site during construction and operation of the Project. These include[1]:

- C138 - Minimum Age Convention, 1973 (ratified 1976)
- C182 - Worst Forms of Child Labour Convention, 1999 (ratified 2001)

[1] Source: http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11200:0::NO::P11200_COUNTRY_ID:103264

- C111 - Discrimination (Employment and Occupation) Convention, 1958 (ratified 1979)
- C017 - Workmen's Compensation (Accidents) Convention, 1925 (ratified 1964)
- C148 - Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (ratified 1980)
- C155 - Occupational Safety and Health Convention, 1981 (ratified 2013)

2.5 EQUATOR PRINCIPLES

The Equator Principles are a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. Equator Principle Financial Institutions (EPFIs) commit to implementing the Equator Principles in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the Equator Principles.

In order to facilitate potential access to funding for project development potential borrowing organisations need to consider the Equator Principles and environmental and social risk management as part of the ESIA process.

There are 10 principles as shown below, and these require that Projects conduct an ESIA process in compliance with the IFC Performance Standards on Environmental and Social Sustainability.

1. Review and categorisation
2. Social and environmental assessment
3. Applicable environmental and social standards
4. Environmental and Social Management System and Equator Principles Action Plan
5. Stakeholder Engagement
6. Grievance mechanism
7. Independent review
8. Covenants
9. Independent monitoring and reporting
10. Reporting and Transparency

2.6 IFC PERFORMANCE STANDARDS ON ENVIRONMENTAL AND SOCIAL SUSTAINABILITY (2012)

The IFC's Environmental and Social Performance Standards (international PSs) define IFC clients' responsibilities for managing their environmental and social risks an provides an international benchmark for identifying and managing environmental and social risk and has been adopted by many organizations as a key component of their environmental and social risk management. The IFC Performance Standards encompass eight topics as shown in Table 4.

Table 4: IFC Performance Standards and their applicability to the Project

IFC Performance Standard	Applicability to this project
PS1: Assessment and Management of Environmental and Social Risks and Impacts PS1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project.	Yes An Environmental and Social Impact Assessment needs to be conducted and an Environmental and Social Management Plan needs to be developed

IFC Performance Standard	Applicability to this project
PS2: Labour and Working Conditions PS2 asks that companies treat their workers fairly, provide safe and healthy working conditions, avoid the use of child or forced labour, and identify risks in their primary supply chain.	Yes Various people will be employed which will require measures for managing labour and working conditions
PS3: Resource Efficiency and Pollution Preventions PS3 guides companies to integrate practices and technologies that promote energy efficiency, use resources—including energy and water—sustainably, and reduce greenhouse gas emissions.	Yes The Project will require various resources and activities (especially during construction) could lead to pollution
PS4: Community, Health, Safety and Security PS4 helps companies adopt responsible practices to reduce such risks including through emergency preparedness and response, security force management, and design safety measures.	Yes Project activities (e.g. construction, transport, power distribution, etc.) could pose a risk to community health and safety
PS5: Land Acquisition and Involuntary Resettlement PS5 advises companies to avoid involuntary resettlement wherever possible and to minimize its impact on those displaced through mitigation measures such as fair compensation and improvements to and living conditions. Active community engagement throughout the process is essential.	Yes Although no physical displacement is anticipated, economic displacement is expected as a result of the placement of Project infrastructure. Land rights are also required.
PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and managing living natural resources adequately are fundamental to sustainable development.	Yes The Project could have impacts on biodiversity and living resources which will require management/mitigation measures
PS7: Indigenous Peoples PS7 seeks to ensure that business activities minimize negative impacts, foster respect for human rights, dignity and culture of indigenous populations, and promote development benefits in culturally appropriate ways. Informed consultation and participation with IPs throughout the project process is a core requirement and may include Free, Prior and Informed Consent under certain circumstances.	No There are no Indigenous Peoples as defined by the IFC present within the Project area of influence
PS8: Cultural Heritage PS8 aims to guide companies in protecting cultural heritage from adverse impacts of project activities and supporting its preservation. It also promotes the equitable sharing of benefits from the use of cultural heritage.	Yes The Project could have impacts cultural heritage which will require management/mitigation measures

2.7 CORPORATE STANDARDS AND GUIDELINES

For purpose of this Project, Mphepo aims to align with the Equator Principle and IFC Performance Standards on Environmental and Social Sustainability (2012). In addition, Mphepo has the following policies currently in place that will guide the Project development:

- Health and Safety Policy;
- Anti-Bribery & Anti-Corruption Policy;
- Employment Equity Policy;
- HIV/AIDS Policy and
- Sexual Harassment Policy.

In addition, the Engineering, Procurement and Construction (EPC) contractor will need to have detailed standards and guideline in place for environmental, health, safety and social management prior to construction commencing.

3. PROJECT DESCRIPTION

3.1 LOCATION OF THE PROJECT

The Project Site is located directly north of Katete (Eastern Province, Zambia), and ± 440 km east of Lusaka, Zambia (Figure 2). The Project Site is approximately 33 350 hectares (ha) in size, while the footprint of the Project is between 8 000 and 10 000 ha.

A map showing the Project Site and the proposed powerline route alternatives is presented in Figure 3. Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from ZESCO. Phase 1 ("Unika I") will include the development of an 40 – 200 MW wind farm (the Project), with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150 MW each. Once all the phases have been completed the project will have a capacity of approximately 450 MW. The final size and layout of the Project will be determined current baseline investigation and wind monitoring data.

Phase 1 ("Unika I") has been prioritised for development. All three phases of the Project will fall within the Project Site as shown in Figure 3. It is also proposed to build an on-site substation and a 132 kV power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site (as shown in Figure 3). The current preferred route for the power transmission line runs mainly along the existing road leading from the Project Site to the Msoro substation.

The Project Site is located on traditional land, controlled by Kalonga Gawa Undi Mkhomo V, the King of the Chewa people. Land marks within the Project Site include Mkaika Palace, Kachingwe Cobalt and the Mtetezi military camp. A number of villages namely Isibaki, Chimoto Kachngwe, Sumbwi, Pindu, Chamani, Undi, Mchaela Chimbundu and Mbangombe Villages are found on the south western area of the Project Site. Other villages located within the Project Site area include Gomani, Sunku, Mkokeza, Katimba, Malanda, Mlangali, Phindani, Tambala and Sakoba.

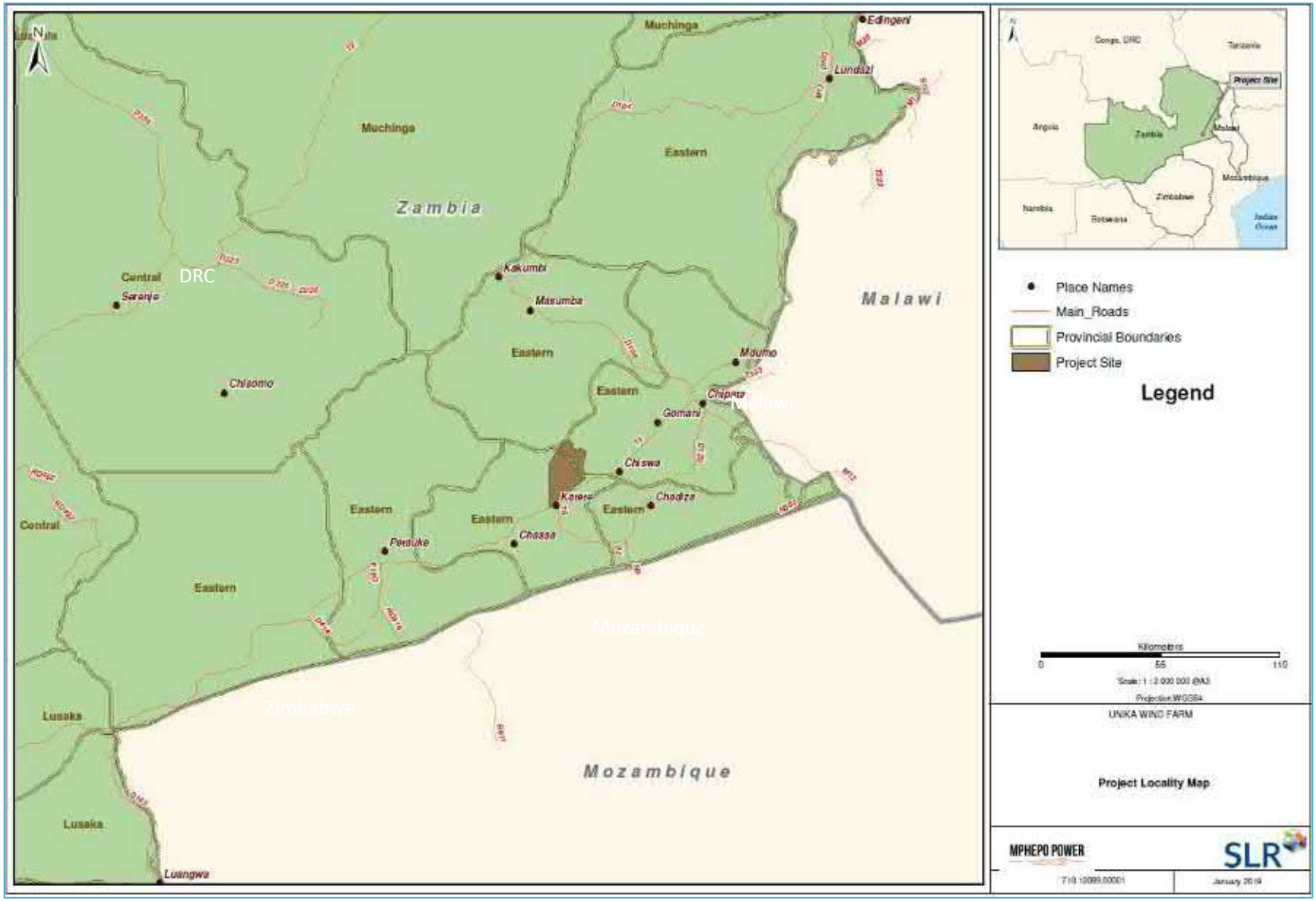


Figure 2: Location of the Project Site

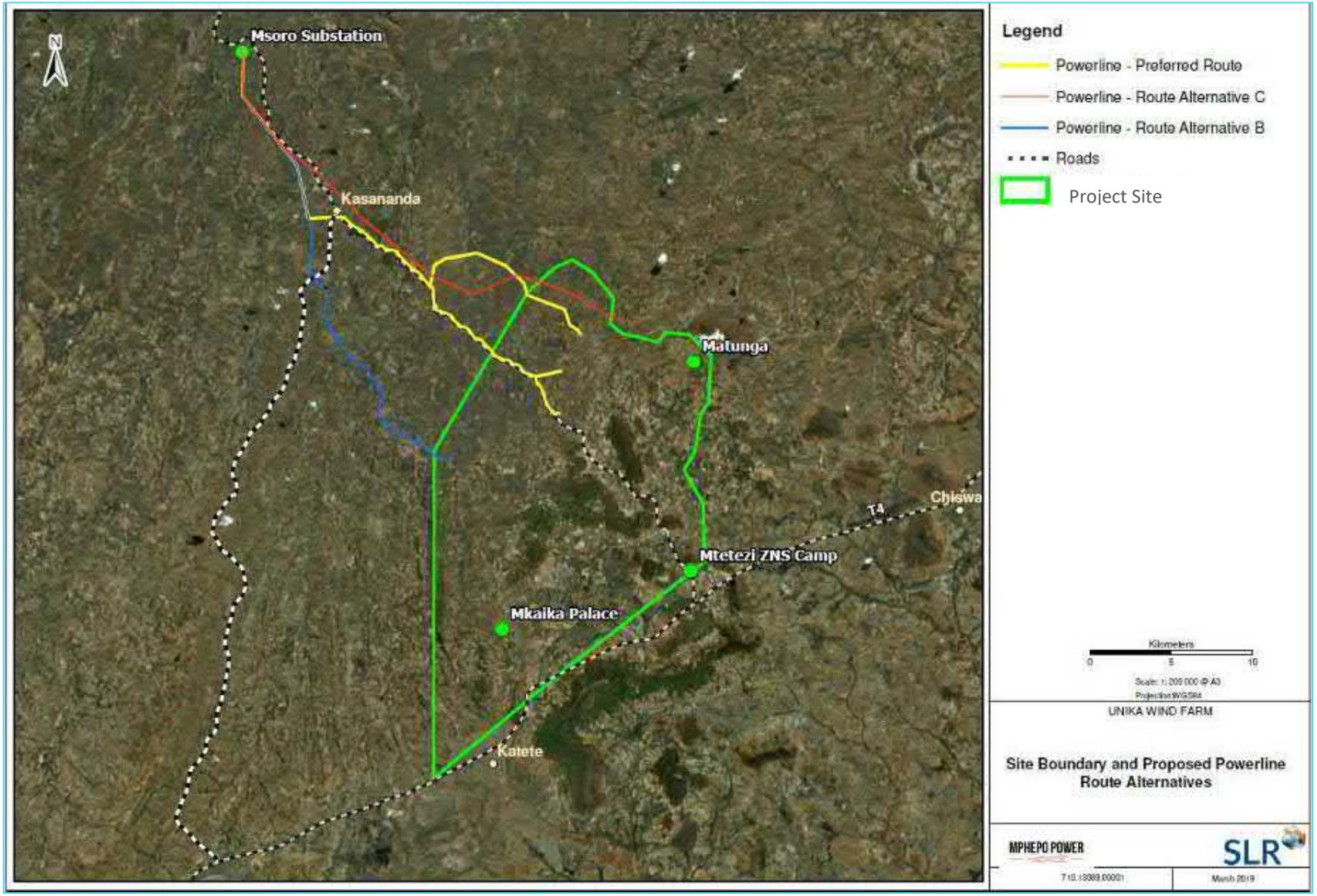


Figure 3: Project Site and proposed powerline route alternatives

3.2 NATURE OF THE PROJECT

The description of project components below is specific to the Unika I Wind Farm Project, and will be further refined during the ESIA Phase. Detailed information (e.g. turbine design, turbine numbers, etc.) on project components specific to the future Phases 2 and 3 have not been established yet; however, all project components would be similar, other than for the increase in turbine numbers and additional access roads associated with the larger wind farm phases. It is estimated that Phases 2 and 3 will have between 20 and 60 wind turbines each. In total it is estimated that the Unika Wind Farm will have between 70 and 160 wind turbines once all 3 Phases have been completed.

3.2.1 Production capacity

The proposed project will have a capacity of 40 – 200 MW for Phase I, 150 MW for Phase 2 and 150 MW for Phase 3. Once all three phases have been completed the project will have a capacity of approximately 450 MW. All power generated will be fed directly into the ZESCO national grid. The annual production will continue to be revised as more data is collected and site design is optimised.

3.2.2 Schedule and life of Project

The construction phase is estimated to take approximately 12-24 months to complete. The construction of Phase 1 is anticipated to commence during Quarter 3 of 2021.

The Power Purchase Agreement (PPA) is anticipated to last 25 years. Beyond that duration, the Project may continue to operate subject to further approvals.

4. ESIA SCOPE OF WORK

The ESIA will apply to the Unika I Wind Farm Project as described in the Scoping Report and will include the entire Project Site and power transmission line routes as depicted in Figure 3 above.

All potentially significant environmental and social impacts associated with the proposed Project have been identified in the Scoping Report (as "*Scoped In*" interactions) and will be further investigated and assessed within the ESIA. Mitigation measures will be provided in the Environmental and Social Management Plan (ESMP), including mitigation measures for interactions identified in the Scoping Report as "*Scoped Out with Justification*".

The ESIA process (as indicated in Figure 4 below) will follow the requirements of the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997 and the IFC Performance Standards on Environmental and Social Sustainability.

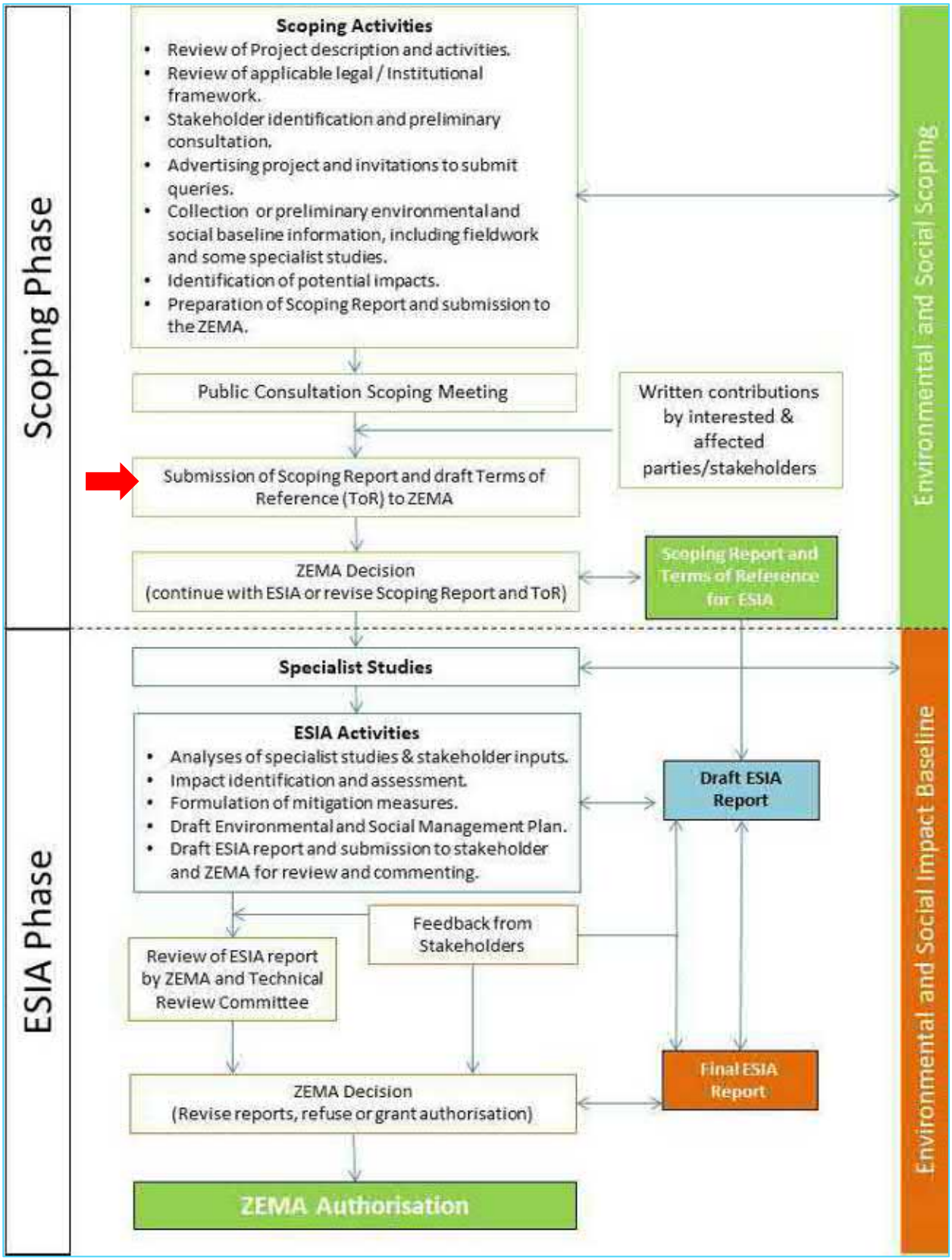


Figure 4: ESIA process for the Project

5. ESIA METHODOLOGY

5.1 IDENTIFICATION AND DESCRIPTION OF IMPACTS

Identified impacts are described in terms of the nature of the impact, compliance with legislation and accepted standards, receptor sensitivity and the significance of the predicted environmental change (before and after mitigation). Mitigation measures may be existing measures or additional measures that were identified through the impact assessment and associated specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of mitigation.

5.2 EVALUATION OF IMPACTS AND MITIGATION MEASURES

5.2.1 Introduction

Environmental and Social Impacts will be assessed using SLR's standard convention for assessing the significance of impacts, a summary of which is provided below.

In assigning significance ratings to potential impacts before and after mitigation the approach presented below is to be followed.

1. **Determine the impact consequence rating:** This is a function of the "intensity", "duration" and "extent" of the impact (see Section 5.2.2). The consequence ratings for combinations of these three criteria are given in Section 5.2.3.

2. **Determine impact significance rating:** The significance of an impact is a function of the consequence of the impact occurring and the probability of occurrence (see Section 5.2.2). Significance is determined using the table in Section 5.2.4.

3. **Modify significance rating (if necessary):** Significance ratings are based on largely professional judgement and transparent defined criteria. In some instances, therefore, whilst the significance rating of potential impacts might be "low", the importance of these impacts to local communities or individuals might be extremely high. The importance/value which interested and affected parties attach to impacts will be highlighted, and recommendations should be made as to ways of avoiding or minimising these perceived negative impacts through project design, selection of appropriate alternatives and / or management.

4. **Determine degree of confidence of the significance assessment:** Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified (see Section 5.2.2). Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact.

5.2.2 Criteria for Impact Assessment

The criteria for impact assessment are provided below.

Criteria	Rating	Description
Criteria for ranking of the INTENSITY (SEVERITY) of environmental impacts	**ZERO TO VERY LOW**	Negligible change, disturbance or nuisance. The impact affects the environment in such a way that natural functions and processes are not affected. People / communities are able to adapt with relative ease and maintain pre-impact livelihoods.

Criteria	Rating	Description
	LOW	Minor (Slight) change, disturbance or nuisance. The impact on the environment is not detectable or there is no perceptible change to people's livelihood.
	MEDIUM	Moderate change, disturbance or discomfort. Where the affected environment is altered, but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
	HIGH	Prominent change, disturbance or degradation. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease. Affected people/communities will not be able to adapt to changes or continue to maintain-pre impact livelihoods.
Criteria for ranking the DURATION of impacts	**SHORT TERM**	< 5 years.
	MEDIUM TERM	5 to < 15 years.
	LONG TERM	> 15 years, but where the impact will eventually cease either because of natural processes or by human intervention.
	PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.
Criteria for ranking the EXTENT / SPATIAL SCALE of impacts	**LOCAL**	Impact is confined to project or study area or part thereof, e.g. limited to the area of interest and its immediate surroundings.
	REGIONAL	Impact is confined to the region, e.g. coast, basin, catchment, municipal region, etc.
	NATIONAL	Impact is confined to the country as a whole, e.g. South Africa, etc.
	INTERNATIONAL	Impact extends beyond the national scale.
Criteria for determining the PROBABILITY of impacts	**IMPROBABLE**	Where the possibility of the impact to materialise is very low either because of design or historic experience, i.e. ≤ 30% chance of occurring.
	POSSIBLE	Where there is a distinct possibility that the impact would occur, i.e. > 30 to ≤ 60% chance of occurring.
	PROBABLE	Where it is most likely that the impact would occur, i.e. > 60 to ≤ 80% chance of occurring.
	DEFINITE	Where the impact would occur regardless of any prevention measures, i.e. > 80% chance of occurring.
Criteria for determining the DEGREE OF CONFIDENCE of the assessment	**LOW**	≤ 35% sure of impact prediction.
	MEDIUM	> 35% and ≤ 70% sure of impact prediction.
	HIGH	> 70% sure of impact prediction.
Criteria for the DEGREE TO WHICH IMPACT CAN BE MITIGATED - the degree to which an impact can be reduced / enhanced	**NONE**	No change in impact after mitigation.
	VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
	LOW	Where the significance rating drops by one level, after mitigation.
	MEDIUM	Where the significance rating drops by two to three levels, after mitigation.

Criteria	Rating	Description
	HIGH	Where the significance rating drops by more than three levels, after mitigation.
Criteria for LOSS OF RESOURCES - the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable	**LOW**	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
	MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
	HIGH	Where the activity results in an irreplaceable loss of a resource.

5.2.3 Determining Consequence

Consequence attempts to evaluate the importance of a particular impact, and in doing so incorporates extent, duration and intensity. The ratings and description for determining consequence are provided below.

Rating	Description
VERY HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***long term***; OR of ***high intensity*** at a ***national level*** in the ***medium term***; OR of ***medium intensity*** at a ***national level*** in the ***long term.***
HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***high intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***national level*** in the ***long term***; OR of ***high intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***regional level*** in the ***long term.***
MEDIUM	Impacts could be EITHER: of ***high intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***medium intensity*** at a ***regional level*** in the ***medium term***; OR of ***high intensity*** at a ***regional level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***local level*** in the ***long term***; OR of ***low intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***regional level*** in the ***long term.***
LOW	Impacts could be EITHER of ***low intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***national level*** in the ***short term***; OR of ***high intensity*** at a ***local level*** and endure in the ***short term***; OR of ***medium intensity*** at a ***regional level*** in the ***short term***; OR of ***low intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.***
VERY LOW	Impacts could be EITHER of ***low intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***; OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.*** OR **Zero to very low intensity** with any combination of extent and duration.

5.2.4 Determining Significance

The consequence rating is considered together with the probability of occurrence in order to determine the overall significance using the table below.

		PROBABILITY			
		IMPROBABLE	POSSIBLE	PROBABLE	DEFINITE
CONSEQUENCE	VERY LOW	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	LOW	VERY LOW	VERY LOW	LOW	LOW
	MEDIUM	LOW	LOW	MEDIUM	MEDIUM
	HIGH	MEDIUM	MEDIUM	HIGH	HIGH
	VERY HIGH	HIGH	HIGH	VERY HIGH	VERY HIGH

In certain cases it may not be possible to determine the significance of an impact. In these instances the significance is **UNKNOWN**.

6. ESIA SCHEDULE

The current Scoping and ESIA schedule is presented in Figure 5 below. At this stage it is anticipated that the ESIA report will be ready for submission to ZEMA for decision making by May 2020.

ID	Task Name	Duration	Start	Finish
1	**ESIA for Unika 1 Wind Farm Zambia**	**497 days**	**Tue 18/09/25**	**Wed 20/08/19**
2	**Project initiation**	**64 days**	**Tue 18/09/25**	**Fri 18/12/21**
3	Kick-off meeting	1 day	Tue 18/09/25	Tue 18/09/25
4	Project Execution Plan	0 days	Tue 18/09/25	Tue 18/09/25
5	Project set-up	10 days	Wed 18/09/26	Tue 18/10/09
6	Site reconnaicance	5 days	Mon 18/11/19	Fri 18/11/23
7	Compile Site Screening Report	20 days	Mon 18/11/26	Fri 18/12/21
8	Site Screening Report	0 days	Fri 18/12/21	Fri 18/12/21
9	**Bird and Bat Monitoring**	**287 days**	**Mon 19/02/25**	**Tue 20/03/31**
10	**Bird monitoring**	**95 days**	**Mon 19/02/25**	**Fri 19/07/05**
11	Season 1 (Summer)	5 days	Mon 19/02/25	Sun 19/03/03
12	Season 2 (Winter)	5 days	Mon 19/06/03	Fri 19/06/07
13	Compile Bird Impact Assessement	20 days	Mon 19/06/10	Fri 19/07/05
14	Bird Impact Assessment Report	0 days	Fri 19/07/05	Fri 19/07/05
15	**Bat Monitoring**	**201 days**	**Mon 19/06/17**	**Mon 20/03/23**
16	Install passice equipment	5 days	Mon 19/06/17	Fri 19/06/21
17	Season 1	5 days	Mon 19/07/08	Fri 19/07/12
18	Season 2	5 days	Tue 19/10/08	Mon 19/10/14
19	Season 3	5 days	Mon 20/01/13	Fri 20/01/17
20	Decomission Equipment	2 days	Mon 20/03/02	Tue 20/03/03
21	Compile Bat Impact Assessment	15 days	Tue 20/03/03	Mon 20/03/23
22	Bat Impact Assessment Report	0 days	Mon 20/03/23	Mon 20/03/23
23	**Scoping Phase**	**171 days**	**Mon 19/02/04**	**Tue 19/10/01**
24	Develop Background Information Document	5 days	Mon 19/02/04	Fri 19/02/08
25	Notification of EIA process	10 days	Mon 19/05/20	Fri 19/05/31
26	Public meetings	5 days	Mon 19/06/17	Fri 19/06/21
27	Compile Draft Scoping Report and ToRs	35 days	Mon 19/05/13	Fri 19/06/28
28	Draft Scoping Report and ToRs	0 days	Mon 19/07/01	Mon 19/07/01
29	Client review	5 days	Mon 19/07/01	Fri 19/07/05
30	Finalise Draft Scoping Report and ToRs	3 days	Mon 19/07/08	Wed 19/07/10
31	Final Scoping Report and ToRs	0 days	Wed 19/07/10	Wed 19/07/10
32	ZEMA Review	40 days	Thu 19/07/11	Wed 19/09/04
33	Approval of Scoping Report and ToRs	0 days	Wed 19/09/04	Wed 19/09/04
34	**DESIGN FREEZE**	**0 days**	**Tue 19/10/01**	**Tue 19/10/01**
35	**Impact Assessment**	**393 days**	**Mon 19/02/18**	**Wed 20/08/19**
36	**Specialist field work**	**186 days**	**Mon 19/02/18**	**Mon 19/11/04**
37	Noise	5 days	Mon 19/02/18	Fri 19/02/22
38	Visual	5 days	Mon 19/02/18	Fri 19/02/22
39	Hydrology	5 days	Mon 19/02/18	Fri 19/02/22
40	Ecology	6 days	Mon 19/02/18	Mon 19/02/25
41	Social	5 days	Mon 19/03/18	Fri 19/03/22
42	Heritage	5 days	Mon 19/03/18	Fri 19/03/22
43	Specialist field trip Report	0 days	Fri 19/03/22	Fri 19/03/22
44	Compile specialist reports	25 days	Tue 19/10/01	Mon 19/11/04
45	Compile 1st Draft ESIA Report (ex Bird and Bats)	20 days	Tue 19/11/05	Mon 19/12/02
46	Compile ESMP	8 days	Tue 19/12/03	Thu 19/12/12
47	1st Draft ESIA Report & ESM	0 days	Thu 19/12/12	Thu 19/12/12
48	Client review	5 days	Fri 19/12/13	Thu 19/12/19
49	Finalise ESIA Report and ESMP	5 days	Mon 20/01/13	Fri 20/01/17
50	Integrate Bird and Bat Studies	15 days	Tue 20/03/24	Mon 20/04/13
51	2nd Draft ESIA Report	0 days	Mon 20/04/13	Mon 20/04/13
52	Disclosure of ESIA Report & ESMP	10 days	Tue 20/04/14	Mon 20/04/27
53	Public review of Draft ESIA Report	15 days	Tue 20/04/28	Mon 20/05/18
54	Compile Comments & Respopnse Report	5 days	Tue 20/05/19	Mon 20/05/25
55	Final ESIA Report and ESMP	0 days	Mon 20/05/25	Mon 20/05/25
56	Christmas break	20 days	Mon 19/12/16	Fri 20/01/10
57	Submit to ZEMA for review	2 days	Tue 20/05/26	Wed 20/05/27
58	ZEMA Review	60 days	Thu 20/05/28	Wed 20/08/19
59	Environmental License	0 days	Wed 20/08/19	Wed 20/08/19

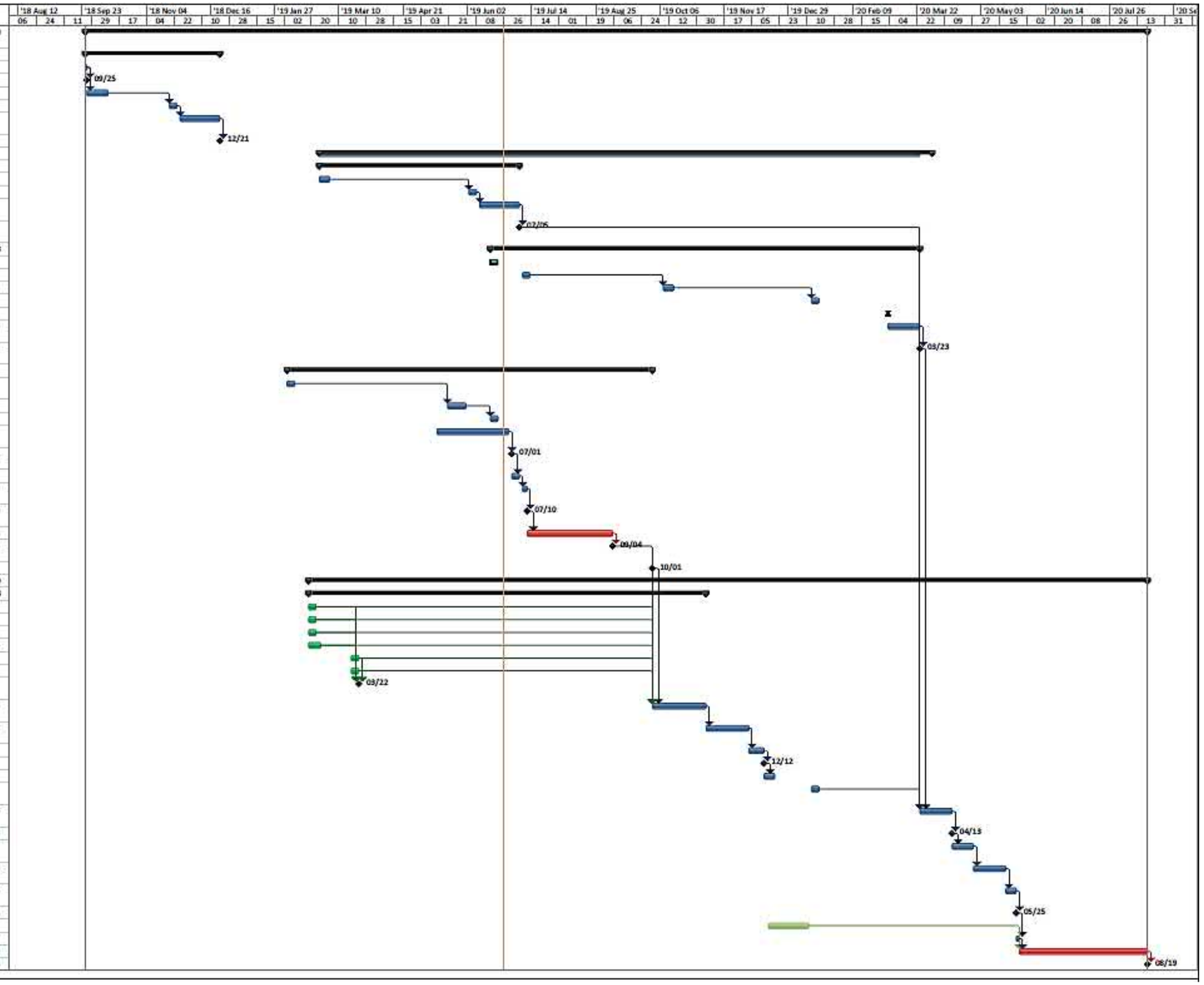


Figure 5: ESIA Schedule

7. ESIA REPORTING AND OUTPUTS

The ESIA report shall be prepared accordance with the final Terms of Reference prepared in consultation with ZEMA.

In line with Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997 and the requirements set by ZEMA, the ESIA will include the following:

- Executive summary
- Introduction:
  - Background of the project
  - Summary description of the project including project rationale
  - Objectives the project
  - Brief description of the location
  - Particulars of shareholders/directors
  - Percentage of shareholding by each shareholder
  - The developer's physical address and the contact person and his/her details
  - Track record/previous experience of enterprise elsewhere
  - Total project cost/investment
  - Proposed project implementation date
- Policy, institutional and organisational framework:
  - Policy and institutional framework
  - Organisational framework
  - International agreements and conventions
- Project description:
  - Location
  - Nature of the project
  - Main activities
- Project alternatives:
  - Identification of alternatives
  - Analysis of each of the identified alternatives
  - List of chosen alternatives in order of preference
  - Reasons for choosing the preferred alternatives and rejecting the other alternatives
- Environmental baseline study:
  - Climate
  - Air quality
  - Geology
  - Hydrology
  - Hydrogeology
  - Topography
  - Soils
  - Land use and land tenure
  - Built environment
  - Noise and vibration
  - Fauna
  - Avifauna (birds)
  - Flora
  - Archaeological and cultural environment
  - Social-economic set up
- Environmental and Social Impacts:
  - Biophysical environment
  - Socio-economic and cultural
  - Evaluation of significance of impacts
- Environment and Social Management Plan (ESMP):
  - Environment and social monitoring plan

  - Decommissioning and rehabilitation plan
- Bibliography
- Declaration of authenticity of report contents
- Appendices (including the Letter of approval of ToRs, Maps and satellite images, specialist study reports and any other relevant supporting documents or information that cannot be presented in the main ESIA report)

8. SPECIALIST STUDIES

8.1 AVIFAUNA/BIRDS

This study will involve an initial screening, pre-construction monitoring and development of an impact assessment report.

8.1.1 Initial screening

A ground based survey will be undertaken by the avifaunal specialist in vehicle and on foot, to cover all sensitive features on Project Site, and within a 20 km radius of site.

8.1.2 Pre-construction bird monitoring

Pre-construction bird monitoring will be conducted over four seasons (wet, dry, autumn and spring).

The primary aims of pre-construction monitoring are:

- To estimate the number/density of birds regularly present or resident within the broader impact area of the Project before its construction;
- To document patterns of bird movements in the vicinity of the proposed Project before its construction;
- To estimate predicted collision risk for key species;
- To inform the avifaunal impact assessment report; and
- To mitigate impacts by informing the final design, construction and management strategy of the development.

Sample counts of small terrestrial species

A number of walked transects will be conducted to sample this component of avifauna. Approximately 9 transects of 1 km length each will be used.

Counts of large terrestrial species and raptors

As with the small species described above, this activity aims to estimate the density and abundance of certain relevant large terrestrial bird species. Approximately 2-3 vehicle-based/driven counts will be conducted, counted twice each season.

Focal site surveys and monitoring

Any cliff-lines, quarry faces, power lines, stands of large trees, marshes, wetlands, dams, nest sites and drainage lines will be surveyed using documented protocol in the initial stages of the monitoring project. Any identified features will be surveyed at least once on each site visit thereafter.

Incidental observations

All other, incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area will be carefully plotted and documented. Where necessary, these features may be developed as focal sites as described above. A full list of bird species recorded on site by all methods will be maintained.

Direct observation of bird movements

This activity aims to observe and collect data on all relevant flying birds, in order to estimate the collision risk once turbines are built. At least five vantage points will be established and data will be collected at these sites during each site visit.

8.1.3 Impact Assessment Report

This will consist of analysing and writing up the results of the pre-construction monitoring, in the format required for the ESIA. This report will address:

- Estimation of the number/density of birds regularly present or resident within the broader impact area of the Project;
- Patterns of bird movements in the vicinity of the proposed Project Site;
- Estimation of the predicted collision risk for key species; and
- Mitigation measures to inform the final design, construction and management strategy of the Project.

8.2 BATS

Twelve months of acoustic monitoring will take place. The monitoring will be done in accordance with international best practise as described in the World Bank Environmental, Health and Safety Guidelines for Wind Energy (August 2015). There are currently no Zambian guidelines for bat monitoring so the relevant guidelines as recommended in the above document were used to develop the scope. However, these guidelines have been developed for the European context and as such this scope is also based on best practise elements in South Africa.

The scope of this study includes passive monitoring from at least five fixed locations (one location in each of the main habitat types), monitoring at height from a meteorological mast, roost searches, focal site monitoring, and drive transects.

The Project Site will be visited at the start of the program to install the passive monitoring equipment. Following this, three seasons (cool dry, rainy and hot dry) of pre-construction bat monitoring will be conducted during which data will be downloaded, and roost searches, transects and focal site monitoring undertaken. Additional site visits will be undertaken to download bat data and ensure the passive equipment is functioning.

Two progress updates will be developed following the first two seasons, and one final monitoring report will be developed following the third season. These reports will summarise bat activity, highlight relevant concerns or opportunities and provide an opinion, with mitigation options, on any potential impacts to bats. The final report will include an impact assessment for inclusion in the ESIA report.

8.3 TERRESTRIAL ECOLOGY

The terrestrial ecology study will be conducted in a two phased approach and will include floral and faunal assessments. Phase one will be a screening phase/initial high-level site assessment, whereby indicative habitat and species data will be collected in order to plan and guide the second phase of detailed sites assessments. During phase two team members will conduct the field assessments and data collection.

Phase one mainly involves a desktop review and a field work component. A desktop review of distribution lists (including Red Data List floral and faunal species) and available literature will be conducted to guide the initial screening field work component. Extensive consideration will also be given to determining the Ecological Importance and Sensitivity (EIS) and Present Ecological State (PES) of the habitat types within the Project Site.

The floral assessment will include a detailed assessment of the entire Project Site, and will include the following:

- Identification of various habitat types;

- A description of each habitat type based on conservation importance and present ecological state;
- Floral species associated with each habitat component:
    - Focus on sensitive habitat types, the ecological importance of flora species and impacts associated to them in order to fulfil the requirements of the study.
    - Vegetation communities will be identified and mapped.
    - Species lists and dominant species associated with each vegetation community will be compiled.
    - Vegetation condition will be identified and compared to the typical vegetation for the vegetation type of the region.
    - Sensitive areas will be mapped where detail will be given of the ecological aspect of concern in each sensitivity zone.
- Specific focus will also be given to establishing the presence of Red Data List (RDL) and protected plants as listed within the IUCN Zambian list;
- Based on the findings a detailed baseline study and impact assessment on all identified significant risks will take place; and
- Recommendations on management and mitigation measures (including opportunities and constraints) with regards to the construction and operation of the proposed activities in order to manage and mitigate impacts on the floral assemblage of the area.

The faunal assessment will also include a detailed assessment of the entire Project Site. The faunal assemblage will be determined as follows:

- Extensive consideration will be given to determining the ecological importance and sensitivity of the study area according to the relevant conservation databases;
- Identification of evidence of occurrence, e.g. call spoor, droppings, etc.;
- The reports produced will include sensitive habitat types (which will be mapped) and impacts from habitat disturbance, faunal assemblages at risk and an assessment of impacts on migratory routes;
- The Species of Conservation Concern (SCC) probability assessment will also be considered in order to quantify the importance of the study area in terms of faunal SCC conservation;
- Based on the findings a detailed baseline study and impact assessment on all identified significant risks will take place; and
- Recommendations on management and mitigation measures (including opportunities and constraints) with regards to the construction and operation of the proposed activities in order to manage and mitigate impacts on the faunal assemblage of the area.

The following information will be included in the terrestrial ecology report:

- Spatial information in digital (shapefile) format;
- Baseline assessment;
- Maps indicating the sensitive areas;
- Ecological Importance and Sensitivity (EIS) and the Present Ecological State (PES) of the habitats on the site;
- Management requirements to be incorporated into the ESMP.

8.4 AQUATIC ECOLOGY

A Freshwater Ecology, Goods and Services Assessment will be conducted according to the approach below.

The wetland delineation will be initiated as a desktop study, where all the relevant information from research sources, as well as existing documentation will be reviewed in order to develop preliminary wetland delineations. Additionally, the desktop study will include a review of the information available for the area to define the aquatic ecological integrity of the systems in the study area, which will include impacts on the system and a classification according to environmental importance and sensitivity.

Following the desktop study field assessments will be undertaken to inform the aquatic and wetland assessment. The following methodologies will be used:

- Delineation of the wetland zone will take place according to International Best Practice Guidelines. Aspects such as soil morphological characteristics, vegetation types and wetness will be used to delineate the various zones of the wetland (permanent and temporary) according to the guidelines. The buffer zone will then be delineated around the wetland in order to ensure protection of the wetland.
- The wetland classification assessment will be undertaken according to International Best Practice Guidelines.
- The wetland areas will be mapped according to the ecological sensitivity of each wetland hydrogeomorphic unit in relation to the Project Site.
- The wetland Present Ecological State and Ecological Importance and Sensitivity will be assessed according to indices in line with international best practice guidelines. In addition, the wetland ecological and socio-cultural service provision will also be defined based on such methods.
- All aquatic ecological work will be undertaken by an accredited SA RHP SASS accredited assessor.
- Aquatic ecological assessments will take place with focus on:
    - Field assessment of biota specific water quality parameters;
    - Visual assessment of aquatic ecological impacts;
    - Macro-invertebrates using international best practice methodologies by accredited assessors;
    - Habitat conditions using international best practice methodologies; and
    - An assessment of fish assemblage integrity using international best practice methodologies.

The following information will be provided in the aquatic and wetland assessment report:

- Spatial information in digital (shapefile) format;
- Baseline assessment;
- Maps indicating the sensitive areas;
- Ecological Importance and Sensitivity (EIS) and the Present Ecological State (PES) of the freshwater resources;
- Description of hydraulic regime, geomorphology, sediment balance, water quality, habitat and biota characteristics of the freshwater resources;
- Description of Goods and Services Provision of the freshwater resources; and
- Management requirements to be incorporated into the ESMP.

8.5 SOCIAL IMPACT ASSESSMENT

The following sub-tasks will be conducted as part of the Social Impact Assessment:

1. **Project Scoping:** An initial scoping of the potential social impacts and benefits will be undertaken to inform the ESIA. This will largely be a baseline report based on desktop research which will include information regarding demographic (including human settlements on affected properties), economic, health and education information as well as the availability of physical infrastructure and services in the proposed areas. Information will be disaggregated by area where necessary.
2. **Fieldwork / Surveys**: A range of fieldwork may be undertaken, including those listed below:
    a. *Random Household Survey*: A socio-economic survey of a random sample of households located in the Project footprint may be undertaken depending on the outcome of the scoping study. This will be used to generate a local socio-economic profile, to augment existing census data and to understand land use and potential impacts of the development of the wind farm on land and resource use.
    b. *Interviews*: Interviews or small focus-group meetings will be held with key stakeholders or stakeholder groups. The type and number of interviews will be determined during the ESIA

Scoping. Interview will at a minimum however be conducted with the relevant District line functions as well as representatives of tribal authorities.

c. *Desk-Top Mapping*: Desk-top mapping, and limited ground-truthing, will be taken on properties, structures and other assets located in the prosed wind farm sites, and any easements required for the powerline network. This will used Client aerial imagery, or publicly available and free imagery (e.g. Google Earth).
d. *Observation of the Public Participation Process*: The Public Participation Process will be observed, and the issues and concerns raised during this process will be profiled in order to determine the priority issues of the local communities.

3. **Social Baseline Chapter**: The collected data will be used to generate a social baseline chapter that will be included in the Scoping and ESIA reports.
4. **Social Impact Assessment**: The collected data including an assessment of the key project components will be used to determine the nature and significance of social impacts as well as any benefits.
5. **Social Management Plan**: A range of practical and implementable social measures will be recommended for inclusion in the overall Environmental and Social Management Plan (ESMP).

The Social Impact Assessment report will assess impacts related to the following:

- Alignment with spatial plans and development schemes;
- Changes in existing land-uses and land tenure;
- Physical and economic displacement;
- Changes to existing livelihoods;
- Disruption of public land, services and amenities;
- Workforce related impacts and social pathologies, including influx;
- Labour and working conditions;
- Community health and safety;
- Disruption of vulnerable peoples (including women);
- Disruption of access and mobility (pathways, roads);
- National power generation benefits; and
- Local economic development.

A Resettlement/Livelihood Policy Framework (RPF/LPF) will be developed as part of the Project approval submission to ZEMA in order to provide guidance and management measures for land acquisition related to the Project. The RPF/LPF establishes the principles and framework for land acquisition and resettlement, and functions as a precursor document to the larger Resettlement Action Plan (RAP)/Livelihood Restoration Plan (LRP) that will need to be developed and implemented prior to construction commencing. The rationale of the development of the RPF/LPF is that the locations of the Project infrastructure are currently unknown. This means that land requirements and Project Affected Persons cannot be determined at this stage of the Project development, therefore the detailed RAP planning (including demarcation of required land, notification of landowners and valuations) cannot be undertaken until the final design and layout of Project infrastructure has been established.

8.6 LANDSCAPE AND VISUAL

A Landscape and Visual Impact Assessment will be conducted for the entire Project Site. This will be conducted as follows:

- Collation and analyses of all available secondary data relevant to the affected proposed Project Site. This includes a site visit of the full Project Site extent, as well as of areas where potential impacts may occur beyond the site boundaries.
- Identification of cumulative effects.
- Specific attention will be given to the following:

- Quantifying and assessing existing scenic resources/visual characteristics on, and around, the proposed site;
- Evaluation and classification of the landscape in terms of sensitivity to a changing land use;
- Determining viewsheds, view corridors and important viewpoints in order to assess the visual impacts of the proposed project;
- Determining visual issues, including those identified in the public participation process;
- Reviewing the legal framework that may have implications for visual/scenic resources;
- Assessing the significance of potential visual impacts resulting from the proposed project for the construction, operation and decommissioning phases of the proposed project;
- Assessing the potential cumulative impacts associated with the visual impact; and
- Identifying possible mitigation measures to reduce negative visual impacts for inclusion into the proposed project design, including input into the Environmental and Social Management Plan (ESMP).

When determining landscape significance the United States Bureau of Land Management's (BLM) Visual Resource Management Method will be used. This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria.

Field surveys will be undertaken. Photographs will be taken from each view-point, and the view direction and GPS location will be captured. The main land uses will be documented as well as the nature of the dominant landscape in the vista. In order to represent views of the proposed landscape modification by means of photomontages for assessment purposes, panoramic photographs will also be taken from key viewpoints.

Sensitivity buffers will be proposed to protect visual resources, should they be identified in the landscape / project Zone of Visual Influence.

In terms of the methodology to be used, landscape character will be derived from a combination of scenic quality, receptor sensitivity to landscape change and distance from the proposed landscape change. The objective of the analysis will be to compile a mapped inventory of the visual resources found in the receiving landscape, and to derive a mapped Visual Resource sensitivity layer from which to evaluate the suitability of the landscape change.

The analysis stage will involve determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required. This requires a contrast rating to assess the expected Degree of Contrast (DoC) the proposed landscape modifications would generate within the receiving landscape in order to define the Magnitude of the impact.

The Landscape and Visual Impact Assessment will provide information on the baseline conditions, landscape, the Project zone of visual influence, receptors, key observations points, physiographic landscape rating units, information on Scenic Quality and Receptor Sensitivity and Visual Resources Management Classes.

8.7 NOISE

The protocol/methodology for the Noise Impact Assessment is defined in SANS 10328:2003, as it allows for a comprehensive Environmental Noise Impact Assessment in line with best international practice. The criteria used to define noise limits will be based on the IFC General EHS Guidelines. Sound Propagation modelling will make use of the algorithms defined by ISO 9613-2 making use of a commercial modelling package (*SoundPlan*).

This study will be based on the following main activities:

- The identification of potential noise-sensitive receptors using available information (GoogleEarth, EIA's in Public Domain);

- Collation of available information for the study area;
- Noise Propagation Modelling for the Construction (basic model) and Operational (detailed model) phases, with the resulting total future predicted sound levels projected on a topographical map or aerial image, considering a worst-case scenario;
- The calculated noise levels (LAeq) will be compared against the derived noise limits and existing sound levels to determine the potential impact on the surrounding environment, focusing on potential sensitive receptors;
- Compilation of an Environmental Noise Impact Assessment report, including the noise impact assessment using defined criteria, noise management measures (if required) recommendations.

Potential measurement locations (considering potential noise-sensitive receptors) as well as assessing the soundscape and define the existing ambient sound levels in terms of various sound will be identified during the fieldwork. The measurements as obtained during fieldwork will be displayed in an appropriate manner and used to classify the area in terms of typical noise districts as well as likely ambient sound levels.

The main objectives of the the Noise Impact Assessment report will be to:

- Identify and define potential noise-sensitive receptors and areas that may be affected by the proposed development;
- Describe the existing Sound Levels as measured on-site;
- Set acceptable noise limits for the soundscape surrounding the development; and
- Provide management requirements to be incorporated into the ESMP.

8.8 CULTURAL HERITAGE

A heritage impact assessment will be undertaken to describe cultural and natural heritage resources that could be present in the Project Site and highlighting specific issues or concerns and probable impacts on the identified heritage resources that could result from the Project activities.

Activities that will be undertaken as part of this assessment include:

- Undertaking a desktop study to review reports and other available information about heritage resources within the proposed Project Site area and surrounds;
- Reviewing any available documents on inventory of cultural and natural heritage resources (within and around the Project Site);
- Undertaking a site visit and interviews with members of the community in order to identify cultural and natural heritage resources present in the Project Site;
- Undertaking a preliminary evaluation of the significance of the identified cultural and natural heritage resources;
- Identifying the potential impacts the proposed Project would have on the heritage resources; and
- Recommending mitigation measures to be incorporated into the ESMP.

9. THE ESIA TEAM

The ESIA team is set out in Table 5 below and consists of companies/organisations/individuals with proven experience in Zambia, and experience with the IFC Performance Standards.

In addition, a research permit was issued to Mphepo by the Department of National Parks and Wildlife (DNPW) for the research field work conducted to inform baseline investigations. This permit requires supervision by an Area Ecologist during research fieldwork. All research field work to date have been supervised by Area Ecologists from the South Luangwa Area Management Unit (at the cost of Mphepo), and this will continue until conclusion of all research field work.

Table 5: ESIA Team

Responsibilities	*Company/Organisation*	*Main Individuals*	*Key Qualifications*
Project Management, Stakeholder Engagement and Deliverables (including Scoping, ToR, ESIA, ESMP, etc.)	SLR Consulting (Africa) Pty Ltd	Stuart Heather-Clark Conroy van der Riet	MPhil Environmental Science BSc (Hons) Civil Engineering BSc (Hons) Environmental Geography
In-country assistance, Public Scoping Meeting and Stakeholder Engagement	DH Engineering Consultants	Danny Holmes Tobias Muyaba	MSc. Environmental Technology BSc. (Hons) in Mechanical Engineering BA Sociology and Industrial Psychology
Specialist Study: Birds	WildSkies Ecological Services	Jon Smallie Wessel Rossouw Eric Herrmann	MSc. Environmental Science BTh (Lic) Master of Forestry: Conservation Ecology
Specialist Study: Bats	Arcus Consultancy Services South Africa (Pty) Limited	Jonathan Aronson Helen Taylor-Boyd	Msc Zoology MSc Conservation Biology
Specialist Study: Terrestrial Ecology	Scientific Terrestrial Services CC	Stephen van Staden Chris Hooton	MSc Environmental Management BTech Nature Conservation

Responsibilities	*Company/Organisation*	*Main Individuals*	*Key Qualifications*
		Catherine Ernest	MSc Environmental Management
Specialist Study: Aquatic Ecology	Scientific Aquatic Services CC	Stephen van Staden Amanda Mileson	MSc Environmental Management N.Dip Nature Conservation
Specialist Study: Social	Nomad Consulting	Marco Da Cunha	MSc (Geography and Environmental Management)
Specialist Study: Visual and Landscape	Visual Resource Management Africa	Stephen Stead	Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems
Specialist Study: Noise	Enviro Acoustic Research CC	Morné de Jager	B.Ing (Chemical Engineering)
Specialist Study: Cultural Heritage	Envirodynamics Consulting Limited	Kagosi Mwamulowe Geofrey Mwanza	MSc Earth Sciences BEd Cultural Studies with History

10. DECLARATION OF AUTHENTICITY OF REPORT CONTENTS

I, __**Stuart Heather-Clark**___ (full name), in my capacity as__ **Africa Power Sector Lead**_ (position) within __ **SLR Consulting (Africa) Pty Ltd**__ (company), declare that the contents of this report is authentic.

Signature: 

Date: 08 August 2019

11.APPENDIX A: DEED OF AGREEMENT WITH LANDOWNER

DEED OF AGREEMENT

This DEED OF AGREEMENT
is hereby made on the 4 day Oct month of 2018

BETWEEN

THE CHEWA DEVELOPMENT TRUST REGISTERED TRUSTEES
of the Kingdom of the Kalonga Gawa Undi of the Chewa people of Malawi, Mozambique and Zambia

AND

MPHEPO POWER LIMITED

THIS DEED OF AGREEMENT ("the Agreement") is made as a deed on the 4.... day of October .....2018 BETWEEN:

A. **THE CHEWA DEVELOPMENT TRUST REGISTERED TRUSTESS** a duly incorporated non-profit organisation in the Republic of Zambia of the first part which expression shall include and extend to its successors and assigns (hereinafter **"the Trust"**);

B. **Mphepo Power Limited,** a private limited company incorporated in the Republic of Zambia with registered number: 120170003750 and having its registered office at Figtree Office Park, 1 Warthog Road, Kabulonga, Lusaka in the Republic of Zambia of the second part which expression shall include and extend to its successors and assigns (hereinafter **"the Investor"**); and

NOW IT IS HEREBY AGREED as follows:

i. The Agreement shall be for a period of 25 years and subject to further renewal by either party on such terms as the Parties will agree;

ii. The intention to renew the Agreement shall be made by either Party, giving the other Party six months' notice;

iii. Having given due notice, requesting authorisation from the Investor to inspect the premises, such authorization not unreasonably withheld, the Trust or the representative thereof may be allowed to inspect the premises to confirm adherence to the objectives of the Agreement;

iv. The Trust shall become a shareholder in Mphepo Power, which shall hold all rights to developing Wind Energy Facilities on Chewa land identified;

v. A Special Purpose Vehicle (hereinafter referred to as, a "**SPV**") shall be a company limited by shares and incorporated in the Republic of Zambia, which will be used to develop different phases of the overall Project. The Investor and the Trust shall be shareholders. In the event of multiple phases of developing the Project, multiple SPVs may be established by the Investor, and The Trust will have the same rights in these as in the first SPV;

vi. The Parties shall become shareholders in a SPV after being duly incorporated with the Investor holding 90% shareholding and the Trust holding 10%;

vii. This Agreement is entered into in order to stipulate the rights and obligations of the Parties as between themselves arising from or in connection with this Agreement and a SPV. In the event that a SPV is established, the Parties will sign a Shareholders' Agreement.

viii. The Investor has identified potential wind sites with various generating capacities/ capabilities, in particular within the control of the Trust. In order to continue the Development, the Investor requires

land to be made available to a minimum of 100MW generating capacity, and such land as may be required and provided by the Trust as indicated in Annex A of this Agreement, is for the exclusive use and all rights thereto for the Investor;

ix. The Investors plan to carry out certain investment in the area of;

a) Detailed bankable feasibility studies

b) Design, Finance, Construction and Operation of any and all infrastructure required/ provided enabling a Wind Energy Facility with the sole purpose of selling energy in the Republic of Zambia or anywhere in the Southern African Power Pool.

1. DEFINITIONS AND INTERPRETATIONS

For the purposes of this Agreement and the preamble above, unless the context requires otherwise –

"this Agreement"	means this Deed of Agreement and includes its schedules which shall form part of it;
"Articles"	means the Articles of Association of a SPV, when duly in force at such a time in the future as may be necessary including such changes required from time to time;
"Auditors"	means the auditors of a SPV from time to time;
"Business Day"	means any day other than a Saturday, Sunday or official public holiday in the Republic of Zambia.
"Calendar Year"	means a period of 1 (one) year commencing on 1 January and terminating on 31 December immediately following;
"Commercial Operation Date"	means the date the Wind Energy Facility exports energy to from the Wind Energy Facility in return for remuneration in terms of a power purchase agreement.
"Companies Act"	means the Companies Act, Chapter 388 of the Laws of Zambia as amended from time to time;
"Construction"	building, constructing of the Wind Energy Facility;
"Confidential Information"	shall have the meaning ascribed in Clause 8 of the Agreement;
"Development"	means the conceptualising of a feasible Project that will result in a commercially viable Wind Energy Facility.
"Effective Date"	means the date on which this Agreement becomes unconditional by virtue of the fulfilment or waiver (as the case may be) of the Suspensive Conditions;
"International Standards"	standards universally acceptable on an international and global level, examples of such include finance, reporting standards and such other standards as may be deemed necessary to provide adequate assurance that processes in place and in use are in line with the norms and values globally acceptable;
"Material Breach"	means a breach of any of the terms of this Agreement which is material having regard to all relevant circumstances including the nature of the relationship between the Parties and the need for the Parties to maintain the confidence of each other, the nature of the breach including whether the breach was intentional or negligent or otherwise, and the consequences of the breach including the loss or prejudice suffered (including whether such loss or prejudice is actual or potential) by the innocent Party as a result thereof, and "**material term**" and "**material warranty**" shall be similarly

	construed;
"Operation"	the operation of the Wind Energy Facility and associated services for the purpose of exporting energy in return for equitable reimbursement, payment from the relevant authority;
"Parties"	means all the parties to this Agreement and in the case of a Stakeholder;
"Period"	Duration of the validity and enforceability of the Agreement;
"Project"	means the Wind Energy Facility as developed by the Investor / SPV (if applicable in phases).
"Stakeholders"	means the Parties and or community directly impacted by the Project and, where the context so requires includes such stakeholders reasonably considered to be deemed as part thereof.
"Signature Date"	means the date on which this Agreement is signed by signatory signing last in time;
"Transfer"	means any form of delivery or transfer, whether actual or symbolic, resulting in a change of ownership, and includes any underlying contract for any such delivery or transfer including without being limited to any sale, donation or other contract for a disposal or change of ownership;
"Wind Energy Facility"	means infrastructure placed, combined, constructed and operated to create an energy generating facility for the purpose of selling energy in the Republic of Zambia or beyond.
"Writing"	(or words of similar meaning) means legible Writing and in English Only.

1.1. For the purposes of this Agreement, the following rules of construction shall apply, unless the context requires otherwise: -

1.2. a reference to any one gender, whether masculine, feminine or neuter, includes the other two;

1.3. any word or expression defined in, and for the purposes of this Agreement shall if expressed in the singular include the plural and vice versa, and a cognate word or expression shall have a corresponding meaning;

1.4. references to a statutory provision include any subordinate legislation made from time to time under that provision and reference to a statutory provision include that provision as from time to time modified or re-enacted as far as such modification or re-enactment applies, to this Agreement or any transaction entered into in accordance with this Agreement;

1.5. references in this Agreement to "clauses" and/or "schedules" and/or "annexures" and/or "appendices", are to clauses and/or to schedules and/or annexures and/or appendices (as the case may be) to, this Agreement;

1.6. words and expressions defined in any law which is referred to in this Agreement and which are not defined in this Agreement shall, if and in the context of and/or in relation to that law, have the same meanings in this Agreement as those ascribed to them in that law;

1.7. any reference in this Agreement to this Agreement or any other agreement, document or instrument shall be construed as a reference to this Agreement or that other agreement, document or instrument as amended, varied, novated or substituted from time to time;

1.8. any word and expression defined in any clause shall, unless the application of the word or expression is specifically limited to the clause in question, bear the meaning ascribed to the word or expression throughout this Agreement;

1.9. if any provision in a definition is a substantive provision conferring a right or imposing an obligation on any Party then, notwithstanding that it is only in a definition, effect shall be given to that provision as if it were a substantive provision in the body of this Agreement;

1.10. no rule of construction shall be applied to the disadvantage of a Party to this Agreement because that Party was responsible for or participated in the preparation of this Agreement or any part of it;

1.11. the use of the word "including" followed by a specific example/s shall not be construed as limiting the meaning of the general wording preceding it and the eiusdem generis rule shall not be applied in the interpretation of such general wording or such specific example/s;

1.12. if any period is referred to in and related to this Agreement by way of a reference to a number of days or weeks or months or other intervals, the period shall be reckoned exclusively of the first day and inclusively of the last day of the relevant interval, unless the last day falls on a day which is not a Business Day, in which case the last day shall be the next succeeding Business Day;

1.13. any reference to days (other than a reference to Business Days), months or years shall be a reference to calendar days, months or years, as the case may be;

1.14. if the due date for performance of any obligation in terms of this Agreement is a day which is not a Business Day then the due date for performance of the relevant obligation shall be the immediately following Business Day;

1.15. any term which refers to a legal concept or process (for example, without limiting the foregoing, winding-up or curatorship) shall be deemed to include a reference to the equivalent or analogous concept or process in any other jurisdiction in which this agreement may apply or to the laws of which a party may be or become subject;

1.16. words or expressions having a meaning which is similar to any word or expression which is defined in this Agreement shall have the same meaning as the word or expression which is so defined;

1.17. All the headings and sub-headings in this Agreement are for convenience only and are not to be taken into account for the purposes of interpreting it, unless the context otherwise requires the heading or Sub-headings to provide such defining meaning therein.

2. PURPOSE

2.1. This Deed of Agreement serves as a facilitating document towards establishing cooperation between the Trust and the Investor enabling a prosperous business relationship to the benefit of all Stakeholders.

2.2. Further, this Agreement will establish a framework of cooperation between the Trust and the Investor as an intention to actualize the objectives of the investments in the Chewa Kingdom and the resultant benefits that may be derived therefrom.

3. OBJECTIVE

3.1. The Chewa Kingdom of Kalonga Gawa Undi through the Trust is committed to providing exclusively for the limited use of the Investor / SPV, an enabling and conducive environment and access to land and other resources as is required for the Project

3.2. The Investor is desirous to invest in the area as annexed to this Agreement, utilize the said resources and contribute to the wellbeing of the area as far financially practical and in a form of resources and capacity building and enhancement of quality of life of the stakeholders of the area as reasonably practical.

3.3. The Investor is desirous to invest resources to the value of achieving the purpose as indicated and developed in relation to the Agreement.

3.4. The Trust is aware of this investment and confirms it has all the necessary rights over the land, and is exclusively allocating land as indicated within the annexure including such other resources available to the Investor as may be required during the execution of the Project.

4. SCOPE

4.1 The intention of this Deed of Agreement is to encourage structured and formal cooperation between the Parties by having engagements quarterly or annually in assistance to the Kingdom through the Trust in deriving socio-economic benefits from its resources.

4.2 The Trust is fully supportive of the Investor's need to establish a profitable and sustainable business that ensures continued economic returns to the providers of capital.

4.3 The parties will strive to have regular meetings to discuss the investments taking place in the Kingdom and will endeavour to safeguard continued profitability (not limited to monetary benefit) and economic benefit of all relevant Stakeholders.

4.4 The Trust will define in a separate document, benefits to the community expected from the investment determined on the availability of economic capital and such other resources required to achieve including but not limited to the following;

4.4.1 Education, health and environmental/sanitation facilities, infrastructure-roads, rail, communications, power, agriculture and animal husbandry, water resources, housing and accommodation, culture and traditional affairs.

5 RIGHTS OF THE DEVELOPMENT TRUST

5.1 The Trust shall comply with International Standards including such Financial and Governance Standards that are Internationally accepted in the reporting of its use of availed resources.

5.2 The Trust shall become a shareholder in Mphepo Power, and on completion of this agreement, will be issued with 10% shares in this company.

5.3 At the incorporation of a SPV, the Trust shall also be credited with 10% shareholding in a SPV in consideration of its commitments under this agreement to provide land with all its applicable permissions for the Project.

5.4 In the likely event that other Investors will have to be brought on in order for the Project to reach a Commercial Operations Date, both the Trust and the Investor will dilute equally. However, in order to reflect the value of the land, the Trust will not be able to be diluted to under 1.5% of the equity of a SPV.

5.5 The Trust can negotiate additional equity in the Project through negotiating the Zesco tariff higher in order to reflect a higher carried interest. These negotiations shall be the sole responsibility of the Trust and must not unduly hinder the Project.

5.6 The Trust shall have the right of first refusal in respect of any intended sale of any stake of a SPV, as will be bestowed to all shareholders

6 OBLIGATIONS OF THE INVESTOR

6.1 The Investor commits to the following as reasonably possible;

6.1.1 Give preference in employment to the local people with appropriate skills, where appropriate

6.1.2 Provide / enable appropriate training in relation to execution of the Project to the employees of a SPV and or contractors as may be required during Construction and Operation of the Wind Energy Facility

6.1.3 Adhere to the relevant laws including labour laws

6.1.4 Abide by the environmental management laws as enshrined in the Environmental and Pollution Control Act

6.1.5 Create as reasonably practical and within the control of the Investor, safe and healthy environment for the employees and communities affected by the Project

6.1.6 Compensate if necessary the people that will be affected by the investments in accordance with the laws of the land

7 OBLIGATIONS OF THE TRUST

7.1 The Kingdom through the Trust will agree to allocate the necessary area of land as indicated in the Annex A and amended from time to time for the specific and exclusive purpose of this Project and this will not be converted to other uses or speculative purposes. In the event that the land is not utilised for the specific project under this agreement, the land and all attendant rights shall revert to the Trust.

7.2 It is agreed by the Parties that the commercial value of the land is consideration for the rights of the Trust under the agreement.

7.3 The land to be made exclusively available to the Investor will be for a specified period of 25 years in line with the investments, Development time period under this agreement, whereupon the land will revert back to the Trust at the end of such period or the lease will be extended on mutual agreement.

7.4 The Trust will avail access to the resources and an enabling environment to facilitate the investments by the investor.

7.5 The Trust will, within all areas under his control, allow quiet possession and utilisation of the resources allocated to the Investor or SPV without undue interference from the local population and the Trust or its representatives for the duration of the of this Agreement.

7.6 The Trust will ensure that all rights relating to the land (mining, water and other rights) do not limit or hinder the project and its operations.

7.7 The Trust commits to managing the relocation of any individuals affected by the project and manage the costs on behalf of the SPV.

8 CONFIDENTIALITY

8.1 The PARTIES agree that in entering into this Agreement it will be necessary to provide each other with certain Confidential Information relating to the investments and funding provided and that neither party, acting reasonably, shall be obliged to disclose to the other party documentation relating to the investments and funding not intended for release outside such party's organization (other than to its own advisers, consultants and agents)and other disclosure including any potential outside business enterprises shall be allowed by mutual agreement of the Parties.

8.2 For the purposes of this Agreement, "Confidential Information" includes

8.2.1 information or material of whatever nature relating to the investments and funding in the Kingdom which has been obtained by the Investor or the Kingdom in writing or in pictorial, machine readable form;

8.2.2 any analysis, data, plans, compilations, studies or other documents prepared by the Kingdom or the investor, their employees or advisers which contain or otherwise reflect or are generated from any such information as is specified in Clause 8.2.1;

8.2.3 The contents of this Agreement

8.3 In consideration of Confidential Information being made available to each other, the Parties hereby agree that;

8.3.1 They will only use the Confidential Information for the purpose of negotiations with each other in connection with the investments in the Kingdom

8.3.2 They will keep the Confidential Information strictly confidential unless permitted by the other party's prior written consent, and

8.3.3 All the Confidential Information shall remain the property of the party disclosing the same and shall be returned to such party pursuant to their written request

8.4 The confidentiality obligations and undertakings set out in this Agreement shall not preclude the disclosure of Confidential Information:

8.4.1 To an Affiliate;

8.4.2 In connection with any legal or administrative proceedings arising out of or in connection with the investments in the Kingdom;

8.4.3 If required to so by an order of a court of competent jurisdiction;

8.4.4 in pursuance of any procedure for discovering documents in proceedings before any such court;

8.4.5 Pursuant to any law or regulation having force of law;

8.4.6 To the party's auditors and technical, financial or legal advisers;

8.4.7 If necessary to disclose to the Government of the Republic of Zambia in order to properly implement the investments;

8.4.8 If required to do so by any taxing authority or other government authority or competent regulatory, supervisory body to which a party is subject;

8.4.9 if necessary for the purpose of attaining any consent, registration or filing required in connection with the investments subject to prior approval of such disclosure by the party to the agreement

8.5 The confidentiality obligations and undertakings set out in this Agreement do not apply to;

8.5.1 Disclosure of Confidential Information to any of its agents, advisors, directors, employees or contractors who require such Confidential Information to carry out their duties;

8.5.2 Use or disclosure of Confidential Information required to be used of disclosed by law or to the Lusaka Stock Exchange;

8.6 Confidential Information, which comes publicly known other than by a party's breach of sub-paragraph 8.5.1 and 8.5.2.

8.7 The Parties acknowledge and agree that their confidentiality obligations and undertakings under this Agreement shall be continuing and, in particular, they shall survive the termination of this Agreement for a further period of twelve (12) calendar months.

9 MEDIATION AND ARBITRATION

9.1 In the event of any dispute arising out of or relating to this Agreement, or the breach, termination or invalidity thereof then any Party may give notice in Writing to the other Party and or Parties to initiate the procedure set out below.

9.2 The Parties shall first endeavour to settle the dispute by amicably through mediation.

9.3 The Parties may agree on the mediation procedure and on the mediator and failing agreement within 5 (five) days of the notice referred to in clause 9.1, the dispute shall be referred to a single mediator appointed by the President for the time being of the Law Association of Zambia and mediation shall take place in accordance with the applicable mediation rules set out in High Court Rules, Chapter 27 of the Laws of Zambia provided that any mediation settlement reached shall not be required to be registered as required under the said Rules.

9.4 If for any reason, including lack of co-operation by the parties, a dispute is not settled by mediation within thirty (30) (thirty) days of the notice referred to in clause 9.1 or such longer period of time as the parties may agree to in Writing, the dispute shall be settled by arbitration.

9.5 The parties may agree on the arbitration procedure and on the arbitrator and, failing agreement within 5 days of the exhaustion of the period referred to in clause 9.4, the arbitration shall take place in

accordance with the Arbitration Act No. 19 of 2000 and Rules issued thereunder in force at the time of the dispute.

9.6 In the event that the parties fail to agree on the arbitrator in the period referred to in clause 9.5 the appointing authority of the arbitrator shall be the President for the time being of the Zambia Association of Arbitrators.

9.7 The number of mediators shall be one (1) and the number of arbitrators shall be one (1).

9.8 The place of the mediation and the arbitration shall be Lusaka, Zambia.

10 NOTICE AND DOMICILIUM

10.1 The parties choose as their *domicilium citandi et executandi* (addresses for legal processes and notices) for all purposes under this Agreement their respective addresses herein aforementioned

10.2 Any notice or communication required or permitted to be given in terms of this Agreement shall be valid and effective only if it is in writing provided it was delivered to a responsible person during ordinary business hours.

11 MISCELLANEOUS

11.1 Should any provision of this Deed of Agreement become illegal or void for any reason, the validity of the remaining provisions shall not be affected

11.2 Both Parties indemnify, defends and holds the other Parties individually and its officers, directors, successors, permitted assigns and agents harmless from and against all damages, losses or expenses of any kind suffered or paid as a result of any and all claims, demands, suits, penalties, causes of action, proceedings, judgments, administrative and judicial orders and liabilities (including reasonable counsel's fees incurred in any litigation or otherwise) assessed, incurred or sustained by or against the Parties and its successors, permitted assigns and agents to the extent arising out of Parties performance of its obligations under this Agreement.

11.3 This provision shall survive any termination of this Agreement.

11.4 Each party undertakes to procure that each of its affiliates abides by the terms of this Agreement as reasonably practical.

11.5 The parties hereby confirm that they shall abide by the Anti-Corruption Commission Act, Chapter 91 of the 1995 edition of the Laws of Zambia and the OECD Convention on Combating Bribery of Foreign Officials in International Business Transactions or such relevant domestic legislation ratifying the convention and will at all times conduct their business pursuant to this Agreement in a proper and ethical manner and in full compliance with such legislation including complying with all applicable laws, statutes, regulations and codes relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010 (UK), as amended, and the (US) Foreign Corrupt Practices Act, 1977, as amended (the Relevant Statutes") (all together, the "Relevant Requirements"); not engage in any

activity, practice or conduct which would constitute an offence under sections 1, 2 or 6 of the Bribery Act 2010 (UK) if such activity, practice or conduct had been carried out in the UK;

11.6 This Agreement shall be effective from the date of which it is signed by both parties and shall continue in full force and effect unless terminated earlier by the agreement of the Parties in writing;

11.7 Termination of this Agreement shall not affect any rights or obligations of the parties, which may have accrued prior to termination;

11.8 This Agreement may be executed with many number of counterparts and by either party on separate counterparts, each of which when executed and delivered shall constitute an original, and all counterparts shall together constitute but one and same instrument;

11.9 This Agreement may be amended or varied in any respect and at any time by mutual agreement of the Parties in writing.

12 IMPLEMENTATION

This Agreement is open to signature by the two Parties and shall become effective on the date of signing by both Parties.

13 DURATION

This Agreement shall remain in force for a Period of 25 years subject to the renewal thereof.

14 ASSIGNMENT

14.1 This Agreement shall be binding on the Parties hereto and their respective successors and assigns.

14.2 None of the Parties may assign this Agreement or any of its rights and obligations under it unless permitted within this Agreement or as varied from time to time. Permitted assignment includes the transfer within the Parties to the Agreement. This Agreement will be ceded / assigned unconditionally to a SPV after incorporation.

15 TERMINATION

15.1 This Agreement shall come into force on the effective date and shall, subject to termination, remain in force in accordance with Clause 13.

15.2 This Agreement may be terminated by mutual agreement giving 6 months' notice in writing to the each of the Parties including the relevant Stakeholders, such termination in terms of the Agreement shall not take place in the event of objection in Writing received from a relevant stakeholder having indicated valid concerns, and such concerns will be those reasonably accepted by a relevant judiciary appointed to oversee the Project.

16 COUNTERPARTS

16.1 This Agreement may be signed in any number of counterparts, all of which taken together shall constitute one and the same instrument.

16.2 Any Party may enter into this Agreement by signing any such counterpart.

16.3 Any Party may enter into this Agreement by executing any counterpart but this Agreement shall not be effective until each Party has executed at least one counterpart.

17 APPLICABLE LAW

17.1 The validity of this Agreement, its interpretation, the respective rights and obligations of the Parties and all other matters arising in any way out of it or its expiration or earlier termination for any reason shall be determined in accordance with the laws of the Republic of Zambia.

17.2 The parties agree to submit to the exclusive jurisdiction of the Zambian Courts as regards any claim or matter arising in relation to this Agreement.

18 DISPUTE RESOLUTIONS

Disputes that may arise during the course of this Agreement shall be referred to the award of a single arbitrator or mediator in the case of the Parties agreeing upon one, or otherwise to two arbitrators/mediators, with each Party appointing one. The arbitration will be carried out in accordance with Arbitration Act of the Laws of Zambia.

IN WITNESS whereof the Parties have caused their Common Seals to be affixed the day and year first before written

The Common Seal of)
THE CHEWA DEVELOPMENT TRUST REGISTERED TRUSTEES)
was hereunto affixed in the presence of)

Trustee : _____

Secretary : _____

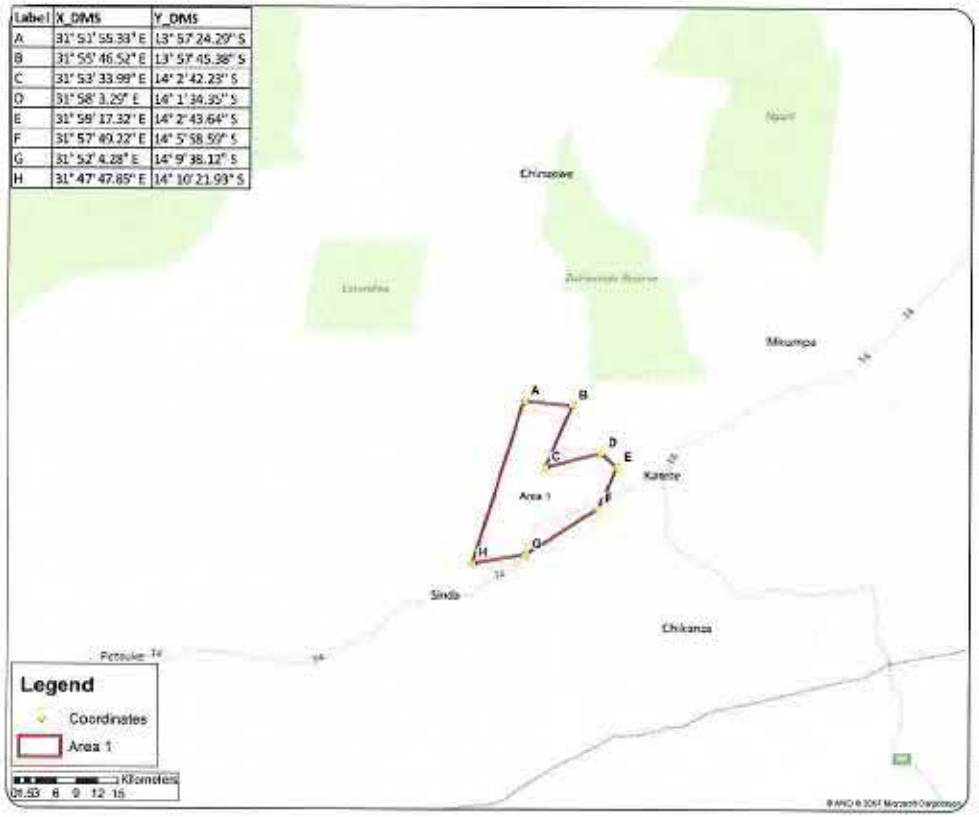
The Common Seal of)
MPHEPO POWER LIMITED)
was hereunto affixed in the presence of)

Director : _____

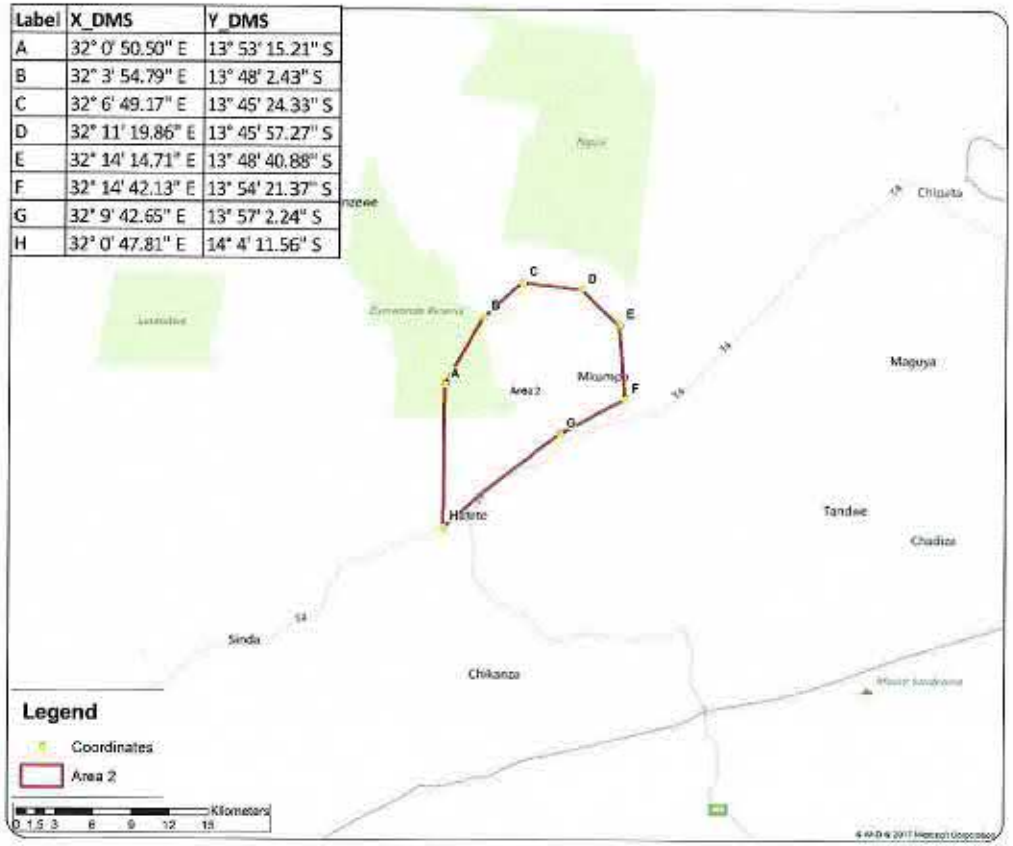
Director : _____

Annex A – Map of Area Identified for Wind Development

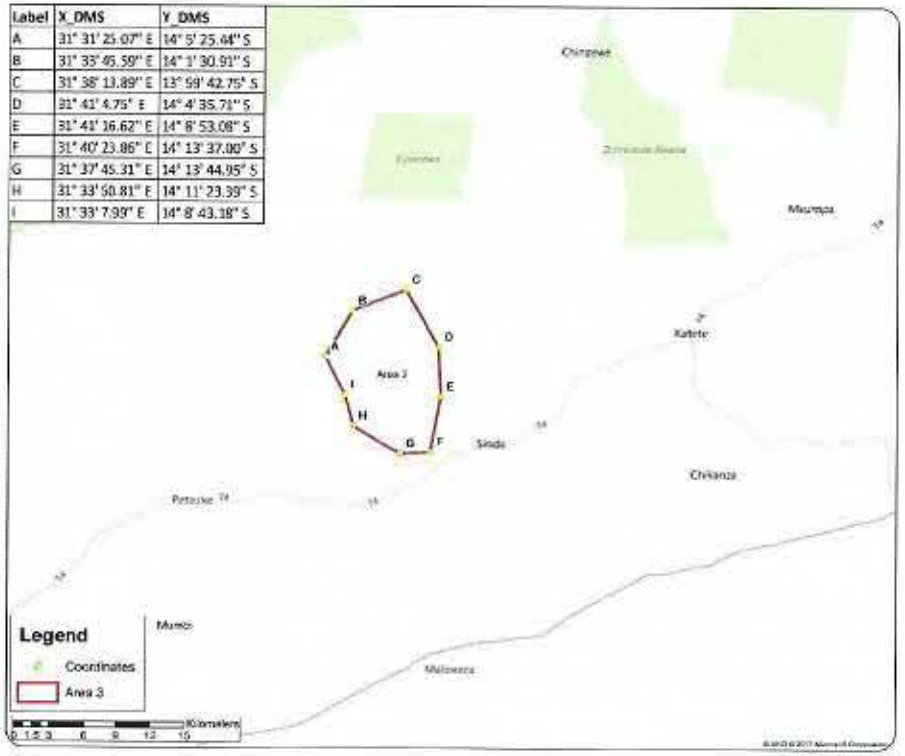
Label	X_DMS	Y_DMS
A	31° 51' 55.33" E	13° 57' 24.20" S
B	31° 55' 46.52" E	13° 57' 45.38" S
C	31° 53' 33.99" E	14° 2' 42.23" S
D	31° 58' 3.25" E	14° 1' 34.35" S
E	31° 59' 17.32" E	14° 2' 43.64" S
F	31° 57' 49.22" E	14° 5' 58.59" S
G	31° 52' 4.28" E	14° 9' 38.12" S
H	31° 47' 47.85" E	14° 10' 21.93" S



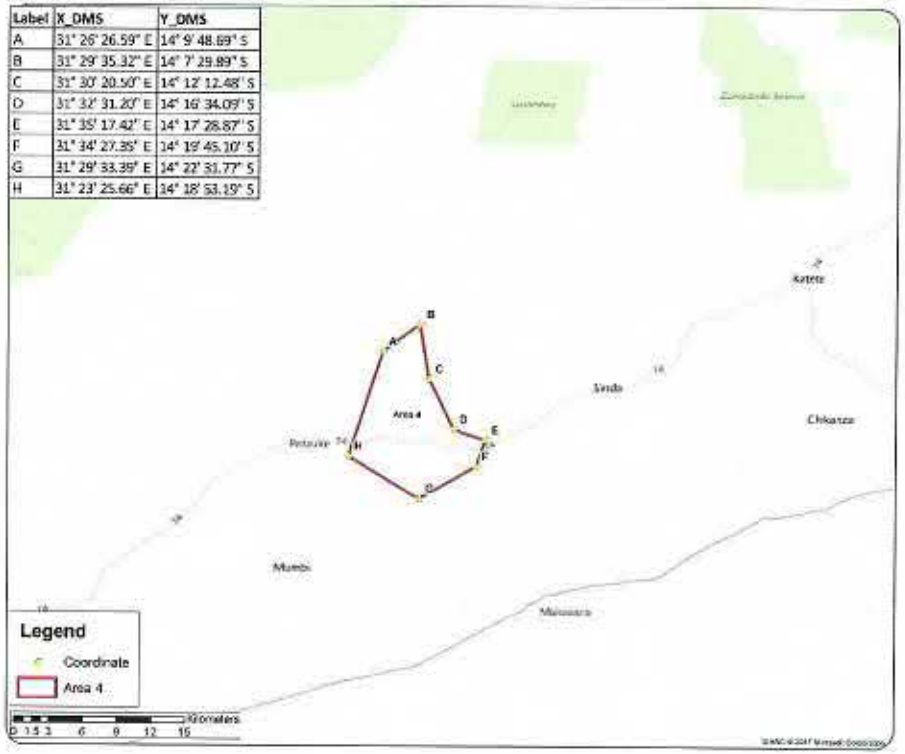
Label	X_DMS	Y_DMS
A	32° 0' 50.50" E	13° 53' 15.21" S
B	32° 3' 54.79" E	13° 48' 2.43" S
C	32° 6' 49.17" E	13° 45' 24.33" S
D	32° 11' 19.86" E	13° 45' 57.27" S
E	32° 14' 14.71" E	13° 48' 40.88" S
F	32° 14' 42.13" E	13° 54' 21.37" S
G	32° 9' 42.65" E	13° 57' 2.24" S
H	32° 0' 47.81" E	14° 4' 11.56" S



Label	X_DMS	Y_DMS
A	31° 31' 25.07" E	14° 5' 25.44" S
B	31° 33' 45.59" E	14° 1' 30.91" S
C	31° 36' 13.89" E	13° 59' 42.75" S
D	31° 41' 4.75" E	14° 4' 35.71" S
E	31° 41' 16.62" E	14° 8' 53.08" S
F	31° 40' 23.86" E	14° 13' 37.00" S
G	31° 37' 45.31" E	14° 13' 44.95" S
H	31° 33' 50.81" E	14° 11' 23.39" S
I	31° 33' 7.99" E	14° 8' 43.18" S



Label	X_DMS	Y_DMS
A	31° 26' 26.59" E	14° 9' 48.69" S
B	31° 29' 35.32" E	14° 7' 29.89" S
C	31° 30' 20.50" E	14° 12' 12.48" S
D	31° 32' 31.20" E	14° 16' 34.09" S
E	31° 35' 17.42" E	14° 17' 28.87" S
F	31° 34' 27.35" E	14° 19' 45.10" S
G	31° 29' 33.39" E	14° 22' 31.77" S
H	31° 23' 25.66" E	14° 18' 53.15" S



12.APPENDIX B: CURRICULA VITAE OF ESIA TEAM

CURRICULUM VITAE

STUART HEATHER-CLARK

TECHNICAL DIRECTOR

Environmental Management Planning & Approvals, Africa

QUALIFICATIONS

MPhil	1996	Environmental Science
BSc (Hons)	1992	Civil Engineering

EXPERTISE

- Environmental and Social Impact Assessment
- Environmental Management Plans/Programmes
- Public Participation & Facilitation
- Environmental & Social Due Diligence
- Environmental & Social Screening & Site Selection
- Training and Capacity Building
- Strategic Environmental Assessment

Stuart has over 23 years of environmental and social consulting experience in Africa. Having worked on over 100 development projects in Africa, his key strength is identifying and managing ESG risks for major capital projects from the concept phase through to the pre-feasibility, feasibility and implementation phases.

Through leading Environmental & Social Screening Studies, Environmental & Social Impact Assessments and Environmental & Social Due Diligences for major capital project in over 13 African countries; Stuart has developed a deep appreciation of key sustainability challenges facing development in Africa. He has excellent project management skills with the ability to manage projects from the concept phase through to project completion.

Stuart has worked for and with a number of IFI's, DFI's and PE firms to identify and managing ESG risks of their investments in Africa. He has an integral knowledge of the Equator Principles and IFC Performance Standards and understands the expectations of lenders and financial institutions when it comes to managing ESG risks.

Stuart has worked across various sectors including O&G, mining, infrastructure and power. Over the past three years he has focussed on the power sector leading projects for wind farms, solar pv farms, hydropower plants and gas to power plants. He has an integral understanding of the Independent Power Producers (IPP) process in South Africa and several other African counties.

PROJECTS

All projects

Environmental and Social Impact Assessment for a 40MW solar PV farm, Globeleq, South Africa (2017)	Project Director for an Environmental and Social Impact Assessment for a 40MW solar PV plant in South Africa. The study included scoping and stakeholder engagement, various specialist studies and the compilation of an ESIA Report and ESMP.
Environmental and Social Impact Assessment for 2 run-of-river Hydropower Plants and associated transmission lines in Northern Zambia,	Project Director for an Environmental and Social Impact Assessment for 2 run-of-river hydropower plants and associated transmission lines on the Kalungwishi River in Northern Zambia. The study included scoping and stakeholder engagement, various specialist studies including environmental flow, heritage, social, biodiversity, visual, noise and other studies. All work was undertaken to IFC Performance Standards. The

Globeleq, Zambia (2017)	project was put on hold after the baseline and Scoping Phase.
Environmental and Social Screening Study for an 212MW HFO Power Plant, Confidential Client, Angola (2017)	Project Director for an Environmental and Social Screening Study for a 212MW HFO Power Plant in Angola. The study included noise and air quality baseline sampling, soil and groundwater baseline sampling, community health screening, and the compilation of a detail legal register and compliance road map.
Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon (2017)	Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon, 2017
Environmental and Social Due Diligence (ESDD) for two Solar PV and two Wind Farm Projects South Africa, Confidential Client, South Africa (2017)	Project Director for the ESDD.
Environmental, Health and Safety Risk assessment of four Solar PV sites in South Africa, Enel Green Power, South Africa (2017)	Project Director for the EHS Risk Assessments.
Environmental and Social Impact Assessment for a 100MW to 250MW solar PV Plant, Globeleq, Zambia (2016-17)	Project Director for an Environmental and Social Impact Assessment for a 100MW to 250MW solar PV plant in Zambia. The study included the analysis of key environmental and social impacts, compilation of an ESIA and ESMP reports and stakeholder engagement.
Environmental and Social Screening Study for a solar PV Plant, Confidential client, Zambia (2016)	Project Director for an Environmental and Social Screening Study for the establishment of solar PV power plant in Zambia. The study included the analysis of key environmental and social risks including regulatory, biodiversity and social risks.
Environmental and Social Due Diligence, Six Solar PV Farms, Confidential Client, South Africa (2016)	Project Director for an ESDD for six solar pv farms is South Africa. The ESDD was undertaken against SA Legislation and Regulations and IFC Performance Standards.
Environmental and Social Impact Assessment for a CCGT Power Plant, ArcelorMittal, South Africa (2016)	Project Director for an Environmental and Social Impact Assessment study for the establishment of a CCGT power plant for ArcelorMittal in Saldanha Bay, South Africa. The ESIA includes detailed specialist studies including air emissions modelling, noise modelling, biodiversity and heritage assessment. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Management Plans, Wind Farm Development, Confidential Client, Kenya (2016)	Project Director and involved in advising the client on various strategies including vantage point bird monitoring and management plan development.
Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast (2016)	Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast, 2016

Environmental and Social Impact Assessment for the Tete-Macuse Railway Line and Macuse Power Development, Italthai, Mozambique (2015-17)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Tete-Macuse railway line and Macuse Port development for the export of coal from Tete Province in Mozambique. The project included the development of over 700km of railway line and a new port development.
Strategic Environmental Assessment for the supporting infrastructure for the Baynes Hydropower Project, Baynes PJTC, Namibia/Angola (2014-15)	Project Director for the Strategic Environmental Assessment of the associated infrastructure for the Baynes hydropower project. The SEA covered the assessment of access roads for construction, transmission lines routing in Angola and Namibia and locations of an airfield.
Cumulative Impact Assessment of the development of numerous hydropower plants on the Kwanza River, Odebrecht, Angola (2014-15)	Project Director for the Cumulative Impact Assessment of the development of a number of hydropower plants on the Cuanza River in Angola.
Environmental and Social Impact Assessment for the Batoka Gorge Hydropower Project, ZRA, Zambia/Zimbabwe (2014-15)	Advisor to the ESIA team undertaking the Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydropower Plant on the Zambezi River below the Victoria Falls. The project includes the construction of a dam wall, hydropower plants, transmission lines and associated infrastructure. The ESIA is being conducted in alignment with the IFC Performance Standards and the World Bank Safeguard Policies.
Environmental and Social Impact Assessment for the Rehabilitation of the Kariba Dam Wall, ZRA, Zambia/Zimbabwe (2014-15)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Kariba Dam Rehabilitation Project. The project includes the rehabilitation of the plunge pool and spillway of the dam wall. The project is being funded by the World Bank, African Development Bank and the EU.
Environmental and Social Due Diligence (ESDD) for a 98 MW wind farm in South Africa, Confidential Client, South Africa (2015)	Project Director for the ESDD.
Environmental and Social Due Diligence (ESDD) for a 2 x 75 MW solar pv farm in South Africa, Confidential Client, South Africa (2015)	Project Director for the ESDD.
Environmental and Social Due Diligence (ESDD) for a 74 MW wind farm in South Africa, Confidential Client (2015)	Project Director for the ESDD.
Environmental and Social Screening Study for a CCGT Power Plant, Confidential Client, South Africa (2015)	Project Director for an Environmental and Social Screening study for the establishment of a gas power plant in Saldanha Bay, South Africa. The screening study outputs included a permitting strategy, environmental opportunities and constraints maps, and input into the site selection process.

Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa (2015-16)	Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Richards Bay in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa, (2015-16)	Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Saldanha in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for LNG Import Terminal in the Port Richards Bay for the Gas to Power Programme, Department of Energy IPP Office, South Africa (2015-16)	Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE's Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for LNG Import Terminal in the Port Saldanha for the Gas to Power Programme, Department of Energy IPP Office, South Africa, (2015-16)	Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE's Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Screening study for the establishment of an CCGT power plant in the Ports of Richards Bay, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Richards Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.
Environmental and Social Screening study for the establishment of an CCGT power plant in the Port of Saldanha, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Saldanha Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.
Environmental and Social Screening study for the establishment of an SCGT power plant in the Ports of Saldanha, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of an SCGT power plant in the Port of Saldanha. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing.
Environmental and Social Impact Assessment for the Burgan Oil Fuel Storage Deport in the Port of Cape Town, Burgan Oil, South Africa (2014-15)	Project Director for the ESIA for the Burgan Oil Fuel Storage Deport in the Port of Cape Town.

Millennium Challenge Account – Malawi: Infrastructure Development Project – Energy Sector (hydropower plants, transmission and distribution lines and substations), MCC, Malawi (2014-15)	Environmental Lead for the Independent Engineer to review all the Contracting Engineers environmental and social studies associated with the Infrastructure Development Project. The project includes the upgrade and development of new power infrastructure including hydropower plants, transmission lines, distribution lines and substations.
Strategic Environmental Assessment of the New Town Integrated Development Zone, TFM Mining, Katanga Province, DRC (2014)	Project Director for the Strategic Environmental Assessment of the New Town Integrated Development Zone undertaken for Tenke Fungurume Mining (TFM) in Katanga Province, DRC.
Environmental and Social Impact Assessment (ESIA) for the Gamsberg Zinc Mine, South Africa, Black Mountain Mine (Vedanta) (2012-13)	Project Director for the Environmental and Social Impact Assessment for a new Zinc Mine in the Northern Cape Province in South Africa. The ESIA includes the assessment of the mine and all associated infrastructure including waste rock dumps, tailing dams, processing plant, transmission lines, a new township development, upgrade of a water pipeline and associated water treatment facilities, and transport options to the Port of Saldanha via both road and rail. The ESIA is being undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act. The process includes various specialist studies, full stakeholder engagement as well as integration with a Biodiversity Off-sets process.
Environmental and Social Impact Assessment for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure, South Africa (2012)	Project Director for the ESIA for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure in the Northern and Eastern Cape, South Africa.
Ore Line Expansion Project for the Sishen-Saldanha Ore Line and Port of Saldanha, various Mining Companies and Transnet, South Africa (2011-2012)	Project Director for the Environmental and Social Screening Study for the Pre-feasibility Phase of the Ore Line Expansion Project. This included compiling a detail Environmental and Social Design Criteria Report together with initial Stakeholder Engagement. A detailed multi-criteria assessment for various port and stockpile options was undertaken. The project included upgrading over a 1000 km of railway line and upgrading the port facilities including stockpiles, stacker-reclaimers, conveyors and ship loading facilities. The stakeholder engagement process was specifically designed to obtain buy-in from stakeholder who were strongly opposed some components of the port and rail expansion.
Strategic Environmental Assessment for the Mozambican Regional Gateway Programme, MRGP, Mozambique, Malawi, Zambia, Zimbabwe (2012)	Project Director for the SEA of the MRGP. The MRGP aims to support the improvement of the Southern African transport (roads, rail and ports), regional infrastructure network, which uses Mozambique as a gateway for international trade. The MRGP geographic scope encompasses the Beira and Nacala Transport Corridors and the respective links to the Maputo and Limpopo Corridors. The SEA identified environmental and social issues that need to be considered in the long terms planning an implementation of the rail and port infrastructure that makes up the Beira and Nacala Transport Corridors.

Strategic Environmental Assessment (SEA) for the coastline of Mozambique, MICOA, Mozambique (2012)	Adviser on the SEA for the coast of Mozambique. The SEA aims to identify potential conflicts between various uses of the coastal zone and to recommend strategic interventions to facilitate sustainable development within the coastal zone. Various users of the coastal zone that are being considered include off-shore oil and gas operations, coastal mining, tourism, conservation and artisanal and industrial fishing.
Environmental and Social Screening Study for port options in Pemba Bay, Anadarko, Mozambique (2012)	Project Lead for an Environmental and Social Screening Study for various port options in Pemba Bay. The screening study includes a multi-criteria assessment of various port locations taking into account marine and terrestrial ecology, social issues, land ownership, legal aspects and physical marine conditions.
Environmental and Social Impact Assessment for a LPG import and distribution facility, Sunrise Energy, South Africa (2011-2012)	Project Director for the Scoping/EIA for a LPG importation, storage and distribution facility which includes a marine offloading facility in Saldanha Bay, a pipeline and a storage facility. The environmental permitting process required the liaison with local and provincial environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
Environmental and Social Screening Study for a Mine development in Angola, Confidential Client, Angola (2011-2012)	Project Director for the Environmental and Social Screening Study for the Concept Phase for a new mine development in Angola. The study included identifying environmental and social risks to the project and costing a full ESIA according to IFC Performance Standards and Equator Principles.
Equator Principles and IFC Performance Standards Training, Vedanta Resources Plc, Zambia (2012)	Lead facilitator of a 5-day training course on the implementation of the Equator Principles and IFC Performance Standards for a number of Vedanta's mining operations across Southern Africa, Europe and Australia.
Environmental and Social Impact Assessment for the upgrade of the Principe Airport, HBD, Principe (2011-2012)	Project Director for the Environmental and Social Impact Assessment for the upgrade of the airport in Principe.
EIA for a 380MW renewable energy facility north of Touwsrivier in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 170MW renewable energy facility east of Touwsrivier in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 670MW renewable energy facility south of Sutherland in the Western and Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process requires the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 500MW renewable energy facility south of Beaufort West in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.

EIA for a 120MW renewable energy facility south east of Victoria West in the Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW wind farm in the Richtersveld, Western Cape (2011)	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 750MW wind farm in the Roggeveld, Western Cape and Northern Cape (2011) **Director**	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW renewable energy facility between Vredenburg and Velddrif in the in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
Environmental and Social Impact Assessment for the Lesotho Highland 150 MW Wind Power Project, Breeze Power, Lesotho (2011)	Project Director for the Scoping Phase of the Environmental and Social Impact Assessment for a 150MW wind farm development in Lesotho. The Scoping Phase included the analysis of available information to identify key environmental and social risks associated with the siting of the wind farm.
Environmental Screening Study for a Wind Farm Development in the Southern Cape, South Africa (2011)	Project Director for the Environmental Screening Study for a wind farm development in the Southern Cape.
Environmental and Social Due Diligence for a Wind Farm Development in Coega, Electrawinds, South Africa (2011)	Project Director for the Environmental and Social Due Diligence for a wind farm development in the Coega.
Environmental and Social Impact Assessment for Venetia Diamond Mine, De Beers, South Africa (2011)	Project Director for the Scoping and ESIA for the proposed new underground mine and EMP consolidation for existing mining activities. The ESIA was undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act.
Environmental and Social Impact Assessment for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2010-2011)	Project Director for the project which includes the assessment of environmental and social impacts associated with dredging over 500km of the Zambezi River. The project includes full stakeholder engagement, coordination of various specialist studies with extensive field work and the integration of all information into an ESIA report and ESMP.
EIA for two solar PV plant development, South Africa (2010)	Project Director of the EIA for the development of two solar PV plants in the Northern Cape and Free State Provinces of South Africa. ERM undertook the required studies to obtain environmental approval for these developments, including specialist studies such as landscape and visual and cultural heritage assessments, and stakeholder engagement.

Basic Assessment for the installation of wind measuring masts on six sites in the Western Cape and two sites in the Northern Cape (2010)	Project Director for the Basic Assessments to install wind measuring masts at eight sites in South Africa. The scope of work included the submission of the application, public participation, preparation of an EMP and submission of the Basic Assessment report.
EIA for a 100MW renewable energy facility north of Velddrif in the in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
EIA for a 300MW renewable energy facility east of Lambert's Bay in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
External adviser and reviewer for an ESIA for a wind farm development in the Eastern Cape, Confidential Client, South Africa (2010)	Adviser and reviewer for an EIA for the development of a wind farm in the Eastern Cape.
Environmental Advisor Environmental and Social Impact Assessment for the Mphanda Nkuwa Hydropower Project in Mozambique (2010)	Advisor for the ESIA for the Mphanda Nkuwa Hydropower Project in Mozambique. The core service was to advise the project team on international standards such as the IFC Performance Standards and World Commission on Dams.
Environmental Sensitivity Study of the Durban Airport Site Expansion Project , South Africa, Transnet (2010)	Project Director for the Environmental Sensitivity Study for the proposed dig-out port currently being considered by Transnet at the Durban International Airport Site. The aim of this assessment was to determine the biophysical, natural and social opportunities and constraints to the development of the dig-out port, as well as provide a strategic overview of the environmental context of the site. In addition, the sensitivity study provided strategic guidance in terms of the environmental due process and licensing requirements with respect to the National Environmental Management Act, and associated legislation.
ESIA for a new high voltage overhead transmission power line in Cameroon, AES Sonel, Cameroon (2007- 2009)	Project Director for the Environmental and Social Impact Assessment and a full Resettlement Action Plan for a new electricity distribution project, comprising a 113km overhead power line, for AES Sonel. As Project Director, Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.
Advisor to the Environmental and Social Impact Assessment for the Baynes Hydropower Project in Namibia and Angola (2009)	Project Advisor for the Environmental and Social Impact Assessment for the proposed Baynes Hydropower Project on the Kunene River. The ESHIA process is being conducted in accordance to the Angolan EIA Regulations, the Namibian EIA Regulations, the World Bank Safeguard Policies and the IFC performance standards.
Environmental and Social Impact Assessment for the upgrade of a 1100 km railway line in South Africa, Transnet (2008- 2009)	Project Director for the Environmental and Social Impact Assessment for the upgrade of a commodities railway line across South Africa. The project included a number of specialist studies, managing subcontractors, interfacing with the railway engineering team, report writing, managing an extensive stakeholder consultation process, client liaison and management of project finances.

Environmental and Social Impact Assessment for the services corridor associated with the development of a greenfield CTL Plant, Sasol, South Africa (2009)	Project Director for an ESIA of a services corridor to support the development of a greenfield CTL plant development in South Africa. The ESHIA process was conducted in accordance to the South African EIA Regulations and the IFC performance standards.
Environmental and Social Impact Assessment for 2D seismic exploration project in the Rovuma Basin, Petronas, Mozambique (2009)	Project Director for the ESIA for the offshore seismic exploration activities in Blocks 3 & 6, situated in the Rovuma Basin off the coast of Mozambique. The exploration activities comprise 2D seismic surveys in deepwater.
Environmental and Social Screening Study for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2009)	Project Director for the project which included the assessment of environmental and social risks associated with dredging over 500km of the Zambezi River. The project included reviewing existing information, mapping key sensitivities and facilitating a specialist workshop in order to develop Terms of Reference for detailed baseline studies that will be required should the project proceed to a full ESIA.
Equator Principled and IFC Performance Standards Review and Training, African Housing Solutions, South Africa (2009)	Lead reviewer for the ESIA and Resettlement Policy Framework, for a housing development in Nigeria, against the Equator Principles and IFC Performance Standards. Mr Heather-Clark was responsible for reviewing the ESIA Report and for presenting a 2 ½ day training course on the Equator Principles and IFC Performance Standards.
Environmental Assessment for the dredging and disposal of dredge spoil at the Port of Saldanha, Transnet, South Africa (2008)	Project Director for this project and was responsible for guidance of technical studies which included dredging studies and marine sediment contamination characterization. The study included the assessment of dredge spoil dumping alternatives. Stakeholder engagement included an important component of the project.
Environmental and Social Screening Study, Port of Saldanha, Transnet, South Africa (2008)	Project Director for the screening study which included an assessment of alternative berth options for the export of iron ore at the iron ore terminal at the Port of Saldanha, South Africa. The work included ongoing interaction with the port engineering and design teams, together with stakeholder engagement.
ESIA for an Early Production System (EPS) and Power Plant for Kaiso-Tonya Area, Exploration Area 2, Tullow Uganda Operations Pty Ltd, Uganda (2007-08)	Project Director for the project which included a full ESIA for an Early Production System and associated Power Plant in the Kaiso-Tonya area on the banks of Lake Albert, Uganda. The intent of the project is to produce oil (and small amounts of gas) which will be converted into electrical power and distillate products (kerosene and diesel) for consumption within Uganda. The electrical power will be fed into the main grid supplementing the Ugandan electrical power grid while the distilled products (diesel and kerosene) will be used to displace the currently imported fuels. The ESIA included a detailed assessment of alternative sites for the proposed EPS and power plant, together with various environmental and social baseline studies and stakeholder engagement.
ESIA monitoring studies for Sasol's Off-shore gas exploration activities in Inhambane and Sofala Provinces, Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2007-08)	Project Director for an environmental monitoring survey programme for Sasol's offshore hydrocarbon exploration activities. Monitoring studies included seismic noise modelling and monitoring, dugong surveys, artisanal fish catch monitoring, coral reef surveys and monitoring, sea turtle monitoring and tourism monitoring.

Strategic Environmental and Social Overview and ESIAs for offshore exploration well drilling activities in Blocks 2 and 3A, Lake Albert, Uganda. Tullow Oil Plc and Heritage Oil and Gas Limited (2006- 2008)	Project Director for this project. The project involved undertaking a strategic overview study of Lake Albert that provided background information on the limnological (physical, chemical and biological) features of the lake as well as environmental and socio-economic resources (such as nature reserves, tourism nodes, prime fishing areas etc). It also presented areas of environmental risk and opportunity associated with oil explorations on, and immediately adjacent to, the lake. The strategic overview provided a framework within which ESIAs were undertaken for the offshore drilling project. A site selection study was undertaken for onshore support infrastructure. Baseline studies included shoreline sensitivity mapping, oil spill modelling, water and sediment quality surveys, fish and fisheries surveys, socio-economic surveys and terrestrial ecology surveys. An extensive public participation process was undertaken as part of the ESIAs.
Environmental and Social Baseline Assessment for a green fields coal mine and CTL plant development, Sasol, South Africa (2008)	Project Director the environmental and social baseline studies to support the evaluation of sites for potential development of a green field's coal mine and associated CTL Plant in South Africa. Mr. Heather-Clark has assisted with review and quality control of the various baseline studies.
Development of guideline document for the integration of environmental and social issues into the project lifecycle for mine development, De Beers, South Africa (2008)	Team member of the project team that assisted the client in developing a detailed guideline document for the integration of social and environmental issues into mine planning. This included all phases of the planning process from Concept through to Pre-feasibility, Feasibility and Implementation. Mr Heather-Clark, as lead facilitator, presented a 2 day training course on these guidelines, to mine planners and engineers.
EIA for a Metal Recovery Plant and Slag Crushing, Screening and Weathering facility at Arcelor Mittal Saldanha Works, MultiServ, South Africa (2007 – 2008)	Project Director for the EIA, including a public consultation process and the following specialist studies: air quality, groundwater, noise impact assessment, botanical and archaeology studies and a traffic impact assessment. Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.
Implementation of the Equator Principles for Standard Bank's Project Financing Processes, Standard Bank, South Africa (2008)	Lead facilitators for Equator Principles and IFC Performance Standards training to assist Standard Bank in adopting the Equator Principles. An assessment system (based on the IFC Performance Standards) to link with Standard Bank's project finance transaction life-cycle was developed. This involved the development of "tools" and guidance documents to form a system, together with training on the use of the system for all project finance staff.
Comparative review of EIAs undertaken by ERM globally for electricity utilities, Eskom, South Africa (2007)	Project Director for this project. The project included research to provide Eskom with an overview of different EIA governance systems and approaches to managing EIAs in other countries, as well as identifying trends in EIA practice.
Environmental and Social Screening and Qualitative Risk Assessment Western Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Saldanha, Port of Cape Town and Port of Mossel Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.

Environmental and Social Screening and Qualitative Risk Assessment Central Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of East London, Port of Port Elizabeth and Port of Ngqura. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
Environmental and Social Screening and Qualitative Risk Assessment Eastern Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Durban and Port of Richards Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
EIA of the Moatize Coal Mine and associated railway line and deep water port infrastructure, CVRD, Tete Province, Mozambique (2006-2007)	Project Coordinator and Cost Controller on this project. ERM was commissioned by CVRD, a Brazilian Mining Company, to undertake environmental studies related to the green fields development of a coal mine in Tete Province, Mozambique. The project included the development of a power plant, railway line and port for the export of coal.
Corporate Social Responsibility Strategy development for a leading South African retailer, South Africa (2006)	Lead facilitator for this project. The project involved identifying and prioritising the company's sustainability issues and defining a strategy to address these issues. The process was driven by the need for the company to be listed on the Johannesburg Stock Exchanges SRI Index.
Research project on the effects of water scarcity on the fresh produce supply to a major South Africa retailer, South Africa (2006)	Project Leader coordinated a group of researchers to identify water scarce areas and to plot these against the location of fresh produce suppliers for a major retailer in South Africa. This researched form a core component of the companies Sustainability Strategy.
Independent Environmental Advisers to the Financing Parties of the Gautrain Rapid Rail Link project, Bowman Gilfillan (2006)	Independent Environmental Advisers to the Financing Parties, provided review and advisory services through Bowman Gilfillan on Environmental Management Plans for the Gautrian Rapid Link project.
ESIA for seismic surveys and exploration well drilling and testing in Blocks 16 and 19 off the coast of Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2005 – 2006)	Project Manager for the ESIA which involved undertaking an ESIA and compiling EMPs for offshore exploration activities in Blocks 16 & 19, situated to the east of the Bazaruto Archipelago National Park, off the coast of Mozambique. The exploration activities comprised 2D and 3D seismic surveys in deepwater and shallow water as well as exploration well drilling and testing activities.
EIA for the upgrade and expansion of the existing sinter plant at Vanderbijlpark, ArcelorMittal, South Africa (2006)	Project Director for the EIA and stakeholder engagement process to meet South African requirements. This included coordination of the technology review, air quality, health and waste management specialist studies and compilation of the integrated Scoping and EIA Report.
Review of Sustainability Report and Sustainability Management System, Confidential, South Africa (2004)	Lead reviewer of the Sustainability Report of a leading retailer in South Africa and providing adhoc advice on sustainability issues. This included compiling a monthly news letter to staff on relevant sustainability issues facing the retail industry in South Africa.

EIA of a proposed expansion of the Container Terminal Stacking area at the Port of Cape Town, National Ports Authority, South Africa (2003-2004)	Project Manager for this EIA. The project included the expansion of the Cape Town container terminal into the sea though dredging 1 million m3 of material for reclamation. The project included a detailed study on alternative sources for fill material and other studies which focused on marine archaeology, coastal erosion, marine hydrodynamics and water quality, visual, noise and traffic. The EIA included full stakeholder engagement throughout the EIA process.
Environmental Site Suitability Study for a manganese smelter, Asia Minerals Limited (2004)	Part of the project team that undertook a preliminary site selection process for a manganese smelter by identifying key environmental and social issues for potential sites within Southern Africa. Sites included the Belualane Industrial Park (Mozambique) and Richards Bay, the Coega Industrial Development Zone (IDZ) and Saldanha (South Africa).
DFID funded project to assess progress towards meeting the water relater targets of the Millennium Development Goals, DIFD, Zambia (2004)	Country Coordinator for Zambia on this project. The project included detailed stakeholder surveys secondary data analysis to establish the countries progress towards meeting the Millennium Development Goals, specifically related to water supply and sanitation.
Roll-out of ISO14001 and OHSAS18001 management systems to 2 industrial sites in South Africa, Confidential, South Africa (2004)	Project Manager responsible for undertaking ISO14001 training at two industrial sites. The project formed part of a global initiative to have several industrial sites throughout Africa and Europe ISO14001 certified.
Strategic Environmental Assessment (SEA) for the Port of Cape Town, National Ports Authority of South Africa, South Africa (2003)	Project Manager for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port planning was supported by city planning and visa-versa.
Strategic Environmental Assessment (SEA) for the Port of Richards Bay, National Ports Authority of South Africa, South Africa (2003)	Project Adviser for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port planning was supported by city planning and visa-versa.
E&S Due Diligence of the Phase 2 Maputo Port Revitalisation and Rehabilitation Project, Standard Corporate Merchant Bank, Mozambique (2003)	Environmental Adviser to the Standard Corporate Merchant Bank for the review of the EIA and Risk Assessment studies undertaken for the Phase 2 Maputo Port Revitalisation and Rehabilitation Project. The EIA was reviewed against the Mozambican and International Best Practice guidelines and detailed recommendation made on how to manage the environmental risks associated with the revitalisation project.
National Oil Spill Contingency Plan for Cameroon, funded by the World Bank, Cameroon Government, Cameroon (2003)	Part of the team that compiled a comprehensive Oil Spill Contingency Plan for Cameroon (OSCP). The OSCP form a core component of the Chad Cameroon Pipeline and included contingency plans for both on land and marine based spills. The OSCP was compiled according to the IPEACA guidelines and was reviewed by the World Bank.
EIA/SEA Capacity Building, Environmental Public Authority (EPA), State of Kuwait (2003)	Lead facilitator for a 2 day training course on SEA and EIA for the Environmental Public Authority (EPA) of the State of Kuwait.

Training Workshop on Strategic Environmental Assessment for South Eastern Africa and the Western Indian Ocean Island States, SEACAM, Mozambique (2003)	Lead course facilitator for the SEA training course funded by SEACAM. The training course included the principles of SEA, SEA process and case studies of SEA's in Southern Africa.
Improving the Effectiveness of EIA and the Potential of SEA in Southern Africa: Case Study on SEA of the National Commercial Ports Policy and SEA for the Port of Cape Town, World Bank/SAIEA, Namibia (2003)	Presenter of two case studies on SEA at a regional workshop funded by the World Bank and SAIEA.
Environmental Impact Assessment for the Eskom SABRE-GEN wind turbine test facility, Eskom, South Africa (2002)	Project Manager for the EIA. The EIA included stakeholder engagement throughout the process and included the following specialist studies: visual assessment, bird strike modelling and noise assessment.
Strategic Environmental Assessment: Scoping Phase Port of Richards Bay, National Ports Authority of South Africa, South Africa (2002)	Project Leader and integrative writer for the Scoping Phase of the SEA for the Port of Richards Bay. This phase included detailed stakeholder consultation to identify opportunities and constraints to long term port development at the Port of Richards Bay.
White Paper on National Commercial Ports Policy, National Ports Authority, South Africa 2002	Lead reviewer of the White Paper on National Commercial Ports Policy for South Africa. The review focussed on the integration of environmental and social issues into the port planning process. Mr Heather-Clark made a formal submission and presentation to the Portfolio Committee on Transport in the South African Parliament.
Environmental Liability and Risk Assessment for the Multi-Purpose Terminal at the Port of Saldanha, National Ports Operations, South Africa (2002)	Project Manager for the project. The purpose of the project was to identify key environmental risks associate with the material handling at the Multi-Purpose Terminal at the Port of Saldanha.
Environmental Overview of South Africa's major ports with special reference to future container terminal development, National Ports Authority Container Terminal Strategy, National Ports Authority, South Africa (2002)	Project Manager for the comparative assessment of the relative environmental sensitivity of the seven commercial ports in South Africa with reference to future container terminal development. The study included a detail review of secondary environmental information of all the ports, the identification of specific environmental criteria and the use of these criteria to rank each port in terms of its sensitivity to future container terminal development.
Review of the EIA undertaken for the Maputo Port Privatisation and Rehabilitation Project, Development Bank of Southern Africa (DBSA), South Africa (2002)	Environmental Adviser to the Development Bank of Southern Africa to review the Phase 1 EIA for the Maputo Port Privatisation and Rehabilitation Project. The review was undertaken against the Mozambican EIA Regulations and International Best Practice.
Oil Spill Contingency Plan, Agip Angola oil operations, Angola, (2002)	Team member of the team to develop an oil spill contingency plan according to the IPEICA International Guidelines.

Ecologically Sustainable Industrial Development Programme, United Nations Industrial Development Organisation (UNIDO), Tanzania (2002)	Team member of the project team appointed to review the Industrial Development Strategy for Industrial Development in Tanzania. The focus of the project was to integrate environmental and social issues into the programme.
Environmental Audit and Assessment of the Socio-economic Impacts of the Trans-Kgalagadi Highway, Botswana, Development Bank of Southern Africa, Botswana (2002)	Lead reviewer of the EIA and EMP implementation for the Trans-Kalagadi corridor in Botswana. The review included site visits, detailed interviews and review of secondary data and records.
World Bank EIA Project Management Training Course, World Bank/SAIEA, Zambia (2002)	Lead facilitator for the 5 day EIA Project Management Training Course. The course was presented to 20 African delegates from southern Africa. The course focused on the practical aspects of EIA project management including budgeting and scheduling an EIA, contract negotiations with clients, managing specialist studies, managing the public participation phase and compiling an integrated EIA report. The course formed part of a Southern Africa capacity building initiative lead by the SAIEA.
Environmental screening study for the establishment of a deep-water port at Ponta Dobela, Confidential Client, Mozambique (2001)	Team member of the project team who undertook a screening study to identify environmental, social and economic issues and show stoppers associated with the development of a deep-water port on the coast on Mozambique.
ESIA of the proposed seismic survey in licence area 2814a on the continental shelf of Namibia, Shell Exploration and Production Namibia B.V., Namibia (2001)	Team member of the ESIA for the offshore seismic exploration project. The ESIA included all issues associated with seismic surveys including seismic noise impacts on marine mammals, oil spill modelling and general environmental management issues.
Environmental Impact Review for the abandonment of the Cuntala Well Protector Platform off the coast of Angola (Block 2), Texaco Panama Inc., Angola (2001)	Team member of the project team who developed a decommissioning plan for a well protector platform off the coast of Angola.
Legal, Technical and Economic Feasibility Study for the Commercialisation of the SSF Association Milnerton Tank Farm and its links to the Port of Cape Town, SFF, Cape Town (2001)	Project Manager for this project.
ESIA of the Phase 2 expansion of the Mozal Aluminium Smelter and Matola Port Terminal in Maputo, BHP Billiton, Mozambique (2000-2001)	Project Manager and integrative writer for this ESIA. The EIA included an assessment of the expansion of the port terminal at the Port of Matola and a review of the Phase 2 expansion of the aluminium smelter. All reports together with the EIA process were reviewed and approved by the International Finance Corporation (IFC).
Scoping Phase of the Environmental Impact Assessment for the expansion	Project Manager for the EIA for the expansion of the container terminal at the Port of Cape Town. The project included the dredging of 1 million m3 dredge material to provide fill for the expansion of the port. Specialist studies that were required

of the Container Terminal at the Port of Cape Town, Portnet, South Africa (2000)	included coastal dynamic modelling, hydrodynamic modelling to assess water quality issues associated with dredging, marine archaeological issues, marine ecology issues, traffic, visual and noise.
Strategic Integrated Port Planning, Port of Saldanha, Transnet (1998)	Project Manager for the Strategic Integrated Port Planning process for the Port of Saldanha. The process culminated in the first Port Development Framework for the Port of Saldanha which integrated environmental and social issues into the port planning process. It included the identification and inclusion of environmental and social opportunities and constraints into the future port planning and development.
Environmental Impact Assessment for the PPC Slag Grinding Mill within the Saldanha Steel Complex, PPC (1998)	Project Manager for the EIA for PPC slag grinding mill. The EIA included a number of specialist studies and comprehensive stakeholder engagement.

MEMBERSHIPS	
CEAPSA	Certified as an Environmental Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa (2006)
IAIAsa	Member of the International Association for Impact Assessment South Africa
IAIA International	Member of the International Association for Impact Assessment

PUBLICATIONS	
	Sep 2007: Co-author of case study for IIEDs 'User Guide' to effective tools and methods for integrating environment and development. South African case study: Role of environmental and social screening in informing the conceptual design and planning of large-scale projects in the pre-feasibility stage.
	Aug 2003: Author of a case study on the SEA for the Port of Cape Town, contained in "The Status and Potential of Strategic Environmental Assessment" by Barry Dalal-Clayton and Barry Saddler, DRAFT 17 September 2003.
	March 2002: Strategic Integrated Port Planning: Moving from EIA to SEA. International Conference on Coastal Zone Management and Development, Kuwait 18 to 20 March 2002.
	Nov 2000: Sustainable Port Development: Report on the preparatory seminar for Africa. 7th International Conference of the International Association for Cities and Ports, Marseilles – France.
	Mar 2000: The development of Strategic Environmental Assessment in South Africa: Journal of Impact Assessment and Project Appraisal, Vol 18, Number 3, pg 217-223. September 2000.
	April 1999: Integrating environmental opportunities and constraints into Port Planning, Development and Operation. 5th International Conference on Coastal and Port Engineering in Developing Countries, Cape Town, 19 to 23 April 1999.

CURRICULUM VITAE

CONROY VAN DER RIET

SENIOR ENVIRONMENTAL CONSULTANT

Environmental Management, Planning & Approvals, South Africa

QUALIFICATIONS

BSc (Hons)	2006	Environmental Geography
BSc	2005	Zoology and Geography

EXPERTISE

- EHS Compliance and Support
- Environmental and Social Due Diligence Assessments
- Environmental Site Assessments
- Environmental and Social Impact Assessments
- Management Plans/Programmes
- ISO 14001, OHSAS 18001 and ISO 45001 Management Systems
- International Finance Corporation (IFC) management systems, reviews and audits

Conroy has more than twelve years of experience as an Environmental, Health and Safety (EHS) consultant in the following areas: Environmental & Social Management Systems (IFC Performance Standards), ISO 14001 and ISO 45001 management systems, Environmental and Social Due Diligence assessments (ESDDs), Environmental, Health and Safety (EHS) auditing and compliance support, Environmental and Social Impact Assessments (ESIAs), Environmental Site Assessments (ESAs), Management Plans/Programmes and project management across a wide range of projects, with focus on the renewable energy, agricultural, oil & gas, mining, power, food & beverage and manufacturing sectors. Conroy has formed part of and led multi-disciplinary teams on projects all over Sub-Saharan Africa, including South Africa, Angola, Botswana, Burundi, Egypt, Ghana, Kenya, Mali, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

PROJECTS

	Oil and Gas
Seplat Petroleum Development Company Plc, Integrated Management System Development, Nigeria, (2018)	Lead Developer to develop an integrated environmental, health and safety management system for Seplat Petroleum Development Company Plc based on the requirements of ISO14001:2015 and ISO45001:2017.
Confidential Client, Environmental & Social Due Diligence, Nigeria, (2017 and 2018)	Conroy was part of team appointed to conduct an Environmental and Social (E&S) Due Diligence assessment of an oil and gas company located in the Niger Delta during 2017 and 2018. This included an assessment of a gas production facility and associated pipelines (upstream and downstream).

Chevron, Safety Performance Improvement, South Africa (2013)	Conroy was part of the team commissioned by Chevron to undertake a Safety Transformation Programme at the refinery located in Cape Town, South Africa. Duties consisted mainly of Leadership Alignment Diagnostic Assessments, Safety Leadership Training and Hazard Recognition and Effective Interventions. The Diagnostic Assessments involved working with the refinery leadership team to assess how they are managing safety in the field. Safety Leadership Training involved highly motivational training sessions for leaders, which create a strong imperative for action by focusing on the absolute criticality of their role in directing the behaviours of their people. Hazard Recognition and Effective Interventions in the Field for Leaders involved sessions with leaders to provide strong motivation at all levels to spend more time in the field and to transform the value they (and the organisation) derive from the time they spend there. The sessions consisted of classroom and field activities.
Chevron Marketing and Retail, EHS Compliance, Angola, Botswana & South Africa (2012-2014)	Conroy was part of the team development of a complete legal compliance register with verification controls to assist the management team ensure the sustainability of compliance at downstream facilities located in Angola, Botswana and South Africa.
Odebrecht Due Diligence Assessment, Ghana (2014)	Lead Assessor commissioned by Odebrecht to conduct a due diligence assessment of a site located in Ghana. The assessment consisted of a desktop review of a potential site to be acquired by Odebrecht.
Goodyear SA, Installation of Underground Storage Vessels, South Africa (2007)	Conroy was a project manager for Management of the EIA process for the proposed installation of underground storage vessels at the Goodyear SA factory in Uitenhage, Eastern Cape
Pragma Africa (Pty) Ltd Removal of Underground Storage Vessels, South Africa (2007)	Conroy was a project manager for Management of the EIA process for the removal of underground storage vessels.
	Power
Mphepo Power Limited, Unika Wind Farm (Phase 1), Environmental and Social Impact Assessment, Zambia (2019)	Conroy is currently leading the Environmental and Social Impact Assessment Process for the Unika Wind Farm (Phase 1) Project in Zambia (in collaboration with local consultants DH Engineering Consultants Ltd). This Project involves the proposed development of one of the first major wind farms in Zambia and will have a capacity of up to 200 MW (for Phase 1).
Confidential Client, Environmental & Social Due Diligence, South Africa (2019)	Lead Auditor appointed to conduct an Environmental and Social (E&S) Due Diligence assessment of a renewable energy holding company involved in a pipeline of hydro-electricity and rooftop solar projects throughout South Africa.
Globeleq, Environmental and Social Management Plan, Zambia (2019)	Conroy developed an Environmental and Social Management Plan (ESMP) in line with the IFC Performance Standards for the Aurora Solar One Solar PV Plant located near Kafue, Zambia.
Confidential Client, Environmental & Social Due Diligence, Burundi (2018)	Lead Auditor appointed to conduct an Environmental and Social (E&S) Due Diligence assessment of a solar PV project located in Burundi.

Enel Green Power, Baseline EHS Risk Assessments, South Africa (2018)	Conroy was a lead auditor appointed by Enel Green Power to conduct baseline EHS risk assessments at a number of solar and wind power facilities located throughout South Africa.
Enel Green Power IFC Environmental and Social Management System, Zambia (2018)	Conroy was part of the team appointed to develop an ESMS in line with IFC Performance Standards for the Ngonye solar project located in Zambia. This also include the development of some operational management plans including, but not limited to, an environmental and social management plan, external grievance mechanism, storm water management plan, waste management plan, security management plan, traffic management plan and stakeholder engagement plan
Confidential Client, Environmental & Social Due Diligence, South Africa (2017)	Lead Auditor was appointed to conduct an Environmental and Social (E&S) Due Diligence assessment of three run-of-river hydropower projects located in South Africa
Confidential Client, Environmental & Social Due Diligence, South Africa (2017)	Lead Auditor to conduct an Environmental and Social (E&S) Due Diligence assessment of an operational solar PV project located in the Northern Cape, South Africa.
Confidential Client, Environmental & Social Due Diligence, South Africa (2017)	Lead Auditor to conduct an Environmental and Social (E&S) Due Diligence assessment of a proposed solar PV project located in South Africa. The main purpose was to assess compliance of the assets' environmental and social management with the client's requirements, and to identify and assess E&S risks associated with the opportunities that may pose a liability or risk.
Globeleq, IFC Environmental and Social Management System, Nigeria (2017)	Conroy was a developer to develop an ESMS in line with IFC Performance Standards for the Bauchi solar project located in Nigeria. This also include the development of operational management plans including, but not limited to, an environmental and social management plan, health and safety plan, waste management plan, water resources and waste water management plan, labour management plan, traffic management plan and stakeholder engagement plan.
Confidential Client, Environmental and Social Monitoring, South Africa (2017)	Conroy was part of a team appointed to act as an independent third party reviewer of the annual environmental and social monitoring reports compiled for the Medupi and Kusile power stations on behalf of an investor.
Confidential Client, IFC Environmental and Social Management System, South Africa (2016)	Developer appointed to develop an Environmental and Social Management System (ESMS) in line with IFC Performance Standards for two solar photovoltaic (PV) plants located in South Africa. Elements of ISO14001 and OHSAS18001 were also incorporated into the ESMS. The project also included the development of Stakeholder Engagement Plans and training on the ESMS.
ENCO, Environmental & Social Due Diligence, South Africa Koeberg Nuclear Power Plant (2016 & 2017)	Conroy was part of the team appointed by ENCO to conduct an Environmental and Social (E&S) Due Diligence assessment of a project related to the Koeberg Nuclear Power Plant.
Investment Managers, IFC Environmental and Social Management System, Kenya, African Infrastructure (2015)	Developer appointed to develop an ESMS in line with IFC Performance Standards for the Kipeto Wind Energy project located in Kenya. Elements of ISO14001 and OHSAS18001 were also incorporated into the ESMS.

Confidential Client, IFC Review, Burundi, Kenya, Namibia & Tanzania (2016)	Conroy was part of the team appointed to conduct a review of the four renewable energy projects in order to assess alignment with the IFC Performance Standards, and to inform the Project Categorisation in terms of the Equator Principles and the IFC Performance Standards.
Confidential Client, Environmental & Social Due Diligence, South Africa (2016)	Conroy was part of the team appointed to conduct an Environmental and Social (E&S) Due Diligence assessment of six renewables assets (solar PV plants) located in South Africa. The main purpose was to assess compliance of the assets' environmental and social management with the client's requirements, and to identify and assess E&S risks associated with the opportunities which may pose a liability or risk.
Confidential Client, Environmental & Social Due Diligence, South Africa (2016)	Conroy was part of the team appointed to conduct an E&S Due Diligence assessment against the IFC performance Standards for a Concentrated Solar Plant (CSP) project located in the Northern Cape, South Africa.
Avon & Dedisa Peaking Power, ISO 14001 Environmental Management System, South Africa (2015)	Developer appointed to develop an Environmental Management System in accordance with ISO 14001 for two peaking power plants located in South Africa.
CEC, Development of Environmental and Social Management System, Zambia and Nigeria (2014)	Conroy was part of the team commissioned to assist Copperbelt Energy Company (CEC) in developing Environmental and Social Management System in line with the IFC Performance Standards, focussing on hydropower generation projects in Zambia and Nigeria, and electricity distribution projects in Nigeria.
	Mining
Dundee Precious Metals, Tsumeb, Environmental and Social Impact Assessment, Namibia (2019)	Conroy assisted in updating the Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP) and various specialist reports for the proposed expansions project for the Tsumeb mine in Namibia. The main objective was to align the reports with the European Bank for Reconstruction and Development (EBRD) Performance Requirements.
Confidential Client, Environmental & Social Due Diligence, Mali (2019)	Conroy conduct a high level desk top based Environmental and Social (E&S) Due Diligence of a gold mine where the client wanted to develop a solar project to provide power to the mine.
Debswana, Feasibility Studies and Management Plans, Botswana (2018)	Conroy was part of the team to develop various feasibility studies and management plans for the proposed expansion of the Jwaneng diamond mine located in Botswana. Conroy was specifically responsible for developing the waste management plan, hydrocarbon management plan, hazardous substance management plan and a contractor SHE plan.
Confidential Client, Environmental & Social Due Diligence, South Africa (2016)	Conroy was part of the team appointed to conduct an E&S Due Diligence assessment of a coal mine.

BASF Supplier (Mine), Third Party Audit Programme, South Africa (2015 & 2017)	Assessor appointed to conduct a supplier audit based on BASF's Together for Sustainability (TfS) Audit Programme at a major platinum mine located in South Africa. The purpose of the audit was to assess the operation's sustainability practices, incorporating environment, health and safety, social (including labour and human rights) and governance issues.
Konkola Copper Mines, EHS Management Systems Gap Analyses and Alignment, Zambia (2014)	Conroy was part of the team appointed to Conducted gap analyses of EHS Management System to align with corporate (Vedanta Resources) standards.
Msobo Coal, Environmental Compliance, South Africa (2012)	Conroy was part of the team that involved the review of compliance against several Environmental Management Programmes at various coal mines located in South Africa.
Xstrata, EHS Sustainability, South Africa (2012)	Conroy was part of the team that involved the review of EHS management of various mines in order to assess compliance against Xtrata's Sustainable Development standards.
Confidential Client, IFC and Review, Tanzania (2015)	Conroy was part of the team appointed to review of a goldmine's operations and ESIAs against the IFC standards primarily to raise funding for the proposed expansion of the mining activities.
	Environmental Health & Safety
Chevron, EHS Compliance Audits, South Africa (2018)	Lead Auditor to conduct compliance audits against the environmental authorisation for the Sandvik Pastillator Plant and the Waste Management License for the hazardous waste storage area.
Confidential Client, Environmental, Health, Safety and Social Assessment, South Africa & Zambia (2017)	Lead auditor to conduct an environmental, health and social assessment of a fertiliser company operating in South Africa and Zambia. The principal objectives of the assessment were to (1) characterise the environmental setting, current surrounding land use, historical land use (on & off-site) of the Assets and related issues concerning the environmental context of the Site; (2) evaluate current and past operational activities and related practices at the Site in order to establish known or potential sources of material soil, groundwater and/or surface water impact; and (3) indicate whether further work is recommended in order to assess the issues identified, for example any further investigation of possible soil/ groundwater impact, drainage surveys, asbestos surveys, boundary noise monitoring, etc.
LSG Lufthansa Service Holding AG, EHS Compliance Audits, Multiple Countries (2015-2016)	Conroy was part of the team appointed by Lufthansa Service Holding AG to conduct EHS compliance audits at their catering facilities located in India, South Africa, Switzerland, Turkey, Tanzania, Russia and the United States of America.

ABF, Assurance Programme & Health, Safety and Environmental Compliance, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zambia (2012-2017)	Lead Auditor & Team Member for the review of EHS management at sugar estates (including manufacturing and agricultural operations) in Malawi, Mozambique, South Africa, Swaziland and Zambia.
Cobham, EHS Legal and SHE Corporate Standards Audits, South Africa (2017)	Conroy was part of the team appointed supporting Cobham their SHE Management System Assurance Programme for a number of years globally. This involved Conroy being part of the Cobham Corporate Team who conducted the audits.
Ingersoll Rand, EHS Compliance Audits, South Africa (2016 & 2017)	Lead Auditor appointed by Ingersoll Rand to conduct EHS compliance audits of their manufacturing facilities located in North and South America, Africa, and Europe.
Roche Tissue Diagnostics, EHS Due Diligence Assessment, South Africa (2018)	Project Manager and Assessor to conduct a Health, Safety and Environmental (EHS) Due Diligence assessment of a property located in Cape Town, South Africa.
Confidential Client, Environmental Health & Safety Reasonable Prudent Operator (RPO) Assessment, South Africa (2014)	Conroy was part of the team commissioned to conduct an EHS RPO Assessment of a traditional sorghum beer brewing and distribution business headquartered in South Africa. The objectives were to: (1) establish the current status of core sites through assessment, survey, review, investigation with regards to their ability to comply with South African EHS legislation, (2) to clarify the gaps between the operating capability and the permitted operating parameters and (3) to define the level of capital expenditure that will be required to bring the sites up to the defined requirements of the South African EHS legislative standards, and in the absence of local legislation, relevant EU or industry standards.
Goodyear, EHS Compliance Assessment, South Africa (2012)	Conroy was a Lead Auditor for an assessment of EHS compliance of a tyre manufacturing facility in South Africa.
Terex, EHS Compliance, South Africa (2012)	Conroy was a Lead Auditor for an assessment of EHS compliance of a crane manufacturing facility in South Africa.
Parsons Brinckerhoff, Health, Safety and Environmental Compliance, South Africa (2012)	Project managed the compilation of a legal register that covers health, safety and environmental (HSE) requirements with regards to national, regional and local legislation.
African Century Group, Environmental & Social Management System, Mozambique, Uganda Zambia and Zimbabwe (2015)	Lead Assessor appointed to review the client's ESMS in order to understand the conformance of the ESMS to IFC Performance Standard 1 (Assessment and Management of Environmental and Social Risks and Impacts), and to assess the level of on-site implementation of the business level ESMS across four businesses located in Mozambique, Uganda, Zambia and Zimbabwe.
	Infrastructure

QGMI, Road Upgrade Project in Accra, Environmental and Social Impact Assessment, Ghana (2019)	Conroy led the Scoping Phase of the Environmental and Social Impact Assessment process for the proposed Winneba Obetsebi-Lamptey Flyover (Phase 2) project in Accra, Ghana in collaboration with local consultants SAL Consult Limited.
Pindulo, Fugitive Emissions Management Plan, South Africa (2019)	Conroy developed a Fugitive Emissions Management Plan for Pindulo as required in terms of their Provisional Air Emissions License for their bulk ore storage and handling facility located in Saldanha, South Africa.
Mota-Engil, Streamwalk Project, Harare, Zimbabwe (2019)	Conroy was part of the team appointed to develop various environmental, health and safety management plans, and lead the review of the ESMS for a hotel development project in Harare, Zimbabwe.
Department of Roads and Public Works, Utilisation of Borrow Pits for Road Upgrades, South Africa (2010-2011)	Project manager in excess of 100 mining permit applications for borrow pits utilised in road maintenance/re-gravelling projects throughout the entire Eastern Cape Province (urban and rural).
South African National Roads Agency Limited (SANRAL), Upgrading of National Route 2, Section 18, South Africa (2010)	Project manager and ECO for both the environmental authorisation process for the proposed improvement of National Route 2, Section 18 for the South African National Roads Agency Limited, as well as the mining permit applications of the borrow pits for the proposed road improvement.
Chris Hani District Municipality, Rathwick Bulk Services and Water Supply Backlog: Cluster 02, South Africa (2009-2011)	Conroy managed environmental authorisation and waste license application process for the proposed upgrading of the bulk services for the proposed Rathwick Development, Queenstown, inclusive of the waste water treatment works, water treatment works, storm water and associated infrastructure. Management of the environmental authorization process for four major regional water supply backlog projects in the Cluster 2 area of the Chris Hani District Municipality, Eastern Cape.
Buffalo City Municipality, Settlement Planning & Formalisation (2007-2010)	Conroy managed the environmental authorization for various settlement planning & formalization projects in the Amathole district.
	Other
Johnson & Johnson, Phase I Environmental Site Assessment, Mauritius (2015)	Project Manager and Assessor commissioned to conduct a Phase I Environmental Site Assessment in accordance with the American Society for Testing and Materials (ASTM) standards for a manufacturing site located in Mauritius.
Confidential Client, Phase I Environmental Site Assessment, Egypt & Nigeria (2015)	Project Manager commissioned to conduct a Phase I Environmental Site Assessment in general accordance with the ASTM standards for various sites located in Egypt and Nigeria.
JTI, ISO14001 & OHSAS18001 Certification Audit, Malawi (2012-2014)	Conroy was part of the team appointed for a certification audit of a tobacco processing facility in Malawi for the implementation and certification of an ISO14001 & OHSAS18001 Management System.

East London Industrial Development Zone, Auditing of the East London Industrial Development Zone (EL IDZ) Environmental Management System and Review of the EL IDZ Environmental Management Framework, South Africa (2011)	Management and team member of the revision of the Environmental Management Framework and assistance in the auditing of the Environmental Management System of the EL IDZ.
Transnet National Ports Authority, Soil Contamination Assessment and Listed Invasive and Protected Plant Species Survey, South Africa (2011)	Management of the soil contamination assessment (inclusive of soil sampling and rehabilitation measures) for the Port of East London. Also included the management of the Listed Invasive and Protected Plant Species Survey for the Port of East London.
Kraft Foods, Phase I Environmental Site Assessment and Environmental Management System, South Africa (2009)	Conroy managed and was part of the team Conducting a Phase I Environmental Site Assessment in accordance with the ASTM standards, and assisted in the preparation of an environmental aspects register, inclusive of significance assessment and proposed mitigation/management strategies for all the Kraft Foods SA – Tunney Plant's activities for purposes of implementation of an environmental management system.
PG Bison, Development and Implementation of an ISO 14001 Environmental Management System, South Africa (2008)	Conroy was a team member that Assisted in the preparation of an environmental aspects register, inclusive of significance assessment and proposed mitigation/management strategies for all the PG Bison activities at the particle board plant in Ugie, Eastern Cape, for purposes of implementation of an environmental management system.
Buffalo City Municipality, Auditing of the Roundhill Waste Disposal Site, South Africa (2008)	Conroy Assisted in the environmental audit process of the Buffalo City Regional Waste Disposal Site, focusing on issues such as construction, operations and air-quality monitoring.
Bigen Africa (Pty) Ltd & Ndlambe Local Municipality, Port Alfred Waste Water Treatment Works, South Africa (2009)	Conroy managed the environmental authorization process for the proposed Port Alfred Waste Water Treatment Works upgrade project. Conroy has also been appointed to act as the Environmental Control Officer for the implementation of the project.
Uhambiso, Tsolo Waste Water Treatment Works, South Africa (2008)	Conroy managed the environmental authorization and Waste License Application process for the proposed Tsolo Waste Water Treatment Works upgrade project
Alvitex 103 (Pty) Ltd, Kidds Beach Golf Estate, South Africa (2008-2009)	Conroy managed the environmental authorization process for a proposed golfing estate development and assisted in the environmental authorization for the sewage works servicing the proposed resort developments.
African Dune Investments, Golf Estate, South Africa (2008)	Conroy assisted in the environmental authorization for the proposed golf estate development.

East London Golf Club, Golf Course, South Africa, 2008	Conroy managed the EIA Process and prepared the rehabilitation management plan for the proposed realignment of the 6th fairway & minor upgrades in order to upgrade the East London Golf Club (ELGC).
Thynk Property Partners (Pty) Ltd, Retail & Residential Development (2007)	Conroy managed the environmental authorization process for the proposed retail & residential development located in East London.
Eskom, Qumbu Substation, South Africa (2010)	Conroy managed the environmental authorization process for the proposed upgrading of the Qumbu Substation and associated infrastructure.
The Diocese of Grahamstown, Rezoning & Development, South Africa (2007)	Conroy managed the environmental authorization for the proposed rezoning and residential development of the St Lukes Mission Land.
Bunker Hills Investments (Pty) Ltd, EMP, South Africa (2008-2009)	Conroy managed the environmental management plan for the proposed residential development.
Rakel (Pty) Ltd, Development & Desalination Plant, South Africa (2009)	Conroy assisted in managing the environmental authorization for the proposed residential development and assisted in the environmental impact assessment for the proposed desalination plant servicing the proposed residential development.
Rapitrade (Pty) Ltd, Residential Development, South Africa (2008)	Conroy assisted in managing the environmental management plan for the proposed residential development and managed the applications to the South African Heritage Resources Agency (SAHRA) and the Department of Water Affairs & Forestry.
Beautiful Connections (Pty) Ltd, Developments, South Africa (2008)	Conroy managed the environmental authorization for a proposed wildlife resort in the Queenstown area and the proposed development of Eco-Type chalets in the East London area
Riverleigh VII cc, Warehousing Development, South Africa (2007)	Conroy managed the environmental authorization process for the proposed warehousing and light industrial manufacturing processes developments.
Purple Moss 29 (Pty) Ltd, Rehabilitation, South Africa (2010)	Conroy managed the rehabilitation of the Quenera River bank on the site and the environmental authorization process for the proposed township establishment consisting of business, mixed use and residential areas.
Silicon Smelters (Pty) Ltd (FerroAtlantica), Charcoal Burners, South Africa (2007-2009)	Conroy managed the environmental impact assessment process and CAPCO permit applications for various charcoal burners in the East Cape, West Cape, Free State, North-West, Limpopo and Gauteng Provinces.
Wild Coast Fishing Co-operative, Fish Works Factory, South Africa (2010)	Conroy assisted in the environmental authorization for the proposed fish works factory.

PUBLICATIONS

None

MEMBERSHIPS

South African Council of Natural Scientific Professions (SACNASP)

Registered as a Professional Natural Scientist (Environmental Scientist) with the South African Council of Natural Scientific Professions (SACNASP)

FORM TECH-6 CURRICULUM VITAE (CV) FOR PROPOSED PROFESSIONAL STAFF

1. Proposed Position **:** Environmental Engineer

2. Name of Firm **:** DH Engineering Consultants Ltd

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3. Name of Staff **:** Daniel Holmes

4. Date of Birth **:** 2nd August, 1967

5. Education

08/93 - 07/94: MSc. with Distinction in Environmental Technology (Water Management), Imperial College, University of London, London, United Kingdom.

08/85 - 07/88: BSc. (Hons) in Mechanical Engineering, University of Manchester Institute of Science and Technology, Manchester, United Kingdom.

08/83-06/85: 3 Grade A's in Mathematics, Physics and Chemistry, Mpelembe Secondary School, Kitwe, Zambia

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6. Membership of Professional Associations:

- Registered Engineer- Engineers Registration Board of Zambia Registration No. 000693
- Member - Engineering Institute of Zambia
- Member - Association of Consulting Engineers of Zambia
- Member- Institution of Mechanical Engineers, United Kingdom
- Chartered Engineer- Engineering Council, United Kingdom No. 513984
- Member- South African Institute of Refrigeration and Air Conditioning Engineers

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7. Other Training:

8. Countries of Work Experience: Zambia, Malawi, Ethiopia and United Kingdom

9. Languages:

	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Chinyanja	Poor	Poor	Fair

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10. Employment Record **:** Mechanical Engineer

From : 11/1999 To : Date (2012)

Employer: DH Engineering Consultants

Positions held: Managing Director

From : 02/1998 To : 11/1999

Employer: BP Zambia PLC

Positions held: Chief Engineer,

From : 05/1995 To : 02/1998

Employer: RM Consulting Engineers

Positions held: Director Mechanical/Water Services

From : 10/1994 To : 04/1995

Employer: RM Consulting Engineers

Positions held: Principal Mechanical Engineer

From : 09/1991 To : 09/1993

Employer: ZMCK Consulting Engineers

Positions held: Mechanical Building Services Engineer

From : 09/1988 To : 09/1991

Employer: Monsanto Chemicals, United Kingdom

Positions held: Mechanical Project Engineer

11.Detailed Tasks Assigned	**12. Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned**
Environmental and Social Impact Assessment Statements And Resettlement Action Plans	**Name of assignment or project**: Kabompo Hydro Electric Power Project – Transmission Lines **Year:** 2010-2012 **Location:** Mwinilunga District **Client:** Copperbelt Energy Corporation **Main project features**: Preparation of EIA and preliminary RAP for relocation of affected persons. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Preliminary RAP and Final EIS

Environmental and Social Impact Assessment Statements And Resettlement Action Plans	**Name of assignment or project**: Big Concessions Agricultural Scheme **Year:** 2012 **Location:** Mumbwa District **Client:** Amatheon Agri Zambia Ltd **Main project features**: Preparation of EIA and preliminary RAP for relocation of affected persons. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Preliminary RAP and Final EIS
Environmental and Social Impact Assessment Statements And Resettlement Action Plans	**Name of assignment or project**: New Road to Denison Mines Zambia Ltd **Year:** 2010 **Location:** Siavonga District **Client:** Denison Mines Zambia Ltd **Main project features**: Preparation of EIA and preliminary RAP for relocation of affected persons. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Preliminary RAP and Final EIS
Environmental Impact Assessment Statements	**Name of assignment or project**: Lafarge Cement Plant Phases 1 and 2 **Year:** 2008 and 2015 **Location:** Lusaka **Client:** Lafarge Zambia Plc **Main project features**: Preparation of ESIA. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Final ESIA
Environmental Impact Assessment Statements	**Name of assignment or project**: Herriot Properties Shopping Malls **Year:** 2009 to 2016 **Location:** Lusaka, Kitwe, Solwezi and Kabwe **Client:** Herriot Properties Ltd **Main project features**: Preparation of ESIA. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Final ESIA

Environmental Impact Assessment Statements	**Name of assignment or project**: Twinpalms Mixed Use Development **Year:** 2018 **Location:** Lusaka **Client:** NAPSA **Main project features**: Preparation of ESIA. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Site survey, preparation of Final ESIA
Environmental Audits	**Name of assignment or project**: Agco Environmental Audit **Year:** 2017 **Location:** Lusaka **Client:** Agco **Main project features**: Study of Existing Practices and Improvements required to achieve ZEMA Compliance. **Positions held**: Team Leader and Environmental Engineer **Activities performed**: Report, indings and Final Recommendations

12. Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

_____ Date: 03/06/2018

Full name of authorized representative: DANIEL HOLMES

FORM TECH-6 CURRICULUM VITAE (CV) FOR PROPOSED PROFESSIONAL STAFF

1. Proposed Position Social/Economic Environmental Officer
2. Name of Firm DH Engineering Consultants Ltd

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3. Name of Staff Tobias Muyaba

4. Date of Birth 6th December 1978

5. Nationality Zambian

6. Education

01/01 - 09/04: BA in Sociology and Industrial Psychology, University of Namibia, Windhoek, Namibia.

01/92 -11/96: 10 IGCE , Chengelo School, Mkushi, Zambia

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7. Other Training: Community Based Natural Resource Management facilitation.

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8. Countries of Work Experience: Zambia, Namibia

9. Languages:

	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Bemba	Fair	Fair	Fair
Nyanja	Excellent	Excellent	Excellent

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10. Employment Record

From: 09/2018 to: Date
Employer: DH Engineering Consultants, Lusaka, Zambia
Positions held: Social/Economic Environmental Officer

From: 09/2012 to: 02/2017
Employer: Amatheon Agri Zambia Limited
Positions held: Sustainable Development Manager

From: 08/2011 to: 08/2012
Employer: Amazing Zambia, Samfya, Zambia
Positions held: Social Liaison Manager

From: 07/2010 to: 08/2011
Employer: Program for Luapula Rural Development (PLARD), Samfya, Zambia

Positions held: Fisheries Programme Assistant

From: 01/2006 to: 06/2010

Employer: Farm Zambia, Lusaka/Mumbwa/Livingstone/Samfya, Zambia

Positions held: Community Development Coordinator

From: 01/2005 to: 04/2005

Employer: Institute Public Policy and Research Namibia, Windhoek, Namibia

Position held: Field Assistant Researcher

I I . Detailed Tasks Assigned	**12. Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned**
Social/Economic Impact Assessment, Project briefs, Baseline Screening and house hold surveys, community mobilization and community stakeholder engagement.	**Name of assignment or project:** Mosi-Oa-Tunya Livingstone Resort ESIA report **Year:** 2018- to date **Location:** Livingstone **Client:** Mukuba Property Development Company **Main project features:** Preparation of Draft ESIA for submission to ZEMA. **Activities performed**. Social survey, house hold survey, data collection, community sensitization, compilation and analysis of data **Name of assignment or project:** Social community Screening and draft ESIA/EPB **Year:** 2018- to date **Location:** Livingstone **Client:** Globeleq Zambia, GETFiT **Main project features:** Preparation of tender documents (Draft ESIA/EPB for submission to ZEMA. **Activities performed**. Social survey, screening and report. House hold survey, survey data collection, community sensitization, compilation and analysis of data **Name of assignment or Project:** Amatheon Agri Zambia Limited, 1200ha and 13,000ha ESIA and RAP (Including implementation). **Year:** 2012-2016 **Location:** Lusaka, Mumbwa **Client:** Amatheon Agri Zambia **Main project features:** Development of a 60,000 Ha commercial agricultural project to include out grower scheme and Dam construction (2). **Positions held:** Corporate and Social Responsibility Manager **Activities performed**: Interview and selection of suitable ESIA consultants. Monitor and draft ESIA and RAP reports for submission to ZEMA-Baseline Site Surveys, Community engagement on all

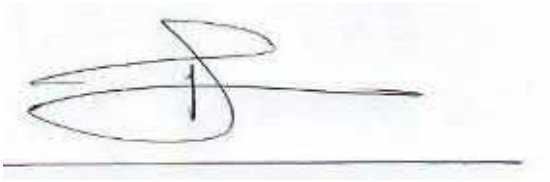
	aspects of the ESIA/RAP process to include leading project disclosure to stakeholders. Post ESIA/RAP approval; comply with stated approval parameters, monitoring and reporting of project progress. Engage stakeholder (local government, traditional leaders/institutions, NGO's to collaborate on stated project interventions for the communities. Prepare timely status reports and updates on project development to all stakeholders. Principal contact for projects community engagement. Asses and decide future ESIA/EPB scope. **Name of assignment or project**: Amazing Zambia, Circuit eco-Tourism **Year:** 2011-2012 **Location:** Samfya, Lusaka, Mumbwa and Livingstone **Client:** Samfya Marines, Livingstone Guesthouse, Puku Pan Lodge **Main project features**: Developing of lodges to create a tourism circuit (Eco tourism) on 3 sites. Samfya beach, Livingstone and Kafue National park. **Positions held**: Social Liaison Manager **Activities performed**: Designing the company's Corporate Social Responsibility program and image (CSR), Designing and actively propagating training modules targeted at communities to impart business skills in the tourism industry. Co-ordinating government, community and partner funds to enable sustainable community programs. Social and Environmental Compliance with approved ZEMA licences (ESIA/EPB's and licences). **Name of assignment or project**: Program for Luapula Agriculture and Rural Development Amazing Zambia **Year:** 2010-2011 **Location:** Luapula province **Client:** Government of Zambia and Finland **Main project features**: Development of Fisheries Management Area(FMA) on Luapula/Mweru river and Lake Bangweulu **Positions held**: Fisheries Program Assistant **Activities performed**: Facilitation and Coordination of community meetings (designing, planning and logistics).Representing government (Zambia and Finland) on varied platforms targeted at Natural Resource Management, specifically Fish/Marine life.

	Mainstream topical cross cutting issues (HIV/A.I.D. S, Climate Change and Gender) at institutional and community level. Design innovative strategies to combat community hostility towards regulatory interventions to preserve fish resource (Conflict resolution Strategies). Design programme information packages to varied audiences/stakeholders (Radio, Print, Posters). Assist government department in creating database on activities for purposes of effective monitoring and evaluation. Training of communities in designing effective income generating activities (proposal writing, basic financial management, record keeping).
	Name of assignment or project: Support to DANIDA intervention **Year:** 2006-2011 **Location:** Lusaka, Mumbwa **Client:** Farm Zambia **Main project features**: Introduction of mixed farming concepts as livelihood alternative to wildlife and other natural resource. Community Based Natural Resource Management (CBNRM) **Positions held**: Community Development Coordinator **Activities performed**: Coordinating and organization of community networking: Meetings with Community members, Local leadership (Councillors/CRB members) and Traditional leadership (Chiefs, Headmen).Designing and implementing a micro-credit scheme in Mumbwa District based on the Family Chicken Unit program (Zambia) and seeking collaborating funding (Cord aid).Management and maintenance of coordinating office to include purchase of project materials, purchase of equipment to support staff (stationary) and designing budgets for various activities. Maintenance of database on micro-credit clients by monitoring deposits and bank balances as well as assisting in creating financial statements. Designing and implementing a 'Mixed Farming as a Business Concept' targeted at the rural small holder family .Annual Guide and tutor to international interns at whom where at undergraduate level (University of Utrecht, Netherlands). Design of the Management Oriented Monitoring Systems (MOMS) country working group within the CBNRM forum. Provision of affordable water sources in rural Southern Province Zambia (Bore-holes) **Name of assignment or project:** Impact of HIV/AIDS awareness campaigns in Namibia **Year:** 2005

	Location: Windhoek, Namibia **Client:** Government of Republic of Namibia **Main project features:** Social research, household surveys and data collection **Positions held:** Field Research Assistant. **Activities performed:** Collection and interpretation of data for suitable media campaigns to include HIV/AIDS awareness

12. Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. Understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.



Date: 12/09/2018

Full name of authorized representative: TOBIAS MUYABA

JONATHAN JAMES SMALLIE
WildSkies Ecological Services (2011/131435/07)
Curriculum Vitae

BACKGROUND

Date of birth:	20 October 1975
Qualifications:	BSC – Agriculture (Hons) (completed 1998)
	University of Natal – Pietermaritzburg
	MSC – Environmental Science (completed 2011)
	University of Witwaterstrand
Occupation:	Specialist avifaunal consultant
Profession registration:	South African Council for Natural Scientific Professions

CONTACT DETAILS

Cell number: 082 444 8919
Fax: 086 615 5654
Email: jon@wildskies.co.za
Postal: 36 Utrecht Avenue, Bonnie Doon, East London, 5210
ID #: 7510205119085

PROFESSIONAL EXPERIENCE

Strategic Assessments:

East Cape Biodiversity Strategy & Action Plan – avifauna.

Renewable energy:

Post construction bird monitoring for wind energy facilities:

Dassieklip (Caledon) –initiated in April 2014 (2yrs); Dorper Wind Farm (Molteno) – initiated in July 2014 (2yrs); Jeffreys Bay Wind Farm – initiated in August 2014 (4yrs); Kouga Wind Farm – started Feb 2015 (2yrs); Cookhouse West Wind Farm – started March 2015 (1yr); Grassridge Wind Farm – initiated in April 2015 (2yrs); Chaba Wind Farm – initiated December 2015 (1yr); Amakhala Emoyeni 01 Wind Farm initiated August 2016 (2yrs); Gibson Bay Wind Farm – initiated March 2017 (2yrs); Nojoli Wind Farm initiated March 2017 (2yrs); Sere Wind Farm (2yrs).

Pre-construction bird monitoring & EIA for wind energy facilities:

Golden Valley 1; Middleton; Dorper; Qumbu; Ncora; Nqamakhwe; Ndakana; Thomas River; Peddie; Mossel Bay; Hluhluwe; Richards Bay; Garob; Outeniqua; Castle; Wolf; Inyanda-Roodeplaat; Dassiesridge; Great Kei; Bayview; Grahamstown; Bakenskop; Umsobomvu; Stormberg; Zingesele; Oasis; Gunstfontein; Naumanii; Golden Valley Phase 2; Ngxwabangu; Hlobo; Woodstock; Scarlet Ibis; Albany; Golden Valley 1 2nd monitoring; Umtathi Emoyeni; Pensulo Zambia; Unika 1 Zambia; Impofu; Nuweveld; Kleinsee wind energy facilities.

Screening studies for wind energy facilities:

Tarkastad Wind Farm; Quanti Wind Farm; Ruitjies Wind Farm; Stutterheim Wind Farm; Molteno Wind Farm; Noupoort Wind Farm.

Avifaunal walk through for wind energy facilities:

Garob Wind Farm; Golden Valley 1 wind farm; Nxuba Wind Farm.

Pre-construction bird monitoring and EIA for Solar energy facilities:

Bonnievale Solar Energy Facility; Dealesville Solar Energy Facility; Rooipunt Solar Energy Facility; De Aar Solar Energy Facility; Noupoort Solar Energy Facility, Aggeneys Solar Energy Facility; Eskom Concentrated Solar Power Plant; Bronkhorstspruit Solar Photovoltaic Plant; De Aar Solar Energy Facility; Paulputs Solar Energy Facility; Kenhardt Solar Energy Facility; Wheatlands Solar Energy Facility; Nampower CSP project;

Other Electricity Generation:

Port of Nqura Power Barge EIA; Tugela Hydro-Electric Scheme; Mmamabula West Coal Power Station (Botswana).

Electricity transmission & distribution:

Overhead transmission power lines (>132 000 kilovolts):

Oranjemund Gromis 220kv; Perseus Gamma 765kv; Aries Kronos 765kv; Aries Helios 765kv; Perseus Kronos 765kv; Helios Juno 765kv; Borutho Nzelele 400kv; Foskor Merensky 275kv; Kimberley Strengthening; Mercury Perseus 400kV; Eros Neptune Grassridge 400kV; Kudu Juno 400kV; Garona Aries 400kV; Perseus Hydra 765Kv; Tabor Witkop 275kV; Tabor Spencer 400kV; Moropule Orapa 220kV (Botswana); Coega Electrification; Majuba Venus 765kV; Gamma Grassridge 765kV; Gourikwa Proteus 400KV; Koeberg Strengthening 400kV; Ariadne Eros 400kV; Hydra Gamma 765kV; Zizabona transmission – Botswana; Maphutha Witkop 400kv; Makala B 400kv; Aggeneis Paulputs 400kv; Northern Alignment 765kv; Kappa Omega 765kv; Isundu 400kv and Substation; Senakangwedi B Integration; Oranjemund Gromis;

Overhead distribution power lines (<132 000 kilovolts):

Kanoneiland 22KV; Hydra Gamma 765kV; Komani Manzana 132kV; Rockdale Middelburg 132kV; Irenedale 132 kV; Zandfontein 132kV; Venulu Makonde 132 kV; Spencer Makonde 132 kV; Dalkeith Jackal Creek 132Kv; Glen Austin 88kV; Bulgerivier 132kV; Ottawa Tongaat 132kV; Disselfontein 132kV; Voorspoed Mine 132kV; Wonderfontein 132kV; Kabokweni Hlau Hlau 132kV; Hazyview Kiepersol 132kV; Mayfern Delta 132kV; VAAL Vresap 88kV; Arthursview Modderkuil 88kV; Orapa, AK6, Lethakane substations and 66kV lines (Botswana); Dagbreek Hermon 66kV; Uitkoms Majuba 88kV; Pilanesberg Spitskop 132kV; Qumbu PG Bison 132kV; Louis Trichardt Venetia 132kV; Rockdale Middelburg Ferrochrome 132kV; New Continental Cement 132KV; Hillside 88kV; Marathon Delta 132kV; Malelane Boulder 132kV; Nondela Strengthening 132kV; Spitskop Northern Plats 132kV; West Acres Mataffin 132kV; Westgate Tarlton Kromdraai 132kV; Sappi Elliot Ugie 132kV; Melkhout Thyspunt 132kV; St Francis Bay 66kv; Etna Ennerdale 88kv; Kroonstad 66kv; Firham Platrand; Paradise Fondwe 132kv; Kraal Mafube 132kv; Loeriesfontein 132kv; Albany Mimosa 66kv; Zimanga 132kv; Grootpan Brakfontein; Mandini Mangethe; Valkfontein Substation; Sishen Saldanha; Corinth Mzongwana 132kv; Franklin Vlei 22kv; Simmerpan Strengthening; Ilanga Lethemba 132kv; Cuprum Burchell Mooidraai 132; Oliphantskop Grassridge 132;

Risk Assessments on existing power lines:

Hydra-Droerivier 1,2 & 3 400kV; Hydra-Poseidon 1,2 400kV; Butterworth Ncora 66kV; Nieu-Bethesda 22kV; Maclear 22kV (Joelshoek Valley Project); Wodehouse 22kV (Dordrecht district); Burgersdorp Aliwal North Jamestown 22kV; Cradock 22kV; Colesberg area 22kV; Loxton self build 11kV; Kanoneiland 22kV; Stutterheim Municipality 22kV; Majuba-Venus 400kV; Chivelston-Mersey 400kV; Marathon-Prairie 275kV; Delphi-Neptune 400kV; Ingagane – Bloukrans 275kV; Ingagane – Danskraal 275kV; Danskraal – Bloukrans 275kV

Avifaunal "walk through" (EMP's):

Kappa Omega 765kv; Rockdale Marble Hall 400kv; Beta Delphi 400kV; Mercury Perseus 765kV; Perseus 765kV Substation; Beta Turn 765kV in lines; Spencer Tabor 400kV line; Kabokweni Hlau Hlau 132kV; Mayfern Delta 132Kv; Eros Mtata 400kV; Cennergi Grid connect 132kV; Melkhout Thyspunt 132kv; Imvubu Theta 400kv; Outeniqua Oudshoorn 132kv; Clocolan Ficksburg 88kv.

Strategic Environmental Assessments for Master Electrification Plans:

Northern Johannesburg area; Southern KZN and Northern Eastern Cape; Northern Pretoria; Western Cape Peninsula

Other electrical infrastructure work

Investigation into rotating Bird Flapper saga – Aberdeen 22Kv; Special investigation into faulting on Ariadne-Eros 132kV; Special investigation into Bald Ibis faulting on Tutuka Pegasus 275kV; Special investigation into bird related faulting on 22kV Geluk Hendrina line; Special investigation into bird related faulting on Camden Chivelston 400kV line

Water sector:

Umkhomazi Dam and associated tunnel and pipelines; Rosedale Waste Water Treatment Works; Lanseria Outfall Sewer; Lanseria Wastewater Treatment Works;

Wildlife airport hazards:

Kigali International Airport – Rwanda; Port Elizabeth Airport – specialist study as part of the EIA for the proposed Madiba Bay Leisure Park; Manzini International Airport (Swaziland); Polokwane International Airport; Mafekeng International Airport; Lanseria Airport

Other sectors:

Lizzard Point Golf Estate – Vaaldam; Lever Creek Estates housing development; East Cape Biodiversity Strategy and Action Plan 2017; Cathedral Peak Road diversion; Dube Tradeport; East London Transnet Ports Authority Biodiversity Management Plan; Leazonia Feedlot; Carisbrooke Quarry; Senekal Sugar Development; Frankfort Paper Mill;

Employment positions held to date:

- August 1999 to May 2004: Eastern Cape field officer for the South African Crane Working Group of the Endangered Wildlife Trust
- May 2004 to November 2007: National Field officer for Eskom-EWT Strategic Partnership and Airports Company SA – EWT Strategic Partnership (both programmes of Endangered Wildlife Trust)
- November 2007 to August 2011: Programme Manager – Wildlife & Energy Programme – Endangered Wildlife Trust
- **August 2011 to present: Independent avifaunal specialist – Director at WildSkies Ecological Sevices (Pty) Ltd**

Relevant achievements:

- Recipient of BirdLife South Africa's Giant Eagle Owl in 2011 for outstanding contribution to bird conservation in SA
- Founded and chaired for first two years – the Birds and Wind Energy Specialist Group (BAWESG) of the Endangered Wildlife Trust & BirdLife South Africa.

Conferences attended & presented at:

- August 2019. Conference of Wind Energy and Wildlife, Stirlign, Scotland.
- November 2018. Raptor Research Foundation. Skukuza, Soith Africa.

- October 2017. Conference of Wind Energy and Wildlife, Estoril Portugal
- May 2011. Conference of Wind Energy and Wildlife, Trondheim, Norway.
- March 2011. Chair and facilitator at Endangered Wildlife Trust – Wildlife & Energy Programme – "2011 Wildlife & Energy Symposium", Howick, SA
- September 2010 – Raptor Research Foundation conference, Fort Collins, Colorado. Presented on the use of camera traps to investigate Cape Vulture roosting behaviour on transmission lines
- May 2010 - Wind Power Africa 2010. Presented on wind energy and birds
- October 2008. Session chair at Pan-African Ornithological Conference, Cape Town, South Africa
- March 27 – 30 2006: International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. Presented a paper entitled "Assessing the power line network in the Kwa-Zulu Natal Province of South Africa from a vulture interaction perspective".
- June 2005: IASTED Conference at Benalmadena, Spain – presented a paper entitled "Impact of bird streamers on quality of supply on transmission lines: a case study"
- May 2005: International Bird Strike Committee 27th meeting – Athens, Greece. Presented a paper entitled Bird Strike Data analysis at SA airports 1999 to 2004.
- 2003: Presented a talk on "Birds & Power lines" at the 2003 AGM of the Amalgamated Municipal Electrical Unions – in Stutterheim - Eastern Cape
- September 2000: 5th World Conference on Birds of Prey in Seville, Spain.

Papers & publications:

- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Guidelines on how to avoid or mitigate impacts of electricity power grids on migratory birds in the African-Eurasian Region. CMS Technical Series Number XX. Bonn, Germany.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series Number XX, Bonn, Germany.
- Jenkins, A.R., van Rooyen, C.S, Smallie, J.J, Harrison, J.A., Diamond, M.D., Smit-Robinson, H.A & Ralston, S. 2014. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa
- Jenkins, A.R., Shaw, J.M., Smallie, J.J., Gibbons, B., Visagie, R. & Ryan, P.G. 2011. Estimating the impacts of power line collisions on Ludwig's Bustards Neotis ludwigii. Bird Conservation International.
- Jordan, M., & Smallie, J. 2010. A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds. Endangered Wildlife Trust , Unpublished report
- Smallie, J., & Virani, M.Z. 2010. A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya. Scopus 30: p32-39
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. A preliminary survey of avian mortality on power lines in the Overberg, South Africa. Ostrich 2010. 81 (2) p109-113
- Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 2010. 20: 263-278.
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. Modelling power line collision risk for the Blue Crane *Anthropoides paradiseus* in South Africa. Ibis 2010 (152) p590-599.
- Jenkins, A.R., Allan, D.G., & Smallie, J.J. 2009. Does electrification of the Lesotho Highlands pose a threat to that countries unique montane raptor fauna? Dubious evidence from surveys of three existing power lines. Gabar 20 (2).
- Smallie, J.J., Diamond, M., & Jenkins, A.R. 2008. Lighting up the African continent – what does this mean for our birds? Pp 38-43. In Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H., & Muchai.

(eds). Proceedings of the 12th Pan-african Ornithological Congress. 2008. Cape Town. Animal Demography Unit. ISBN (978-0-7992-2361-3)
- Van Rooyen, C., & Smallie, J.J. 2006. The Eskom –EWT Strategic Partnership in South Africa: a brief summary. Nature & Faunae Vol 21: Issue 2, p25
- Smallie, J. & Froneman, A. 2005. Bird Strike data analysis at South African Airports 1999 to 2004. Proceedings of the 27th Conference of the International Bird Strike Committee, Athens Greece.
- Smallie, J. & Van Rooyen, C. 2005. Impact of bird streamers on quality of supply on transmission lines: a case study. Proceedings of the Fifth IASTED International Conference on Power and Energy Systems, Benalmadena, Spain.
- Smallie, J. & Van Rooyen, C. 2003. Risk assessment of bird interaction on the Hydra-Droërivier 1 and 2 400kV. Unpublished report to Eskom Transmission Group. Endangered Wildlife Trust. Johannesburg. South Africa
- Van Rooyen, C. Jenkins, A. De Goede, J. & Smallie J. 2003. Environmentally acceptable ways to minimise the incidence of power outages associated with large raptor nests on Eskom pylons in the Karoo: Lessons learnt to date. Project number 9RE-00005 / R1127 Technology Services International. Johannesburg. South Africa
- Smallie, J. J. & O'connor, T. G. (2000) Elephant utilization of *Colophospermum mopane*: possible benefits of hedging. African Journal of Ecology 38 (4), 352-359.

Courses & training:

- Successfully completed a 5 day course in High Voltage Regulations (modules 1 to 10) conducted by Eskom – Southern Region
- Successfully completed training on, and obtained authorization for, live line installation of Bird Flappers

Eric Herrmann

Hopefield, Western Cape, South Africa
Tel: +27 (0)83 311 0299 (mobile), *Email*: benfontein@gmail.com

SUMMARY

An enthusiastic and dedicated field biologist with over 10 years of experience in biodiversity research and conservation, capable of working well in a team or independently, with knowledge and experience in the following fields:

- Research aimed at developing practical management strategies for species conservation, and reducing conflict between wildlife and agriculture.
- Quantitative survey methods for estimating abundance of wildlife species.
- Surveying bird and mammal populations with respect to demographics and movements.
- Practical field research, with respect to bird banding and observation.
- Dissemination of scientific information by means of publications, presentations and workshops.
- Spreadsheet modelling of animal populations dynamics.
- Languages : English and Afrikaans (fluent), German (conversational), Spanish (elementary).

QUALIFICATIONS

Master of Forestry: Conservation Ecology (*cum laude*), 2000 – 2004
Department of Conservation Ecology, University of Stellenbosch, **S**tellenbosch, Western Cape, South Africa

Baccalaureus Technologiae: Nature Conservation (*cum laude*), 1998 – 1999
Faculty of Applied Sciences, Cape Peninsula University of Technology, Cape Town, Western Cape, South Africa

National Diploma: Nature Conservation (*cum laude*), 1995 – 1997
Faculty of Applied Sciences, Cape Peninsula University of Technology, Cape Town, Western Cape, South Africa

PROFESSIONAL EXPERIENCE

Independent Field Biologist (primarily ornithology), 2016 – present

- Conduct field work for avifaunal specialist studies (Environmental Impact Assessment) related to wind and solar facilities, according to guidelines stipulated by Birdlife South Africa.
- Conduct field work for avifaunal, faunal and limited botanical surveys for specialist studies (Environmental Impact Assessment) related primarily to mining operations.

Senior Conservation Scientist (Mammalogist), 2006 – 2012
Department of Environment and Nature Conservation. Kimberley, Northern Cape, South Africa

- Conducted population surveillance projects on a number of threatened mammal species, and initiated new approaches to obtaining population estimates using statistically-sound methods.
- Provided assistance and recommendations to official nature reserves with regards to species management strategies and surveys (censuses) of large ungulate populations.
- Provided scientifically-based recommendations on permit applications relating to the wildlife ranching industry, biological research, and Environmental Impact Assessments (EIAs).
- Contributed to the development of national conservation action plans for certain threatened mammal species.
- Delivered paper and poster presentations at national wildlife management conferences.

Field Projects Manager, 2003 – 2006
Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Western Cape, South Africa

- General management of an outpost research centre (near Kimberley, South Africa) for ecological studies.
- Initiated a pilot research project to investigate the behavioural and evolutionary ecology (co-operative breeding and dispersal) of an arid-zone bird species, the Anteating Chat (*Myrmecocichla formicivora*).
- Maintained a long-term banding study on a well-studied population of Sociable Weavers (*Philetairus socius*).
- Assisted visiting researchers with practical logistics relating to their field studies.

Field Researcher, 2001 – 2002
Deciduous Fruit Producer's Trust, Stellenbosch, Western Cape, South Africa

- Investigated bird-damage to high-value table grape crops in the Orange River Valley, Northern Cape, South Africa, to develop reliable, cost-effective, and ecologically sound methods for reducing bird damage to crops.
- Quantified the extent of bird damage to table grape crops, as well as bird usage of vineyards, and abundance of damage-causing birds in vineyards and surrounding natural habitats.
- Produced an information booklet outlining strategies for reducing bird damage to table grape crops.
- Conducted a series of workshops to disseminate research findings and recommendations to fruit producers.

Research Assistant, 1999 – 2001
Endangered Wildlife Trust, Johannesburg, Gauteng, South Africa

- Assisted in the investigation of the population-ecology of free-ranging lions (*Panthera leo*) in the Kgalagadi Transfrontier Park, South Africa/Botswana, to develop a species conservation management strategy.
- Conducted spoor transects for determining the relationship between true density of lions and frequency of spoor.
- Developed a spreadsheet population model to determine the long-term impact of human-induced mortality on the lion population (part of Masters studies).
- Assisted with aerial radio telemetry for estimating lion home ranges over a vast conservation area.
- Assisted with a series of workshops to disseminate research findings and recommendations to local livestock owners, with the aim of reducing conflict with lions in adjoining livestock ranching areas.

OTHER WORK EXPERIENCE

Jul 2012 & Jul 2010: Assisted with surveys (counts) of cliff-nesting seabirds (guillemots and kittiwakes) at numerous breeding colonies in the Svalbard Archipelago, Arctic region, for the Norwegian Polar Institute, Tromsø, Norway.

Dec 2005: Assisted with surveys (mist-netting/observations) of montane forest birds in northern Mozambique (Mount Chiperone and Mount Mabu) and southern Malawi (Mount Thyolo), in collaboration with the Mulanje Mountain Conservation Trust, Malawi, and Dr Claire Spottiswoode (*http://www2.zoo.cam.ac.uk/africancuckoos/home.html*).

ACTIVITIES AND INTERESTS

Travel: Undertook a solo cycling tour, from Jul 2012 to May 2015, across Norway, Europe, Iran, India, South-East Asia and northern South America (Colombia and Ecuador).

Birding: Fairly extensive birding experience in southern Africa (650 species identified), with general birding experience in Europe, Middle East, India, South-East Asia and northern South America.

Photography: Enjoy both landscape and bird photography at the amateur level.

CURRICULUM VITAE

Wessel Jacobus Rossouw

Date of birth: 8/5/1953

Educational Statistics:

Grade 12	-	1970
BA	-	1974
BA Hons	-	1975
BTh	-	1980
BTh (Lic)	-	1981

Work Experience: I worked as a Chaplain in the South African National Defence Force for 36 years and retired in 2013.

Bird Monitoring: I got involved in bird monitoring after I retired and have the following experience:

1. I did monitoring at a Black Harrier roost in the district of Jeffrey's Bay on a weekly basis for two years.

2. I did bird counts and monitoring both pre-construction and post-construction on windfarm sites in and around Jeffrey's Bay. These were done with members of the St Francis Bird Club every six weeks and this still continues. In this regard I have done monitoring on the Jeffrey's Bay windfarm, Tsitsikamma Community Windfarm, Tsitsikamma west, Happy Valley, Kouga Windfarm, Gibson Bay, and Oyster Bay.

3. I also participated in CAR counts, CWAC counts and Shore Bird counts. These are all official projects, but the one I have participated in most is the SABAP2 project where I have submitted just under 1000 full protocol lists.

4 . As far as offical monitoring is concerned, I have done monitoring on the following proposed projects:

Amathole:	**59 days pre-construction monitoring.**
Ngxwabangu:	**49 days pre-construction monitoring.**
Humansdorp:	**30 days pre-construction monitoring.**
Sutherland Esizayo:	**48 days pre-construction monitoring.**
Sutherland MRP:	**44 days pre-construction monitoring.**

Woodstock: **76 days pre-construction monitoring.**

Hlobo: **24 days pre-construction monitoring.**

Amakhala: **33 days post-construction monitoring.**

Tsitsikamma: **36 days post-construction monitoring.**

5. I have also done one session of two days monitoring the Cape Vulture roost at Msikaba Gorge.

I trust that this information is acceptable.

W.J. Rossouw

CURRICULUM VITAE

Jonathan Aronson MSc Pr.Sci.Nat

Senior Ecologist

Email:JonathanA@arcusconsulting.co.za

Specialisms

- Ecological Impact Assessments
- Pre-construction and Operational monitoring at wind energy developments
- Data analysis and statistical assessment of ecological data
- GIS mapping and Analysis

Summary of Experience

Jonathan has 12 years of experience studying and researching bats and has presented at the International Bat Research Conference and local bat workshops. He has been at the forefront of bats and wind energy research in South Africa and has worked on more than 40 WEF projects in South Africa, Kenya, Mozambique, Zambia and the UK undertaking pre-construction monitoring, operational monitoring, impact assessments and mitigation strategy design. He is a co-author of the Good Practise Guidelines for Surveying Bats at Wind Energy Facilities in South Africa, is the lead author on the operational monitoring guidelines for bats and is a founding member of the South African Bat Assessment Advisory Panel (SABAAP). He has experience managing wind energy facility projects including developing survey strategies, implementing field surveys, data analysis and report writing. He has provided extensive input to Environmental Impact Assessments (EIA) and post-construction Environmental Management Plans (EMP) for bats.

Professional History

2019 to current - Senior Ecologist, Arcus Consultancy Services Ltd, Cape Town
2013 to 2019 - Ecology Specialist, Arcus Consultancy Services Ltd, Cape Town
2011 to 2013 - Director, Gaia Environmental Services Pty (Ltd), Cape Town
2008 to 2008 - Research Assistant, Percy Fitzpatrick Inst. of African Ornithology, Cape Town

Qualifications and Professional Affiliations

- **University of Cape Town, 2009-2010**
  Msc Zoology
- **University of Cape Town, 2007**
  BSc (Hons) Freshwater Biology
- **University of Cape Town, 2003-2006**
  BSc Zoology
- Member of Society for Conservation Biology (2011 to present)
- South African Bat Assessment Advisory Panel (2013 to 2018)
- South African Bat Assessment Association (2013 to present)
- Professional Natural Scientist (Ecological Science) – SACNASP Registration #400238/14

Project Experience

<u>Pre-Construction Bat Monitoring and Environmental Impact Assessments</u>

- Pienaarspoort Wind Energy Facility (ABO Wind renewable energies (Pty) Ltd).
- Nuweveld Wind Energy Facility (Red Cap Energy (Pty) Ltd).
- Banna Ba Phifu Wind Energy Facility (WKN Windcurrent SA (Pty) Ltd).
- Choje Wind Farm (Wind Relic (Pty) Ltd).
- Kwagga Wind Energy Facility (ABO Wind renewable energies (Pty) Ltd).
- Wind Farm in Zambia (SLR Consulting).
- Namaacha Wind Farm (Consultec).
- Beck Burn Wind Farm. Post-construction Monitoring. (EDF Energy).
- Paulputs Wind Energy Facility (WKN Windcurrent SA (Pty) Ltd).
- Putsonderwater Wind Energy Facility (WKN Windcurrent SA (Pty) Ltd).
- Zingesele Wind Energy Facility (juwi Renewable Energies (Pty) Ltd).
- Highlands Wind Energy Facility (WKN Windcurrent SA (Pty) Ltd).
- Kap Vley Wind Energy Facility (juwi Renewable Energies (Pty) Ltd).
- Universal and Sonop Wind Energy Faculties (JG Afrika).
- Kolkies and Karee Wind Energy Facility (Mainstream Renewable Power South Africa).
- Komsberg East and West Wind Energy Facility (African Clean Energy Developments Pty Ltd).
- Pofadder Wind Energy Facility (Mainstream Renewable Power South Africa).
- Elliot Wind Energy Facility (Rainmaker Energy).
- Spitskop West Wind Energy Facility (RES Southern Africa/Gestamp).
- Spitskop East Wind Energy Facility (RES Southern Africa).
- Patryshoogte Wind Energy Facility (RES Southern Africa).
- Swartberg Wind Energy Facility (CSIR).
- Clover Valley and Groene Kloof Wing Energy Facility (Western Wind Energy).

CURRICULUM VITAE

Jonathan Aronson MSc Pr.Sci.Nat

Senior Ecologist

Email:JonathanA@arcusconsulting.co.za

Operational Bat Monitoring Studies

- West Coast One Wind Energy Facility. Post-construction Monitoring (Aurora Wind Power (RF) (Pty) Ltd).
- Fazakerly Waste Water Treatment Works. Post-construction Monitoring. (United Utilities).
- Gouda Wind Energy Facility (Blue Falcon 140 (Rf) Pty Ltd)
- Hopefield Wind Farm (Umoya Energy).

Ecological Surveys

- Killean Wind Farm. Bat acoustic surveys including a driven transect and commissioning of bat detectors for this proposed site in Scotland, UK. (Renewable Energy Systems Ltd).
- Maple Road, Tankersely. Bat acoustic surveys including a walked transect for this proposed site near Barnsley, UK (Rula Developments).

Due Diligence

- Due Diligence of Bat Monitoring at the Excelsior, Golden Valley and Perdekraal Wind Farm (IBIS Consulting).
- Due Diligence of Bat Monitoring at the Copperton Wind Enery Facility (SLR Consulting).
- Due Diligence of Bat Monitoring at the Roggeveld Wind Farm (IBIS Consulting).
- Due Diligence of Bat Monitoring at the Kangas, Excelsior and Golden Valley Wind Farms (ERM).

Amendment Applications

- Ukomeleza Wind Energy Facility (CES - Environmental and social advisory services).
- Great Kei Wind Energy Facility (CES - Environmental and social advisory services).
- Motherwell Wind Energy Facility (CES - Environmental and social advisory services).
- Dassiesridge Wind Energy Facility (CES - Environmental and social advisory services).
- Great Karoo Wind Energy Facility (Savannah Environmental (Pty) Ltd).
- Gunstfontein Wind Energy Facility (Savannah Environmental (Pty) Ltd).
- Komserberg East and West Wind Energy Facilities (Aurecon South Africa (Pty) Ltd).
- Soetwater Wind Energy Facility (Savannah Environmental (Pty) Ltd).
- Karusa Wind Energy Facility (Savannah Environmental (Pty) Ltd).
- Zen Wind Energy Facility (Savannah Environmental (Pty) Ltd).

Peer Review

- Peer Review for Three Bat Monitoring Reports for the Bokpoort II Solar Developments (Golder Associates)
- Peer Review of Operational Monitoring at the Jeffreys Bay Wind Farm, including updating the operational mitigation strategy for bats (Globeleq South Africa Management Services (Pty) Ltd).
- Oyster Bay Wind Energy Facility. Reviewing a pre-construction bat monitoring study and providing input into a stand-alone study (RES Southern Africa).
- Review and design mitigation strategies for bats at the Kinangop Wind Park, Kenya (African Infrastructure Investment Managers).

Feasibility Studies

- Feasibility assessment for four potential wind farms in the Northern Cape (ABO Wind renewable energies (Pty) Ltd).
- Feasibility assessment for four potential wind farms in Mozambique (Ibis Consulting (Pty) Ltd).
- Assessment of the Feasibility of a Wind Farm in the Northern Cape (juwi Renewable Energies (Pty) Ltd).
- Assessment of the Feasibility of a Wind Farm in the Eastern Cape (WKN Windcurrent SA (Pty) Ltd).

Research Projects

- Darling National Demonstration Wind Farm Project. Designed and implemented a research project investigating bat fatality in the Western Cape.

CURRICULUM VITAE

Jonathan Aronson MSc Pr.Sci.Nat

Senior Ecologist

Email:JonathanA@arcusconsulting.co.za

Publications

- Aronson, J.B., Shackleton, S., and Sikutshwa, L. (2019). Joining the puzzle pieces: reconceptualising ecosystem-based adaptation in South Africa within the current natural resource management and adaptation context. Policy Brief, African Climate and Development Initiative.
- MacEwan, K., **Aronson, J.**, Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – South African Bat Assessment Association (1st Edition).
- **Aronson, J.B.** and Sowler, S. (2016). Mitigation Guidance for Bats at Wind Energy Faculties in South Africa.
- **Aronson, J.B.**, Richardson, E.K., MacEwan, K., Jacobs, D., Marais, W., Aiken, S., Taylor, P., Sowler, S. and Hein, C (2014). South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (1st Edition).
- Sowler, S. and S. Stoffberg (2014). South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments - Pre-Construction (3rd Edition). Kath Potgieter, K., MacEwan, K., Lötter, C., Marais, M., **Aronson, J.B**., Jordaan, S., Jacobs, D.S, Richardson, K., Taylor, P., Avni, J., Diamond, M., Cohen, L., Dippenaar, S., Pierce, M., Power, J. and Ramalho, R (eds).
- **Aronson, J.B.**, Thomas, A. and Jordaan, S. 2013. Bat fatality at a Wind Energy Facility in the Western Cape, South Africa. *African Bat Conservation News* 31: 9-12.

Workshops, Seminars, Conferences and Courses

- Conference on Wildlife and Wind Energy Impacts, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Kirstenbosch Research Centre (KRC), October 2018.
- The Ecosystem Approach and Systems Thinking Course, United Nationals Environment Programme.
- Bats and Wind Energy Workshop, The Waterfront Hotel & Spa, Durban, July 2016.
- Why Carbon Footprinting Makes Business Sense, African Climate and Development Initiative Seminar, September 2016.
- The Age of Sustainable Development Course, The SDG Academy, 2016.
- Planetary Boundaries and Human Opportunities Course, The SDG Academy, 2015.
- Endangered Wildlife Trust (EWT) Bats and Wind Energy Training Course, October 2013.
- Ecological Networks Course, Kirstenbosch Research Centre (KRC), July 2013.
- Social and Economic Network Analysis Course, online via Stanford University, 2013.
- Social Network Analysis Course, online via University of Michigan, 2013.
- Introduction to Complexity Science Course, online via Santa Fe Institute, 2013.
- Introduction to Spatial Analysis using R, Kirstenbosch Research Centre (KRC), May 2013.
- Google Geo Tools for Conservation, University of Cape Town, February 2013.
- Endangered Wildlife Trust (EWT) Bats and Wind Energy Training Course, January 2012.
- 15th International Bat Research Conference, Prague, August 2010.
- Statistical Modelling Workshop for Biologists, University of Cape Town, September 2010.
- ESRI Virtual Campus Online GIS Courses, 2010.
- WAYS/ScholarShip IT Workshop: Remote Sensing and GIS Course, March 2009.

Curriculum Vitae - Helen Taylor-Boyd

Contact Details:
Mobile: 07557526326
Email: taylorboyd1@yahoo.co.uk

Personal Profile:
As an enthusiastic and professional person I have worked to gain a wide range of qualifications and experience in research, conservation and management. I have specialised in ecological surveys and environmental impact assessments and am currently undertaking a part time PhD on Bats in Agricultural Landscapes in Zambia with the University of Stirling, Scotland, whilst remaining available for seasonal or freelance work in the UK and Africa.

Academic Qualifications:

Date	Qualification	Result	Establishment
28th Jan 2010	MSc in Conservation Biology	Distinction	Manchester Metropolitan University
14th July 2008	BSc in Biosciences (specializing in Zoology)	2 (i)	The University of Birmingham
June 2004	A - Level Mathematics A - Level Biology A - Level Chemistry AS - Level Physics	A B B A	Fyling Hall School, North Yorkshire
Nov 2000 Nov 2001 Nov 2001 Nov 2001 Nov 2001 Nov 2001 Nov 2001 Nov 2001 June 2001 Jan 2001	IGCSE Maths IGCSE English Language IGCSE English Literature IGCSE Biology IGCSE Chemistry IGCSE Physics IGCSE Geography IGCSE Agriculture GCSE French RSA Computer Literacy and IT	A* A A* A* A A A A A Stage 1	Chengelo Secondary School, Zambia
1995	Grade 7 Examinations		Sakeji School, Mwinilunga, Zambia

Relevant Employment History:

Date	Employer and Position	
May 2013 - present	Self Employed	Freelance Ecologist
May 2013 – Nov 2014	Jacobs	Seasonal Ecologist
2011-present	Self Employed	Academic Private Tutor
2011-2013	Briar Dawn Veterinary Centre	Veterinary Reception Manager
2010	Kapishya & Mutinondo, Zambia	Lodge, Campsite, Stables and Reserve Manager

Relevant Training/Practical Courses:

Date	Qualification
May 2017	Landscape Computer Modelling Workshop, International Association for Landscape Ecology
May 2015	Emergency First Aid – Expiry May 2018
2014	Bat Trapping, Handling & Radiotracking Course – Wytham Woods, University of Oxford
2009-2016	South Lancs Bat Group training – research methods, ecology, care, law, public engagement etc.
2008-2013	British Trust for Ornithology Bird Ringing Trainee
Feb 2010	Immobilization of Wild Animals Course, Zimbabwe

Relevant Work Experience:

Date	Volunteer Placement	
2014- present	Project Co-ordinator	Zambian Bats Project – practical research, conservation and training
2013- present	Bats without Borders	Fundraising, research and education projects
2009-present	SL Bat Group	Surveys, Rehabilitation, Minutes, Newsletter Editor, Trustee (2012-16)
June-Aug 2009	NamibRand & N/a'ankusê, Namibia	Research on collared and released cheetahs and leopards - home range analysis using telemetry and other positional data
2007	CLZ, Zambia	Publicity, General office work & Wildlife rehabilitation

Relevant Memberships:
Impact Assessment Association of Zambia
International Association for Landscape Ecology
British Ecological Society

Relevant Achievements:
Invited speaker –
Southern African Bat Conference 2017 (and organising committee member)
Research Impact Symposium 2017
International Association for Landscape Ecology Workshop 2017
The Rufford Foundation, Tanzania Conference 2017
Bat Conservation Trust Conferences (Northern 2017, Midlands 2016 & Northern 2015)
Workshop on Conservation Volunteering 2016, Manchester Metropolitan University
Career Conference 2009, The University of Birmingham

Senior Librarian Prefect and Club Coordinator, Fyling Hall School
First Team Hockey, Fyling Hall School
Librarian Prefect – Chengelo School, Zambia
International Swimming Galas for Zambia - Lusaka 2000**,** Nairobi 2001
Competing in school horse riding shows (dressage and show jumping)

Hobbies and Interests:
Wildlife Watching
Rescue & Rehabilitation and Conservation
Reading & Hand Crafts
Sports - Swimming, walking and horse riding

References:
Available upon request

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
- Accredited River Health practitioner by the South African River Health Program (RHP)
- Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
- Member of the Gauteng Wetland Forum;
- Member of International Association of Impact Assessors (IAIA) South Africa;
- Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland Assessment short course Rhodes University	2016

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia

Eastern Africa – Tanzania Mauritius

West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona

Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES OUT OF OVER 2000 PROJECTS WORKED ON

1 Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2 Linear developments
3 Energy Transmission, telecommunication, pipelines, roads
4 Minerals beneficiation
5 Renewable energy (wind and solar)
6 Commercial development
7 Residential development
8 Agriculture
9 Industrial/chemical

Project	Project Description	Area
RESIDENTIAL		
Bloemwater Knelpoort Project	Full ECO Assessment	Free State
Bongwini and Toekomsrus Project Gold 1	Environmental Sensitivity Analyses as part of the development of site Development Plans and Precinct Planning on the outskirts of Takoradi Ghana (2000 ha)	Randfontein
Skoenmaker River	Wetland, Aquatic & ECO Assessment	Somerset East
The Hills Eco Estate	Wetland delineation and ecological assessment, and rehabilitation plan	Midrand, Gauteng
ROADS, PIPELINES, POWERLINES AND OTHER LINEAR DEVELOPMENTS		
Lesotho Border Road Project	Soil & Land Capability Assessment, full wetland ecological assessment and aquatic assessment as part of the EIA process	Lesotho
Thabazimbi Waste Water Treatment Works; Upgrade of Sewer Pipeline	Freshwater resource ecological assessment and rehabilitation and management plan	Limpopo
N11 Ring Road	Freshwater Ecological Assessment	Limpopo
N7 Road Upgrade Cederberg & Kransvleikloof	Floral RDL scan and delineation of the wetland areas along the proposed N7 road upgrade between Clanwilliam and Citrusdal	Western Cape
N3TC De Beers Pass Route	Variation order for additional work on N3TC De Beers pass route and existing N3 route	Kwa-Zulu Natal
MINING		
Der Brochen Mine	Ongoing bi-annual seasonal aquatic biomonitoring from 2011 to present	Steelport Limpopo
Der Brochen Mine	Wetland Ecological Assessment (2014) Full terrestrial, wetland and aquatic ecological assessment, soil and land capability assessment (2018)	Steelpoort, Limpopo
Bokoni Platinum Mine	Annual Soil Monitoring & Soil Contamination	Free State

Rustenburg Bridges	Aquatic Biomonitoring Assessment	Rustenburg, North West
Assmang Chrome Machadodorp Works	Biomonitoring & Toxicological Monitoring for the 2015 period	Machadodorp, Mpumalanga
Sabie TGME Project	Freshwater Ecological Assessment as part of the environmental assessment and authorization process for the proposed development (gold mining project – pre-mined residue and hard rock mining near Sabie)	Mpumalanga
Ikwezi Doornkop Colliery	Develop freshwater resource rehabilitation and management plans, and conduct ecological biomonitoring in fulfillment of the water use licensing process for the Ikwezi Doornkop Colliery near Newcastle	Newcastle
Blesbokspruit Enstra Mill	Biomonitoring studies, whole effluent toxicity (WET) studies, bioaccumulation assessment and sediment heavy metal contaminant analyses	Johannesburg
Malati Opencast	Freshwater ecological assessment, risk assessment and freshwater rehabilitation and management plan and plant species plan as part of the water use authorization process for a proposed Malati opencast near Tzaneen	Limpopo
Heuningkranz Mine	Freshwater assessment, soil and land capability assessment done for Sishen Iron Ore Company (Pty) Ltd part of Kumba Iron Ore limited as part of the environmental management services for the Heuningkranz project	Northern Cape
Leslie Colliery	Project manager, freshwater ecological assessment as part of the environmental impact assessment process for the underground coal mine to determine the status of the freshwater resources within the proposed mining area	Mpumalanga
Commissiekraal Colliery	Full Ecological investigation, including a terrestrial fauna and flora assessment as well as an assessment of the wetland and aquatic PES and wetland ecoservices on the site.	Kwa-Zulu Natal
Leandra Colliery	Full Ecological Assessment, including a terrestrial fauna and flora assessment as well as an assessment of the wetland and aquatic PES and wetland ecoservices on the site.	Mpumalanga
Marula Platinum Mine	Freshwater resource ecological assessment. Development of a plant species plan in line with the project's rehabilitation objectives	Burgersfort
Donkerhoek Dam development	Full ecological assessment (Fauna, floral, wetland and aquatic assessment) as part of the EIA process	Mpumalanga
Evander Gold Mine Wetland Offset	Determination of the Wetland Offset Requirements for the proposed expansion of the Elikhulu Tailings Storage Facility	Mpumalanga
Canyon Coal - Witfontein mining project	Delineate and characterize the wetland and aquatic resources for the Witfontein mining project located by the farms Holfontein and Witrand near Bethal	Mpumalanga
The Sierra Rutile Mine	Specialist terrestrial ecology, aquatic ecology and wetland ecology studies	Moyamba District - Sierra Leona
INFRASTRUCTURE		

Bronkhorstspruit Feeder Line	Monthly Aquatic Biomonitoring as part of the environmental assessment and authorization process for the proposed conversion of the Bronkhorstspruit plots feeder from 6.6kv to 22kv	Bronkhorstspruit
South Dunes Precinct Project	Full Ecological Assessment	Richards Bay
Braamfonteinspruit Rehabilitation	Terrestrial, Freshwater and Aquatic Ecological Assessment as part of the rehabilitation and management plan for the Braamfonsteinspruit, Johannesburg	Johannesburg
City of Johannesburg	Aquatic Ecological Assessment, monitoring and managing the ecological state of rivers in the City Of Johannesburg Metropolitan area	Johannesburg
Lethabo Pump Station	Aquatic present ecological state assessment of the Vaal river	Vereeniging
CTIA runway re-alignment project – Wetland Offset	Determination of the Wetland offset requirements for Cape Town international Airport runway realignment, identification of a suitable offset location and compilation of relevant baseline assessments (Wetland and faunal), Khayelitsha. (2017)	Cape Town
Musami Dam	Determination of the draft environmental water quality requirements for the project	Zimbabwe
uMkhomazi Water Project	Determination of the Wetland and Terrestrial Biodiversity Offset Requirements for the proposed uMkhomazi Water Project	Richmond - KZN
POWER GENERATION		
Mzimvubu Dam	Full Terrestrial (Flora and Faunal), Wetland and Aquatic Baseline Ecological Assessment	Eastern Cape
HGA HAGA WEF	Hydrological Assessment	Eastern Cape
RPM Crossing	Wetland Delineation	Free State
Eskom Denova Powerline and sub-station	Freshwater assessment as part of the EIA process for the proposed Eskom powerline (1,75 km in length) and sub-station (132kV) near Denova, Western Cape. (2014)	Western Cape
Sutherland WEF	Freshwater Ecological Assessments	Northern Cape
Victoria West WEF	Freshwater Ecological Assessments	Northern Cape
INFRASTRUCTURE		
GIBB (Pty) Ltd	Bronkhorstspruit Feeder Line	Monthly Aquatic Biomonitoring as part of the environmental assessment and authorization process for the proposed conversion of the Bronkhorstspruit plots feeder from 6.6kv to 22kv	Bronkhorstspruit
SRK Consulting (PTY) Ltd	South Dunes Precinct Project	Full Ecological Assessment	Richards Bay
SRK Consulting (PTY) Ltd	Braamfonteinspruit Rehabilitation	Terrestrial, Freshwater and Aquatic Ecological Assessment as part of the rehabilitation and management plan for the Braamfonsteinspruit, Johannesburg	Johannesburg

Iliso Consulting (Pty Ltd)	City of Johannesburg	Aquatic Ecological Assessment, monitoring and managing the ecological state of rivers in the City Of Johannesburg Metropolitan area	Johannesburg
Maanakana Projects and Consulting (Pty) Ltd	Lethabo Pump Station	Aquatic present ecological state assessment of the Vaal river	Vereeniging
SRK Consulting	CTIA runway re-alignment project – Wetland Offset	Determination of the Wetland offset requirements for Cape Town international Airport runway realignment, identification of a suitable offset location and compilation of relevant baseline assessments (Wetland and faunal), Khayelitsha. (2017)	Cape Town
GIBB (Pty) Ltd	Musami Dam	Determination of the draft environmental water quality requirements for the project	Zimbabwe
Nemai Consulting (PTY) Ltd	uMkhomazi Water Project	Determination of the Wetland and Terrestrial Biodiversity Offset Requirements for the proposed uMkhomazi Water Project	Richmond - KZN
POWER GENERATION			
Iliso Consulting	Mzimvubu Dam	Full Terrestrial (Flora and Faunal), Wetland and Aquatic Baseline Ecological Assessment	Eastern Cape
WKN-Wind current SA C/O Alan Wolfromm	HGA HAGA WEF	Hydrological Assessment	Eastern Cape
SRK Consulting (PTY) Ltd	RPM Crossing	Wetland Delineation	Free State
SRK Consulting (Pty) Ltd	Eskom Denova Powerline and sub-station	Freshwater assessment as part of the EIA process for the proposed Eskom powerline (1,75 km in length) and sub-station (132kV) near Denova, Western Cape. (2014)	Western Cape
CSIR Consulting & Analytical Services	Sutherland WEF	Freshwater Ecological Assessments	Northern Cape
CSIR Consulting & Analytical Services	Victoria West WEF	Freshwater Ecological Assessments	Northern Cape

REFERENCES

- Terry Calmeyer
  Director: ILISO Consulting Environmental Management (Pty) Ltd
  Tel: +27 (0) 11 465 2163
  Email: terryc@icem.co.za

- Alex Pheiffer
  African Environmental Management Operations Manager
  SLR Consulting
  Tel: +27 11 467 0945
  Email: apheiffer@slrconsulting.com

- Marietjie Eksteen
  Managing Director: Jacana Environmental
  Tel: 015 291 4015

Yours faithfully

STEPHEN VAN STADEN

SCIENTIFIC TERRESTRIAL SERVICES (STS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Ecologist
Date of Birth	24 June 1986
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Freestate

Zimbabwe

SELECTED PROJECT EXAMPLES

Faunal Assessments

- Faunal assessment as part of the environmental assessment and authorisation process for the proposed Mzimvubu Water Project, Eastern Cape.
- Faunal assessment as part of the environmental assessment and authorisation process for the proposed Setlagole Mall Development, North West.
- Faunal assessment as part of the environmental assessment and authorisation process for the proposed Expansion and Upgrade of the Springlake Railway Siding, Hattingspruit, Kwa-Zulu Natal.
- Faunal assessment as part of the environmental assessment and authorisation process for the proposed Styldrift tailings storage facility, return water dams, topsoil stockpile and other associated infrastructure, North West.
- Faunal assessment as part of the environmental assessment and authorisation process for the development of a proposed abalone farm, Brand se Baai, Western Cape.
- Faunal assessment as part of the environmental assessment and authorisation process for the development of a proposed abalone farm, Doringbaai, Western Cape.
- Vegetation composition and subsequent loss of carrying capacity for the Rand Water B19 and VG Residue Pipeline Project, Freestate.
- Faunal assessment as part of the environmental assessment and authorisation process for the Evander Shaft 6 Plant Upgrade, New Tailings Dam Area and Associated Tailings Delivery and Return Water Pipeline, Evander, Mpumalanga.

Previous Work Experience

- Spotted Hyaena Research Project, Phinda Private Game Reserve, KwaZulu Natal.
- Camera Trap Survey as part of the Munyawana Leopard Project, Mkuze Game Reserve, KwaZulu Natal.
- Lowveld Wild Dog Project, Savé Valley Conservancy, Zimbabwe.
- Lion collaring and Tracking as part lion management program, Savé Valley Conservancy, Zimbabwe.
- Junior Nature Conservator, Gauteng Department of Rural Development and Land Reform.

C A T H E R I N E M U N D I A E R N E S T

Nationality: Zambian
Marital Status: Married
Profession: Ecology and Wildlife Specialist
Position: Senior Consultant

SUMMARY OF QUALIFICATIONS AND EXPERIENCE

A qualified and experienced ecologist and wildlife specialist who currently is studying for her MSc in Environmental Management with the University of Lusaka. Catherine Ernest has over five years of both professional work experiences in environmental assessment and related fields of study. She has been a lead ecologist in majority of the ESIA studies undertaken by Riverine Zambia Limited and Golder Associates (Z) Ltd.

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

2016 MSc Environmental Management Student, University of Lusaka
2013 Introduction to statistical analysis, on-line ELearning, Berkley University, USA
2009 BSc Ecology and Wildlife Management, University of Zambia
2004 Basic information technology, Lusaka Vocation Training Centre
1996 GCE certificate, Njase Girls secondary School

CONSULTANCIES UNDERTAKEN

Aug 2018: **Chibaye** - Ecologist responsible for biodiversity study on a proposed solar farm project.

May 2018: **Rural Electrification Authority** – Ecologist responsible for ecology studies on eight Grid Extension projects in Kazungula, Kalomo, Pemba, Mazabuka, Petauke, Sioma, and Chongwe districts of Zambia.

Dec 2017: **ZESCO** – Ecologist responsible for biodiversity study on the Lusaka Transimission and Distribution Project Rehabilitation.

Mar 2017: **Kitwe Tailings Facility** - Responsible for the terrestrial biodiversity study and report write-up on the Kitwe tailings Facility ESIA

June 2017: **Ndola and Mufulira Rural** - Social survey for Frontier mine for an Environmental Impact and Social Impact Assessment.

Sept 2016: **Maamba** – Associate consultant with Golder Associates Zambia Limited responsible for collection of air emissions and sound for the Maamba Thermal Power post ESIA monitoring, including general maintenance of E samplers.

May 2016: **Lusaka** – Member of the SASSCAL 109 project team implemented by the Department of Geography and Environmental Studies of the University of Zambia responsible for the classification and identification of micro-invertebrates, assessment of factors influencing

their occurrence, assessment of opportunities and challenges for increased biodiversity in the sampled reservoirs, as well as reporting.

Mar to May 2016: **Lusaka** – Ecologist for the ESIA and responsible for the biodiversity assessment on the study to establish and operate two burrow pits at Kenneth Kaunda International Airport (KKIA) for use as a source of construction material in the construction of the new airport infrastructure at KKIA. The EPB was commissioned by China Jiangxi Corporation Zambia Limited and undertaken by Riverine Zambia Limited.

Jan to Apr 2016:**Siavonga** – Ecologist responsible for biodiversity assessment, report write-up for Environmental and Social Impact Assessment on the Aquaculture Project ESIA study for Yalelo Limited undertaken by Golder Associates Zambia Limited.

Apr 2015 to Aug 2016: **Munali** – Ecologist and member of the consultant team responsible for the biodiversity study on the Munali Nickel Mine ESIA study – Proposed process plant upgrade project Munali Nickel Mine, Zambia. The study was jointly undertaken by Riverine Zambia Limited and Zyl Consulting Limited of the UK.

Mar 2015: **Maamba**- Health and Social Survey and Compilation of Standard Operation Procedures and Management Programs for the Maamba Collieries Ltd Health, Safety, Environmental and Social Management Plan. This includes Bi-Annual Social Surveys for Resettlement Action Plan monitoring of the Thermal Power Plant.

January 2015 to Date: **Siavonga**-Water sampling, monitoring and Reporting for Yalelo Ltd Aquaculture Project Including ZEMA permitting and return submission, subcontracted by Golder associates (Z) Ltd.

Feb to Nov 2014: **Lusaka** – Ecologist and sub-consultant on the Kenneth Kaunda International Airport ESIA study assisting with the biodiversity study.

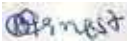
Feb to May 2014: **Mazabuka** – Lead environmental consultant subcontracted by Golder Associates on the ESIA study team for the Mazabuka Hospital Environmental Project Brief and overall preparation of Environmental Project Brief.

Apr to July 2014: **Kolwezi, Congo DR** – Ecologist and assistant consultant under Golder Associates Zambia Limited helping with the biodiversity assessment for the prospecting works and overall preparation of the EPB for the Kamoa Copper Project

Jan to Dec 2013: **Zambia** – Field Entomologist with the National Malaria Control Centre responsible for identification and collection of Anopheles mosquitoes; ensuring that mosquitoes are kept alive for duration of field trip and transportation brought back to the National Malaria Control Centre alive; caring for and growing mosquito colonies, and carrying out bioassays to test the efficacy of insecticides on the first generation female Anopheles mosquitoes.

2010 to 2012: **Lusaka** – Tutor and laboratory Demonstrator at the University of Zambia Great East Road Campus, School of Natural Sciences.

2012: **Lusaka** – Research Assistant on the Makeni Savanna Research responsible for identification of trees and grass species as well as biomass survey.



CATHERINE MUNDIA ERNEST
23/07/17

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Ecologist
Date of Birth	15 February 1978
Nationality	Zimbabwean
Languages	English
Joined SAS	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

South African Wetland Society

Gauteng Wetland Forum

Society of Wetland Scientists

EDUCATION

Qualifications

N.Dip Nature Conservation (UNISA)	2017
Tools for Wetland Assessment (Rhodes University)	2017
Wetland Rehabilitation (University of the Free State)	2015

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape

Zimbabwe

SELECTED PROJECT EXAMPLES

Wetland Assessments

- Baseline Aquatic and Freshwater Assessment as part of the Environmental Assessment and Authorisation Process for the N11 Ring Road, Mokopane, Limpopo Province.
- Freshwater Resource Ecological Assessment as part of the Water Use License Application Requirements for the Proposed Upgrades to the Klippan Pump Station Near Welkom, Free State Province.
- Freshwater Resource Ecological Assessment as part of the Water Use License Application Requirements for the Proposed Urania-Bronville 11kv and 132kv Powerline Corridor Near Welkom, Free State Province.
- Freshwater Assessment for the Proposed Rietrug, Distribution Line: Basic Assessment for the proposed Construction of Electrical Grid Infrastructure to support the proposed (split) Rietrug Wind Energy Facility, near Sutherland, in the Northern Cape and Western Cape Provinces.
- Freshwater Assessment for the Proposed Sutherland 2 Distribution Line: Basic Assessment for the proposed Construction of Electrical Grid Infrastructure to support the proposed (split) Sutherland 2 Wind Energy Facility, near Sutherland, in the Northern Cape and Western Cape Provinces.

- Freshwater Assessment for the Proposed Sutherland Distribution Line: Basic Assessment for the proposed Construction of Electrical Grid Infrastructure to support the proposed (split) Sutherland Wind Energy Facility, near Sutherland, in the Northern Cape and Western Cape Provinces.
- Freshwater resource delineation and ecological assessment as part of the proposed expansion of the Kudumane Mining Project, Northern Cape Province.
- Freshwater assessment as part of the environmental assessment and authorisation process for associate electrical infrastructure and a proposed pipeline for the Rooipunt Solar Thermal Power Park Project near Upington, Northern Cape.
- Present Ecological State of the Wetlands Report: Jukskei and Klip River Catchments: Monitoring and Managing the Ecological State of the Wetlands in the City of Johannesburg Metropolitan Area.
- Wetland assessment as part of the environmental assessment and authorisation process for the proposed Leandra underground coal mine.
- Freshwater ecological assessment as part of the water use licence application process for the proposed waste rock dump expansion for Impala Platinum Mine in Rustenburg, North-West Province.
- Wetland assessment as part of the water use licence application process for the Marula Platinum Mine, Limpopo Province.
- Wetland assessment as part of the environmental authorisation process for the Anglo Platinum Der Brochen Project, Limpopo Province.
- Wetland assessment as part of the environmental authorisation process for the proposed Yzermyn Coal Mining Project near Dirkiesdorp, Mpumalanga.
- Wetland assessment as part of the environmental authorisation process for the Mzimvubu Water Project, Eastern Cape.
- Wetland assessment as part of the proposed water management process at the Assmang Chrome Machadodorp Works, Mpumalanga.
- Wetland ecological assessment as part of the Section 24G application process for the Temba Water Purification Plant.

Terrestrial Assessments

- Investigation of specialist biodiversity aspects required by GDARD in the vicinity of the Apies River, downstream of the proposed construction of new outlet works at the Kudube (Leeuwkraal) Dam in Temba, Gauteng
- Terrestrial Ecological Scan as part of the environmental authorisation process for three proposed bridge upgrades near Edenvale, Gauteng
- Terrestrial Ecological Scan as part of the environmental authorisation process for the proposed Dalpark Ext 3 filling station development, Gauteng

Rehabilitation Projects

- Freshwater Resource Rehabilitation and Management Plan as part of the Environmental Authorisation Process for the Proposed Urania-Bronville 11kv and 132kv Powerline Corridor Near Welkom, Free State Province.
- Rehabilitation Plan as part of the Water Use License Application Requirements for the Proposed Upgrade of the Thabazimbi Wastewater Treatment Works (WWTW) Sewer Line, Limpopo Province.
- Wetland rehabilitation and management plan for The Hills EcoEstate, Midrand, Gauteng.
- Riparian rehabilitation and management plan for The Diepsloot River, Riversands, Gauteng.
- Riparian rehabilitation and management plan for the Apies River in the vicinity of the proposed construction of new outlet works at the Kudube (Leeuwkraal) Dam in Temba, Gauteng.

Environmental Control Officer

- Monthly specialist Environmental Control Officer (ECO) function for the monitoring of riparian crossings at Riversands Country Estate Development, Gauteng province.
- Weekly specialist Environmental Control Officer (ECO) function for the monitoring of emergency desilting and rehabilitation of existing stormwater retention dams on ERF 836 Kosmosdal ext 1, and portion 5 of ERF 115 Kosmosdal ext 4, near Centurion, Gauteng Province.

Marco Da Cunha
Nomad Consulting
Social and Resettlement Specialist

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PERSONAL DETAILS

Full Name:	Marco Filipe Santos da Cunha
Date of Birth:	19 July 1980
Nationality:	South African / Portuguese
Country of Residence:	South Africa
Home Language:	English
Other Language:	Portuguese

PROFESSIONAL SUMMARY

Marco has 16 years of experience in the field of environmental and social management. This includes specialisation in undertaking Social Impact Assessments (SIAs) and Resettlement Action Plans (RAPs) for a range of industry sectors throughout sub-Saharan Africa and more recently globally. Specific industry sector experience includes mining, oil and gas, transport infrastructure, dams and hydropower, forestry, agriculture, and public infrastructure.

All work is undertaken in conformance with international good practice standards as framed by the World Bank, International Finance Corporation, and Equator Principles, where specifically required by the client or financing Institutions.

Marco also has extensive expertise in undertaking Environmental and Social Screening Studies, Compliance Audits, Due Diligence Assessments, Resettlement Close Out-Audits and Monitoring and Evaluation. This has included internal performance monitoring for private clients, and independent audits required by financing Institutions.

Geographical Experience – Afghanistan, Angola, Botswana, Ethiopia, Ghana, Guinea-Bissau, Kenya, Lesotho, Malaysia, Myanmar, Mozambique, Namibia, Rwanda, Pakistan, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia.

EMPLOYMENT HISTORY

Resettlement and Social Specialist, Nomad Consulting, 2012 to Current
Senior Consultant, Environmental Resources Management, 2010-2012
Environmental Consultant, Jeffares & Green, 2008-2010
Environmental Consultant, Coastal & Environmental Services, 2005-2008

EDUCATION

MSc (Geography and Environmental Management), University of Natal, South Africa, 2004-2005
BSc Honours (Geography and Environmental Management), University of Natal, South Africa, 2003
BSc (Geography and Environmental Management), University of Natal, South Africa, 1998-2002

REPRESENTATIVE PROJECTS

SIIP 2 Third Party Monitoring and Evaluation, Afghanistan, Current: Social and resettlement monitoring of two Asian Development Bank (ADB) funded projects in Afghanistan, including two projects funded under the Transport Network Development Investment Programme and Energy Sector Development Investment Program.

Mphepo Wind Unika 1 Wind Farm Social Impact Assessment, Zambia, Current: Preparation of the SIA for a proposed Mphepo Wind Unika 1 Wind Farm located in the Eastern Province of Zambia. The SIA includes the development of a social baseline, impact assessment and Social Management Plan.

Toliara Sands Resettlement Action Plan, Madagascar, Current: Preparation of a Resettlement Action Plan for the development of the Toliara Sands Heavy Mineral Sands Project. This includes both physical and economic displacement on the mine site, dedicated haul road and the port site.

Sese Power RAP, Botswana, Current: Project manager for the development of a Resettlement Action Plan for the resettlement of households' resident in the surface right area of the proposed open pit coal mine and a power station (the Sese Power Project) approximately 60 km south-west of Francistown.

Globeleq Aurora Solar PV Plant Livelihoods Restoration Framework, Zambia, 2019: Preparation of a Livelihoods Restoration Framework (LRF) for a proposed 40MW solar PV plant located in Zambia. The LRF forms part of the overall environmental assessment required to secure project funding.

Kitwe Tailings Retreatment Project, Land Acquisition and Resettlement Framework, Zambia, 2019: Preparation of a Land Acquisition and Resettlement Framework (LARF) to address economic displacement related to the proposed retreatment of 11 historical tailing dumps by Copper Tree Minerals in Kitwe Town, Zambia

Resettlement Policy Framework, DRC, 2019: Preparation of a Resettlement Policy Framework document as a precursor to a full Resettlement Acton Plan for a Private Client in the Democratic Republic of Congo.

Ngonye Falls Hydropower Project Social Impact Assessment, Zambia, 2019: Preparation of the SIA for a proposed hydropower Project located on the Zambezi River and directly upstream of the Ngonye Falls in Zambia. The SIA is being prepared to conform with the provisions of the IFC Performance Standards.

Ngonye Falls Hydropower Project Resettlement Policy Framework, Zambia, 2019: Preparation of a Resettlement Policy Framework document as a precursor to a full Resettlement Acton Plan for the proposed hydropower Project located on the Zambezi River and directly upstream of the Ngonye Falls in Zambia. The Resettlement Policy Framework is being prepared to conform with the provisions of the IFC Performance Standards.

TAPI Pipeline Project Resettlement Action Plan, Pakistan and Afghanistan, 2019: Team member in providing remote advisory services and guidance in the preparation of separate RAPs for the TAPI Pipeline Project that is proposed to cross Pakistan and Afghanistan.

20MW Solar PV Plant Social Screening Assessment, Zambia, 2018: Preparation of a social screening assessment of a proposed 20MW solar PV plant located in Zambia. The screening form part of the overall environmental assessment required to secure project funding.

World Wildlife Fund – Training on IFC Performance Standards, Kenya, 2017: Presenter at a WWF sponsored training workshop on the application of the IFC Performance Standards for private and public projects in Kenya. Special focus was given to the social components of the Performance Standards notably in terms of involuntary resettlement and indigenous peoples.

Social and Resettlement Services for Contract Area 1, Uganda, 2017: Part of a consortium of specialists appointed by Total E&P Uganda and Tullow Uganda to prepare an IFC conformance Resettlement Action Plan for multiple phases of resettlement related to Contract Area 1, EA-1, EA-1A and Licensed Area 2 development in Uganda.

Chiansi Resettlement Action Plan, AgDevCo, Zambia, 2017: Provided support to the Client in the validation of household assets and defined entitlement contracts for Project-Affected-Persons as a lead-up to the update of the Project RAP.

Anglo-Platinum Twickenham Resettlement Review, Anglo-Platinum, South Africa, 2017: Currently undertaking a detailed review of the resettlement undertaken a multiple mine sites in South Africa. The intent of the review is to determine the socio-economic changes over time and advise on the way forward on any community development programmes.

Kenmare Moma Mineral Sands Social Monitoring, Mozambique, 2017: Completed a detailed social monitoring programme for the Kenmare-Moma Minerals Sands Project in Mozambique. This included a household survey and focus group interviews, as well as the review of community investment projects.

Baseline Socio-Economic Survey for the Northern Agricultural Hub, AgDevCo, Zambia, 2016: Provided support in the preparation of a baseline study to facilitate future impact evaluations, and understand and improve livelihoods associated with the Northern Zambia Agricultural Hub (NZAH). This included a detailed assessment of the potential socio-economic and resettlement risks related to specific project components.

ZESCO Resettlement Review, Nordea, Standard Bank, SEK and SEF, Zambia, 2016: Completed a comprehensive independent review of the the resettlement aspects of the construction of a high-voltage power transmission line project (the North-Western Grid Extension Project, or “Project”) owned by ZESCO in Zambia. The review included an assessment of the RAP implementation regarding its alignment with the IFC Performance Standards.

Farim Resettlement Action Plan, GB Minerals, Guinea-Bissau, 2016: Prepared an IFC conformant RAP for the proposed Farim Phosphate Mine located in Guinea-Bissau. The RAP defines the entitlement and livelihoods restoration requirements for the resettlement of approximately 175 households and land acquisition of approximately 3000 hectares.

Panda Hill Environmental and Social Due Diligence, Tanzania, KfW, Tanzania, 2016: Completed a detailed due diligence review of the socio-economic risks and proposed management interventions related to the proposed Panda Hill Niobium Project against both national requirements and international good practice standards (as framed by the International Finance Corporation (IFC) Performance Standards).

Richards Bay Minerals Socio-Economic Baseline Study, Rio Tinto, South Africa, 2015: Completed a comprehensive a Socio-Economic Baseline Study of the 17 communities surrounding the Richards Bay Minerals Project area, which covers heavy mineral sands mining in the Richards Bay area in Kwazulu-Natal, South Africa. This included a household census survey of 521 households and extensive focus group meetings and interviews of key stakeholders. The findings were integrated into a Social Management Plan (SMP)

Ethemba Dam Resettlement Action Plan, Ministry of Natural Resources, Swaziland, 2015: Prepared a Resettlement Action Plan for the proposed Ethemba Dam in Swaziland on behalf of the Ministry of Natural Resources. The Resettlement Action Plan functioned as a specific technical input into the Environmental Impact Assessment.

Border Management Agency Bill SIA, Government of South Africa, South Africa, 2015: Prepared a Social Impact Assessment System to assess the socio-economic implications, both costs and benefits, associated with the establishment of the Border Management Agency. This included an analysis of policy, organisational, functional implications, and the potential impacts on, both legitimate and undocumented, users of the South African Ports of Entry and borderline.

Trident Kalumbila Mine Resettlement Close-Out Audit, Zambia, Trident Minerals, 2015: Prepared a Close-Out Audit for the Kalumbila Mine Project resettlement and compensation programme in Zambia, on behalf of Trident Minerals. This included a household survey and focus group interviews, as well as the review on company internal systems against the RAP commitments.

Farim Phosphate Mine Resettlement Policy Framework, GB Minerals, Guinea-Bissau, 2015: Prepared a Resettlement Policy Framework for the proposed Farim Phosphate Mine located in Guinea-Bissau. The framework included a household survey to determine the initial quantum of resettlement as well as interviews with potentially affected persons.

Social Impact Assessment for 2D/3D Offshore Seismic Survey, Woodside Energy, Myanmar, 2015: Prepared a Social Impact Assessment and Social Management Plan a specialist component of the ESIA for 2D and 3D Offshore Seismic Surveys in blocks AD-05 and A-7 in the Rakhine Basin, Myanmar.

Kenmare Moma Heavy Mineral Sands Resettlement Close-Out Audit, Kenmare, Mozambique, 2015; Completed a detailed Close-Out Audit for the Kenmare-Moma Minerals Sands resettlement and compensation programme in Mozambique. This included a household survey and focus group interviews, as well as the review on company internal systems against the RAP commitments.

Copler Complex Mine Capacity Increase Project Social Impact Assessment, Turkey, 2015 Project team member in the preparation of the Social Impact Assessment for the expansion of the Copler Mine in Turkey. This included the assessment of local community livelihoods, cumulative impacts related to existing mine operations and the development of a Social Management Plan.

Pietermaritzburg National Ring Road Social Impact Assessment, SANRAL South Africa, 2015 Prepared a Social Screening Assessment of the proposed upgrade of the National Route 3 (N3) in proximity to the City of Pietermaritzburg, KwaZulu-Natal. This functions as a lead up to the Environmental and Social Impact Assessment.

Waste to Energy Facility Environmental and Social Screening Study, Malaysia, 2014 Team member in the preparation of an Environmental and Social Screening Study for a proposed USD 100 million Waste-to-Energy Facility that seeks to incinerate municipal waste and generate electricity in Malaysia.

Project RAPID Social Impact Assessment, PETRONAS, Malaysia, 2014 Team member in the preparation of an IFC conformance Social Impact Assessment for the Refinery and Petrochemical Integrated Development Project (Project RAPID) proposed to be developed by PETRONAS in Malaysia.

Kenmare Moma Mineral Sands Resettlement Monitoring, Kenmare Minerals, Mozambique, 2014 Prepared a social and resettlement monitoring programme for the Kenmare Moma Mineral Sands Project, Moma District, Mozambique. Task work included household surveys, database development and a range of qualitative interviews and focus group discussions.

Bingo Resettlement Action Plan, Mozambique, Limpopo National Park, 2014, Team member for the preparation of a Resettlement Action Plan for the community of Bingo, whom reside in the Limpopo National Park, on behalf of the Ministry of Tourism - National Directorate of Conservation Areas.

Kwale Mineral Sands Social Monitoring, Kenya, Base Minerals, 2014 Managed the monitoring and evaluation of the Kwale Mineral Sands Project against the Projects' Social Monitoring Plan (SMP), including undertaking field surveys, database development, interviews and report writing.

New Forest Socio-Economic Baseline, Rwanda, New Forest, 2014 Team member in the preparation and field work for the development of a socio-economic baseline of communities located in proximity of the New Forest plantation concession area (termed the Nyungwe Buffer Zone) in conformance with New Forest Corporate Social Responsibilities, and international good practice standards. This included recommending potential community development and investment plans.

Makandazulo Resettlement Action Plan, Mozambique, Limpopo National Park, 2014 Prepared a a Resettlement Action Plan for the community of Makandazulo, whom reside in the Limpopo National Park, on behalf of the Ministry of Tourism - National Directorate of Conservation Areas.

Geita Compensation Programme, AngloGold, Tanzania, 2013, Team member in the preparation of compensation contracts and database development for the Geita Gold Mine Compensation Programme. This included working alongside the Anglo-Gold Ashanti community team on-site.

Kafue Catchment Socio-Economic Baseline, KFW, Zambia, 2013 Project manager in preparing a socio-economic baseline for the Kafue Catchment, Zambia as part of a wider integrated water resources management information system, and application of the information system to incorporate climate change in water resources management in Zambia.

Mafube Coal Mine Resettlement Review, AngloCoal, South Africa, 2013 Project manager in undertaking a detailed review of the resettlement process managed by Anglo American at the Mafube Colliery Project, South Africa. The review included detailed household surveys, interviews, and data review to determine fulfilment of resettlement commitments.

AngloGold Ashanti Iduapriem Mine Resettlement Planning, AngloGold, Ghana, 2013 Project manager on the survey of potentially affected villages and hamlets associated with the AngloGold Ashanti Iduapriem Mine. Functions included the management and supervision of field surveys, development of eligibility and entitlement frameworks, database development and on-going support on the development of a RAP.

Nacala Dam Resettlement Action Plan, MCC Mozambique, Mozambique, 2013: Provision of advisory services to the Millennium Challenge Account, Mozambique in terms of entitlement provision as part of the Nacala Dam upgrade resettlement process.

Kwale Mineral Sands Social Monitoring, Base Minerals, Kenya, 2013 Managed the monitoring and evaluation of the Kwale Mineral Sands Project against the Projects' Social Monitoring Plan (SMP), including undertaking field surveys, database development, interviews and report writing.

Kwale Mineral Sands Labour Audit, Base Minerals, Kenya, 2013: Managed an audit of the overall performance of Base Minerals, and third-party contractors, against the requirements and indicators established in the Labour, Recruitment, and Influx Management Plan (LRIMP).

Kwale Mineral Sands EMP/EMS Support, Base Minerals, Kenya, 2012 Assisted in the preparation of Environmental Management Plans and Programmes, as part of the development of the Environmental and Social Management System for the Kwale Minerals Sands Project, Kenya

Sisili-Kulpawn Irrigation Project Environmental and Social Screening Study, Ghana, 2012 Assessed the socio-economic, land-tenure and environmental context of the proposed Sisili-Kulpawn Irrigation Project located in northern Ghana, as well as identify key opportunities and risks to the project, and advise on suitable strategies and mitigation measures.

Sonaref Refinery ESIA, Angola, SONAREF, 2012 Managed the Environmental, Social and Health Impact Assessment (ESIA) for the Sonaref Refinery Project in Lobito, Angola. Several addenda EIA were prepared covering an Early Works Programme, Dredging Programme, and a Demining Programme, in addition to the main Refinery ESIA.

Ncondezi Coal Mine ESIA, Mozambique, Ncondezi Coal, 2012 Managed the Environmental and Social Impact Assessment (ESIA) for the proposed Ncondezi Coal Mine in the Province of Tete, Mozambique. This project has been structured to meet both Mozambiquan environmental law and international best practice standards in terms of environmental performance and due process.

Dube TradePort Environmental Compliance Auditing, Dube TradePort, South Africa, 2012 Prepared Operational Environmental Compliance Audits at quarterly intervals for the Dube TradePort, specifically against the Operational Environmental Management Plan (OEMP) and EIA Record of Decision.

Etango Uranium Mine Linear Infrastructure ESIA, Namibia, 2011 Part of the ESIA team that prepared an Environmental and Social Impact Assessment for all ancillary linear infrastructures for the Etango Uranium Mine in Namibia. This included the preparation of a Scoping Report and an Environmental Impact Report in line with local legislation and international best practice standards.

Riversdale Transhipment EIA, Riversdale, Mozambique, 2011 Prepared a Simplified Environmental Assessment was prepared for the proposed transhipment programme for Riversdale from the Port of Beira to ocean-going vessels in the Bay of Sofala, Mozambique.

Coal of Africa Due Diligence, Coal of Africa, South Africa, 2011 Part of a multidisciplinary team that prepared an independent International Finance Corporation and Equator Principles review of the Makhado Colliery Project Limpopo Province, South Africa. This included a review of all environmental and social factors to determine overall conformance with IFC performance standards.

Angola LNG Due Diligence, Chevron and BP, Angola, 2011 Managed an independent third-party Due Diligence review of the Angola LNG facility. The review compared the environmental and social performance against the commitments established in the Angola LNG Environmental, Socio-Economic and Health Impact Assessment.

Transnet Durban International Airport Dig-Out Port Environmental Sensitivity Study, TRANSNET, South Africa, 2011 Managed a feasibility level environmental sensitivity analysis of the dig-out port proposed by Transnet at the existing Durban International Airport Site.

Project Craft Due Environmental and Health and Safety Diligence Assessment, Simba Food, South Africa, 2011 Prepared a Due Diligence was undertaken of a food flavourants facility located in Durban, South Africa. The overall objective was to identify any environmental and health and safety compliance issues or soil and groundwater risks which may affected the proposed acquisition of facility by a private client.

Prospection Phase 1 Environmental Due Diligence, Private Client, 2011 Prepared a Phase 1 Environmental Due Diligence of a food manufacturing facility in Durban South, South Africa to provide input into the acquisition Due Diligence process by a private client.

Bluefield's Due Diligence, South Africa, Private Client, 2011 Prepared a Phase 1 Environmental Due Diligence was undertaken of a proposed facility in KwaZulu-Natal for a private client as part of acquisition process. This included an assessment of national and provincial legislative requirements and consideration of environmental and social risks related to the facility.

Project St Lawrence Environmental and Health and Safety Audit, Private Client, South Africa, 2011 Team member in the preparation of a Phase 1 Environmental and Health and Safety Audit for a major metal firm in South Africa as part of a wider due diligence assessment.

Chevron Lubricants Plant Compliance Assurance, Private Client, South Africa, 2011 Team member in the preparation of a Compliance Assurance programme to determine the environmental, health and social legal requirements of the Chevron Lubricants Plant, in East London, South Africa.

Dube TradePort Operational EMP, Dube TradePort, South Africa, 2011 Prepared an Operational Environmental Management Plan for the Dube TradePort – which a special development zones associated with the King Shaka International Airport, Durban, South Africa. This OEMP was based on ISO 14001 standards and defined legal requirement, performance standards, roles and responsibilities, monitoring and reporting, and non-compliance procedures.

Vale Beira Coal Terminal EMP, Riverside, Mozambique, 2011 Prepared an Environmental Management Plan prepared for the Beira Coal Terminal located at the Port of Beira, Mozambique. The coal terminal functions as a key logistics point in the wider Vale Moatize Coal Project.

Chevron Lubricants Plant Compliance Assurance, Chevron, South Africa, 2010 A Compliance Assurance programme was undertaken to determine the environmental, health and social legal requirements of the Chevron Lubricants Plant, in Durban South Africa.

Schlumberger Environmental Audit and License Application, Schlumberger, Angola, 2010 Prepared an Environmental, Social and Health and Safety Audit of the Schlumberger Facilities in Luanda and Soyo, Angola as part of the environmental license application process.

Kangra Coal Legal Compliance Audit, Kangra Coal, South Africa, 2010 Prepared a legal compliance audit for the Kangra Coal Mine, in Mpumalanga Province, South Africa. The audit focused on applicable environmental legislation, compliance issues, risk profile and final recommendations.

Como Oil Due Diligence, South Africa, and Mozambique, 2010 Prepared an Environmental Due Diligence Assessment of Como Oils facilities in both South Africa and Mozambique, against International Finance Corporation Performance Standards.

Nacala Dam ESIA, MCC Mozambique, Mozambique, 2010 Project manager in the preparation of an Environmental Impact Assessment to international best practice standards for the rehabilitation and upgrade of the Nacala Dam, Nampula Province. Key focus areas included ensuring that ecological flow requirements were sustained, addressing resettlement concerns, and developing a community investment strategy.

Mpofana Bulk Water Supply Scheme EIA, Umgeni Water, South Africa, 2009 Prepared an Environmental Impact Assessment prepared for the establishment of a 70km bulk water supply scheme in the Natal Midlands in KwaZulu-Natal. Key issues involved the protection of natural endemic vegetation, reducing potential impacts on local tourism and ensuring landowner consultation.

La Repose Resort EIA, South Africa, 2008 Project Manager in the preparation of an Environmental Impact Assessment of the La Repose Golf Estate and Holiday Resort on the Eastern Cape coast in compliance with the South African environmental legislation.

Namalope Resettlement Action Plan, Mozambique, Moma Mineral Sands, 2006 Developed a RAP for the Moma Heavy Minerals Sands Project. This included surveying 183 affected households, the establishment of resettlement protocols and on-going monitoring of the resettlement process.

Corridor Sands Heavy Minerals Sands, BHP Billiton, Mozambique, 2006 Provided consulting support as part of the Environmental and Resettlement Management Team, in terms of day-to-day management and monitoring for the Corridor Sands Heavy Minerals Sands Project.

Curriculum Vitae

Stephen Lloyd Stead

Stephen Stead is the owner / director of Visual Resource Management Africa and has been operating as a Landscape and Visual Impact Practitioner for 15 years.

After completing an honours degree in Human Geography at the University of KwaZulu-Natal (Pietermaritzburg) in 1992, Stephen gained six years of practical experience in the field of Geographic Information Systems working as a consultant for the KwaZulu-Natal Department of Health, and thereafter, working with an Environmental Impact Assessment company based in the Western Cape, South Africa. In 2004, Stephen set up the company Visual Resource Management Africa, which specializes in Visual Impact Assessment and landscape modification visualisation. The company has undertaken over 170 assessments of large-scale developments, enabling experience in a wide variety of landscape modifications in many different landscape contexts, including South Africa, Lesotho, Namibia, Mozambique, Kenya and Zambia.

Stephen's interest in best practice in impact assessment led him to join the South Africa section of the International Association of Impact Assessors (IAIA) in 2008. In 2011 he was elected President of the IAIA South Africa. In 2014, Stephen was registered as a Visual Impact Practitioner with the Association of Professional Heritage Practitioners (Western Cape, South Africa).

1. **Position**: Owner / Director
2. **Company**: Visual Resource Management Africa cc *(www.vrma.co.za)*
3. **Name**: Stephen Stead
4. **Date of Birth**: 9 June 1967
5. **Nationality:** South African

6. **Contact Details:** **Cell: +27 (0) 83 560 9911**
Email: stephen@vrma.co.za

7. **Educational qualifications**:
    - University of KwaZulu-Natal:
        - Bachelor of Arts: Psychology and Geography
        - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems, 1993

8. **Professional Accreditation**
    - Association of Professional Heritage Practitioners (APHP) Western Cape
        - Accredited VIA practitioner member of the Association (since 2014)

9. **Association involvement:**
    - International Association of Impact Assessment (IAIA) South African Affiliate
        - Past President (2012 - 2013)
        - President (2012)
        - President-Elect (2011)
        - Conference Co-ordinator (2010)
        - National Executive Committee member (2009)
        - Southern Cape Chairperson (2008)

10. **Conferences Attended:**
    - International Geographic Union, Lisbon - Portugal 2018 (50 Years of Local Governance)
    - IAIAsa 2012
    - IAIAsa 2011
    - IAIA International 2011 (Mexico)
    - IAIAsa 2010 (Conference organiser)
    - IAIAsa 2009
    - IAIAsa 2007

11. **Continued Professional Development:**
    - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day, 2012)
    - Achieving the full potential of Social Impact Assessment (Mexico, IAIA Conference, 2 days, 2011)
    - Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)
    - Online courses:
        - Climate Change: The Science (2019) – University of Exeter
        - Make an Impact: Sustainability for Professionals – University of Bath (2016)
        - Our Hungry Planet: Agriculture, People and Food Security – University of Reading (2016)
        - Permaculture Design Certificate (2015)

12. Projects List:

YEAR	NAME	DESCRIPTION	LOCATION
2019	Port Barry Residential	Settlement	Western Cape (SA)
2019	Gamsberg Smelter	Plant	Northern Cape (SA)
2019	Sandpiper Nature Reserve Lodge	Residential	Western Cape (SA)
2019	Bloemsmond PV 4 - 5	Solar Energy	Northern Cape (SA)
2019	Mphepo Wind (Scoping Phase)	Wind Energy	Zambia
2018	Mogara PV	Solar Energy	Northern Cape (SA)
2018	Gaetsewe PV	Solar Energy	Northern Cape (SA)
2017	Kalungwishi Hydroelectric (2) and power line	Hydroelectric	Zambia
2017	Mossel Bay UISP (Kwanoqaba)	Settlement	Western Cape (SA)
2017	Pavua Dam and HEP	Hydroelectric	Mozambique (SA)
2017	Penhill UISP Settlement (Cape Town)	Settlement	Western Cape (SA)
2016	Kokerboom WEF * 3	Wind Energy	Northern Cape (SA)
2016	Hotazel PV	Solar Energy	Northern Cape (SA)
2016	Eskom Sekgame Bulkop Power Line	Infrastructrue	Northern Cape (SA)
2016	Ngonye Hydroelectric	Hydroelectric	Zambia
2016	Levensdal Infill	Settlement	Western Cape (SA)
2016	Arandis CSP	Solar Energy	Namibia
2016	Bonnievale PV	Solar Energy	Western Cape (SA)
2015	Noblesfontein 2 & 3 WEF (Scoping)	Wind Energy	Eastern Cape (SA)
2015	Ephraim Sun SEF	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip and Sirius Grid TX	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip PV	Solar Energy	Nothern Cape (SA)
2015	Zeerust PV and transmission line	Solar Energy	North West (SA)
2015	Bloemsmond SEF	Solar Energy	Nothern Cape (SA)
2015	Juwi Copperton PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 14 PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 13 PV	Solar Energy	Nothern Cape (SA)
2015	Spitzkop East WEF (Scoping)	Solar Energy	Western Cape (SA)
2015	Lofdal Rare Earth Mine and Infrastructure	Mining	Namibia
2015	AEP Kathu PV	Solar Energy	Nothern Cape (SA)
2014	AEP Mogobe SEF	Solar Energy	Nothern Cape (SA)
2014	Bonnievale SEF	Solar Energy	Western Cape (SA)
2014	AEP Legoko SEF	Solar Energy	Northern Cape (SA)
2014	Postmasburg PV	Solar Energy	Northern Cape (SA)
2014	Joram Solar	Solar Energy	Northern Cape (SA)
2014	RERE PV Postmasberg	Solar Energy	Northern Cape (SA)
2014	RERE CPV Upington	Solar Energy	Northern Cape (SA)
2014	Rio Tinto RUL Desalinisation Plant	Industrial	Namibia

2014	NamPower PV * 3	Solar Energy	Namibia
2014	Pemba Oil and Gas Port Expansion	Industrial	Mozambique
2014	Brightsource CSP Upington	Solar Energy	Northern Cape (SA)
2014	Witsand WEF (Scoping)	Wind Energy	Western Cape (SA)
2014	Kangnas WEF	Wind Energy	Western Cape (SA)
2013	Cape Winelands DM Regional Landfill	Industrial	Western Cape (SA)
2013	Drennan PV Solar Park	Solar Energy	Eastern Cape (SA)
2013	Eastern Cape Mari-culture	Mari-culture	Eastern Cape (SA)
2013	Eskom Pantom Pass Substation	Substation /Tx lines	Western Cape (SA)
2013	Frankfort Paper Mill	Plant	Free State (SA)
2013	Gibson Bay Wind Farm Transmission lines	Tranmission lines	Eastern Cape (SA)
2013	Houhoek Eskom Substation	Substation /Tx lines	Western Cape (SA)
2013	Mulilo PV Solar Energy Sites (x4)	Solar Energy	Northern Cape (SA)
2013	Namies Wind Farm	Wind Energy	Northern Cape (SA)
2013	Rossing Z20 Pit and WRD	Mining	Namibia
2013	SAPPI Boiler Upgrade	Plant	Mpumalanga (SA)
2013	Tumela WRD	Mine	North West (SA)
2013	Weskusfleur Substation (Koeburg)	Substation /Tx lines	Western Cape (SA)
2013	Yzermyn coal mine	Mining	Mpumalanga (SA)
2012	Afrisam	Mining	Western Cape (SA)
2012	Bitterfontein	Solar Energy	Northern Cape (SA)
2012	Kangnas PV	Solar Energy	Northern Cape (SA)
2012	Kangnas Wind	Solar Energy	Northern Cape (SA)
2012	Kathu CSP Tower	Solar Energy	Northern Cape (SA)
2012	Kobong Hydro	Hydro & Powerline	Lesotho
2012	Letseng Diamond Mine Upgrade	Mining	Lesotho
2012	Lunsklip Windfarm	Wind Energy	Western Cape (SA)
2012	Mozambique Gas Engine Power Plant	Plant	Mozambique
2012	Ncondezi Thermal Power Station	Substation /Tx lines	Mozambique
2012	Sasol CSP Tower	Solar Power	Free State (SA)
2012	Sasol Upington CSP Tower	Solar Power	Northern Cape (SA)
2011	Beaufort West PV Solar Power Station	Solar Energy	Western Cape (SA)
2011	Beaufort West Wind Farm	Wind Energy	Western Cape (SA)
2011	De Bakke Cell Phone Mast	Structure	Western Cape (SA)
2011	ERF 7288 PV	Solar Energy	Western Cape (SA)
2011	Gecko Industrial park	Industrial	Namibia
2011	Green View Estates	Residential	Western Cape (SA)
2011	Hoodia Solar	Solar Energy	Western Cape (SA)
2011	Kalahari Solar Power Project	Solar Energy	Northern Cape (SA)
2011	Khanyisa Power Station	Power Station	Western Cape (SA)
2011	Olvyn Kolk PV	Solar Energy	Northern Cape (SA)

2011	Otjikoto Gold Mine	Mining	Namibia
2011	PPC Rheebieck West Upgrade	Industrial	Western Cape (SA)
2011	George Southern Arterial	Road	Western Cape (SA)
2010	Bannerman Etango Uranium Mine	Mining	Namibia
2010	Bantamsklip Transmission	Transmission	Eastern Cape (SA)
2010	Beaufort West Urban Edge	Mapping	Western Cape (SA)
2010	Bon Accord Nickel Mine	Mining	Mapumalanga (SA)
2010	Etosha National Park Infrastructure	Housing	Namibia
2010	Herolds Bay N2 Development Baseline	Residential	Western Cape (SA)
2010	MET Housing Etosha	Residential	Namibia
2010	MET Housing Etosha Amended MCDM	Residential	Namibia
2010	MTN Lattice Hub Tower	Structure	Western Cape (SA)
2010	N2 Herolds Bay Residental	Residential	Western Cape (SA)
2010	Onifin(Pty) Ltd Hartenbos Quarry Extension	Mining	Western Cape (SA)
2010	Still Bay East	GIS Mapping	Western Cape (SA)
2010	Vale Moatize Coal Mine and Railway	Mining / Rail	Mozambique
2010	Vodacom Mast	Structure	Western Cape (SA)
2010	Wadrif Dam	Dam	Western Cape (SA)
2009	Asazani Zinyoka UISP Housing	Residential Infill	Western Cape (SA)
2009	Eden Telecommunication Tower	Structure	Western Cape (SA)
2009	George SDF Landscape Characterisation	GIS Mapping	Western Cape (SA)
2009	George SDF Visual Resource Management	GIS Mapping	Western Cape (SA)
2009	George Western Bypass	Road	Western Cape (SA)
2009	Knysna Affordable Housing Heidevallei	Residential Infill	Western Cape (SA)
2009	Knysna Affordable Housing Hornlee Project	Residential Infill	Western Cape (SA)
2009	Rossing Uranium Mine Phase 2	Mining	Namibia
2009	Sun Ray Wind Farm	Wind Energy	Western Cape (SA)
2008	Bantamsklip Transmission Lines Scoping	Transmission	Western Cape (SA)
2008	Erf 251 Damage Assessment	Residential	Western Cape (SA)
2008	Erongo Uranium Rush SEA	GIS Mapping	Namibia
2008	Evander South Gold Mine Preliminary VIA	Mining	Mpumalanga (SA)
2008	George SDF Open Spaces System	GIS Mapping	Western Cape (SA)
2008	Hartenbos River Park	Residential	Western Cape (SA)
2008	Kaaimans Project	Residential	Western Cape (SA)
2008	Lagoon Garden Estate	Residential	Western Cape (SA)
2008	Moquini Beach Hotel	Resort	Western Cape (SA)
2008	NamPower Coal fired Power Station	Power Station	Namibia
2008	Oasis Development	Residential	Western Cape (SA)
2008	RUL Sulpher Handling Facility Walvis Bay	Mining	Namibia
2008	Stonehouse Development	Residential	Western Cape (SA)
2008	Walvis Bay Power Station	Structure	Namibia

2007	Calitzdorp Retirement Village	Residential	Western Cape (SA)
2007	Calitzdorp Visualisation	Visualisation	Western Cape (SA)
2007	Camdeboo Estate	Residential	Western Cape (SA)
2007	Destiny Africa	Residential	Western Cape (SA)
2007	Droogfontein Farm 245	Residential	Western Cape (SA)
2007	Floating Liquified Natural Gas Facility	Structure tanker	Western Cape (SA)
2007	George SDF Municipality Densification	GIS Mapping	Western Cape (SA)
2007	Kloofsig Development	Residential	Western Cape (SA)
2007	OCGT Power Plant Extension	Structure Power Plant	Western Cape (SA)
2007	Oudtshoorn Municipality SDF	GIS Mapping	Western Cape (SA)
2007	Oudtshoorn Shopping Complex	Structure	Western Cape (SA)
2007	Pezula Infill (Noetzie)	Residential	Western Cape (SA)
2007	Pierpoint Nature Reserve	Residential	Western Cape (SA)
2007	Pinnacle Point Golf Estate	Golf/Residential	Western Cape (SA)
2007	Rheebok Development Erf 252 Apeal	Residential	Western Cape (SA)
2007	Rossing Uranium Mine Phase 1	Mining	Namibia
2007	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Western Cape (SA)
2007	Sedgefield Water Works	Structure	Western Cape (SA)
2007	Sulpher Handling Station Walvis Bay Port	Industrial	Namibia
2007	Trekkopje Uranium Mine	Mining	Namibia
2007	Weldon Kaya	Residential	Western Cape (SA)
2006	Farm Dwarsweg 260	Residential	Western Cape (SA)
2006	Fynboskruin Extention	Residential	Western Cape (SA)
2006	Hanglip Golf and Residential Estate	Residential	Western Cape (SA)
2006	Hansmoeskraal	Slopes Analysis	Western Cape (SA)
2006	Hartenbos Landgoed Phase 2	Residential	Western Cape (SA)
2006	Hersham Security Village	Residential	Western Cape (SA)
2006	Ladywood Farm 437	Residential	Western Cape (SA)
2006	Le Grand Golf and Residential Estate	Residential	Western Cape (SA)
2006	Paradise Coast	Residential	Western Cape (SA)
2006	Paradyskloof Residential Estate	Residential	Western Cape (SA)
2006	Riverhill Residential Estate	Residential	Western Cape (SA)
2006	Wolwe Eiland Access Route	Road	Western Cape (SA)
2005	Harmony Gold Mine	Mining	Mpumalanga (SA)
2005	Knysna River Reserve	Residential	Western Cape (SA)
2005	Lagoon Bay Lifestyle Estate	Residential	Western Cape (SA)
2005	Outeniquabosch Safari Park	Residential	Western Cape (SA)
2005	Proposed Hotel Farm Gansevallei	Resort	Western Cape (SA)
2005	Uitzicht Development	Residential	Western Cape (SA)
2005	West Dunes	Residential	Western Cape (SA)
2005	Wilderness Erf 2278	Residential	Western Cape (SA)

2005	Wolwe Eiland Eco & Nature Estate	Residential	Western Cape (SA)
2005	Zebra Clay Mine	Mining	Western Cape (SA)
2004	Gansevallei Hotel	Residential	Western Cape (SA)
2004	Lakes Eco and Golf Estate	Residential	Western Cape (SA)
2004	Trekkopje Desalination Plant	Structure Plant	Namibia (SA)
1995	Greater Durban Informal Housing Analysis	Photogrametry	KwaZulu-Natal (SA)

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Morné de Jager

Personal Data

Identity Number	711221 5062 080
Date of Birth	21 December 1971
Sex	Male
Marital Status	Married, three children
Driver's license	Code 08
Nationality	South African
Home Language	Afrikaans (speak, read and write)
Other Languages	English (speak, read and write)
Higher Educational Qualifications	B.Ing (Chemical Engineering) [Pretoria University]
Previous Employment	JCI Wates Meiring and Barnard Department of Water Affairs and Forestry M2 Environmental Connections cc
Current Employment	Enviro-Acoustic Research cc

Short Resumé

Morné started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after his second year of his studies at the University of Pretoria.

After graduation he worked as a Water Pollution Control Officer at the Department of Water Affairs and Forestry for two years (first year seconded from Wates, Meiring and Barnard), where duties included the perusal (evaluation, commenting and recommendation) of various regulatory required documents (such as EMPR's, Water Licence Applications and EIA's), auditing of licence conditions as well as the compilation of Technical Documents.

Since leaving the Department of Water Affairs, Morné has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing these projects within budget and timeframe. During that period he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 9 years, and was involved with more than 250 noise studies in the last few years, including amongst others:

Project Experience – Acoustics

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Isivunguvungu (Aurecon), De Aar (Aurecon), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Kokerboom 3 (Aurecon), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee (ARCUS), Kolkies (ARCUS), San Kraal (ARCUS), Phezukomoya (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Scarlet Ibis (CESNET), Albany (CESNET), Sutherland (CSIR), Kap Vley (CSIR), Kuruman (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Perdekraal (ERM), Teekloof (Mainstream), Eskom Aberdene (SE), Dorper (SE), Spreeukloof (SE), Loperberg (SE), Penhoek Pass (SE), Amakhala Emoyeni (SE), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Namas (SE), Zonnequa (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Klipheuwel (SE), INCA Swellendam (SE), Cookhouse (SE), Iziduli (SE), Msenge (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Boulders (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Graskoppies (SiVEST), Philco (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Spitskop West (Terramanzi), Haga Haga (Terramanzi), Vredenburg (Terramanzi), Msenge Emoyeni (Windlab)*
Mining and Industry	*Full Environmental Noise Impact Assessments for – Delft Sand (AGES), BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream Environmental), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hacra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream Environmental), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream Environmental), Otjikoto Gold (AurexGold), Klipfontein Colliery (MENCO), Imbabala Coal (MENCO), ATCOM East Expansion (Jones and Wagner), IPP Waterberg Power Station (SE), Kangra Coal (ERM), Schoongesicht (CleanStream Environmental), EastPlats (CleanStream Environmental), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Glencore Boshoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladum Smelter, Iron and PGM Complex (Prescali Environmental), Fumani Gold (AGES), Leiden Coal (EIMS), Colenso Coal and Power Station (SiVEST/EcoPartners), Klippoortjie Coal (Gudani), Rietspruit Crushers (MENCO), Assen Iron (Tshikovha), Transalloys (SE), ESKOM Ankerlig (SE), Nooitgedacht Titano Project (EcoPartners), Algoa Oil Well (EIMS), Spitskop Chrome (EMAssistance), Vlakfontein South (Gudani), Leandra Coal (Jacana), Grazvalley and Zoetveld (Prescali), Tjate Chrome (Prescali), Langpan Chromite (Prescali), Vereeniging Recycling (Pro Roof), Meyerton Recycling (Pro Roof), Hammanskraal Billeting Plant 1 and 2 (Unica), Development of Altona Furnace, Limpopo Province (Prescali Environmental), Haakdoorndrift Opencast at Amandelbult Platinum (Aurecon), Landau Dragline relocation (Aurecon), Stuart Coal Opencast (CleanStream Environmental), Tetra4 Gas Field Development (EIMS), Kao Diamonds – Tiping Village Relocation (EIMS), Kao Diamonds – West Valley Tailings Deposit (EIMS), Upington Special Economic Zone (EOH), Arcellor Mittal CCGT Project near Saldanha (ERM), Malawi Sugar Mill Project (ERM), Proposed Mooifontein Colliery (Geovicon Environmental), Goedehoop North Residue Deposit Expansion (Geovicon Environmental), Mutsho 600MW Coal-Fired Power Plant (Jacana Environmentals), Tshivhaso Coal-Fired Power Plant (Savannah Environmental), Doornhoek Fluorspar Project (Exigo), Royal Sheba Project (Cabanga Environmental), Rietkol Silica (Jacana), Gruisfontein Colliery (Jacana), Lehlabili Colliery (Jaco-K Consulting), Bloemendal Colliery (Enviro-Insight), Rondevly Colliery (REC), Welgedacht Colliery (REC), Kalabasfontein Extension (EIMS)*
Road and Railway	*K220 Road Extension (Urbansmart), Boskop Road (MTO), Sekoko Mining (AGES), Davel-Swaziland-Richards Bay Rail Link (Aurecon), Moloto Transport Corridor Status Quo Report*

	and Pre-Feasibility (SiVEST), Postmasburg Housing Development (SE), Tshwane Rapid Transport Project, Phase 1 and 2 (NRM Consulting/City of Tshwane), Transnet Apies-river Bridge Upgrade (Transnet), Gautrain Due-diligence (SiVest), N2 Piet Retief (SANRAL), Atterbury Extension, CoT (Bokomoso Environmental), Riverfarm Development (Terramanzi)
Airport	*Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping (Aurecon)*
Noise monitoring and Audit Reports	*Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional (Xstrata), Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF Ambient Sound Level study (Cennergi and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Hopefield WEF Noise Analysis (Umoya), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon), Jeffries Bay Wind Farm (Globeleq), Sephaku Aganang (Exigo), Sephaku Delmas (Exigo), Beira Audit (BP/GPT), Nacala Audit (BP/GPT), NATREF (Nemai), Rappa Resources (Rayten), Measurement Report for Sephaku Delmas (Ages), Measurement Report for Sephaku Aganang (Ages), Bank of Botswana measurements (Linnspace), Skukuza Noise Measurements (Concor), Development noise measurement protocol for Mamba Cement (Exigo), Measurement Report for Mamba Cement (Exigo), Measurement Report for Nokeng Fluorspar (Exigo), Tsitsikamma Community Wind Farm Pre-operation sound measurements (Cennergi), Waainek WEF Operational Noise Measurements (Innowind), Sedibeng Brewery Noise Measurements (MENCO), Tsitsikamma Community Wind Farm Operational noise measurements (Cennergi), Noupoort Wind Farm Operational noise measurements (Mainstream), Twisdraai Colliery (Lefatshe Minerals), SASOL Prospecting (Lefatshe Minerals)*
Small Noise Impact Assessments	*TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlardia K220 (UrbanSmart), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Slag Milling Plant (AGES), Arcelor Mittal WEF (Aurecon), RVM Hydroplant (Aurecon), Grootvlei PS Oil Storage (SiVEST), Rhenosterberg WEF, (SiVEST), Concerto Estate (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion 2 (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), RareCo (SE), Struisbaai WEF (SE), Perdekraal WEF (ERM), Kotula Tsatsi Energy (SE), Olievenhoutbosch Township (Nali), , HDMS Project (AECOM), Quarry extensions near Ermelo (Rietspruit Crushers), Proposed uMzimkhulu Landfill in KZN (nZingwe Consultancy), Linksfield Residential Development (Bokomoso Environmental), Rooihuiskraal Ext. Residential Development, CoT (Plandev Town Planners), Floating Power Plant and LNG Import Facility, Richards Bay (ERM), Floating Power Plant project, Saldanha (ERM), Vopak Growth 4 project (ERM), Elandspoort Ext 3 Residential Development (Gibb Engineering), Tiegerpoort Wedding Venue (Henwood Environmental)*
Project reviews and amendment reports	*Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma Community Wind Farm Noise Simulation project (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (SE), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy), De Aar WEF (Holland), Quarterly Measurement Reports – Dangote Delmas (Exigo), Quarterly Measurement Reports – Dangote Lichtenburg (Exigo), Quarterly Measurement Reports – Mamba Cement (Exigo), Quarterly Measurement Reports – Dangote Delmas (Exigo) Quarterly Measurement Reports – Nokeng Fluorspar (Exigo), Proton Energy Limited Nigeria (ERM), Hartebeest WEF Update (Moorreesburg) (Savannah Environmental), Modderfontein WEF Opinion (Terramanzi), IPD Vredenburg WEF (IPD Power Vredenburg), etc.*

KAGOSI MWAMULOWE CURRICULUM-2019

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Organization	Core Business	Organization	Core Business
Director- Northern Region National Heritage Conservation Commission, Box 410339 Kasama ZAMBIA	Conservation	Managing Director, Envirodynamics Consulting Limited Box 31537, Lusaka, ZAMBIA	Heritage and Environmental and Socio-economic Research/ GIS Mapping Consultancies
Managing Director- Mwamspro-Graphics P.O Lusaka, ZAMBIA	Video Documentaries	Managing Director, - Apexlab Solutions Plot 26 Chiwaya Road Lusaka ZAMBIA	Production and Provision of E-Learning materials

- 27 Years as a Heritage Conservationist /Researcher
- Awarded 2 Research Grants by University of Zambia in the Heritage Related topics in two consecutive years.
- An Africa Nature Mentor in Assessment of the Protected Area Systems in the Heritage Sector in African World Heritage Sites as recognized IUCN Nature Expert
- He is also a Consultant/Capacity building expert/Facilitator on World Heritage Programmes in Africa covering fields of:
  - Nominations
  - Buffer Zones
  - Risk Preparedness
  - Preparation of Management Plans
  - Sustainable Development
  - State of Conservation Reporting
  - Assessment of Effectiveness of Management
- He was a UNESCO Focal Person on the World Heritage Convention in Zambia for 7 years
- A Publisher in Conservation and Sustainable Development aspects
- An Entrepreneur

KAGOSI MWAMULOWE CURRICULUM-2019

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HIGHER EDUCATION

Post Graduate			
Original title	**Masters of Science**	**Obtained in**:	1999
Field of study	Earth Sciences: Paleontology, Environmental Impact Assessment, Water and sediment Analysis, Literature Review: Thesis on Conservation of Geological Heritage in Zambia		
From:	1997	**To:**	1999
School/ University	University of Manchester,	**Country**	United Kingdom

Graduate			
Original title	**Bachelor of Science**	**Obtained in**:	1989
Field of study	Geography and Earth Sciences		
From	1985	**To:**	1989
School/ University	Chancellor College, University of Malawi	**Country**	Malawi

Professional			
Original title	**Certificate**	**Obtained in**:	1996
Field of study	Environment		
From	1985	**To:**	1989
School/ University	Commonwealth Secretariat	**Country**	Kenya

Professional			
Original title:	**Certificate**	**Obtained in**:	2007
Field of study:	Geographical information Management Systems (GIS) and Mapping		
From:	2007	**To:**	2007
School/ University:	Kelly +Kelly (ESRI Certified)	**Country**	Kenya

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PERSONAL SKILLS

Communication					
Language	Speak	Write	Read	Understand	Official Language of Operation
English	X	X	X	X	X
Arabic					
Chinese					
Spanish					
French					
Russian					

Computer and Other Skills	
Database	X
Internet/Mail	X
Presentation tools	X
Spreadsheet	X
Text processing	X
Interpersonal Skills	X

EMPLOYMENT RECORD

Policy Direction			
Job title	Regional Director	From: 2010	To: 2019
Employer	National Heritage Conservation Commission, Zambia		
Functions	Coordination of all Regional Cultural and Natural Heritage Conservation programs: Developing conservation plans; Material, Human and Financial resources management		

Job title	Chief Natural Heritage Officer	From: 2000	To: 2010
Employer	National Heritage Conservation Commission, Zambia		
Functions	Formulation of Policy, Standards, Guidelines Operational and General Management Plans for natural heritage sites in Zambia, Ensuring compliance by Ecological, Geological and Geomorphological Heritage Divisions in the Regions in implementation of Heritage Management and Conservation Programs at National Level and in line with the World Heritage Convention and other Multilateral Agreements		

Professional/Technical			
Job title	Conservation Geologist	From: 1992	To: 2000
Employer	National Heritage Conservation Commission, Zambia		
Functions	Ensuring the Protection of all Geological/Paleontological Sites in Zambia. Preparing guidelines on the protection, interpretation and presentation of Zambia's Heritage.		

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WORK EXPERIENCE

More than 27 Years of continuous working experience in Natural Heritage and Cultural Heritage Management in Zambia and in the United Nations Educational, Scientific and Cultural Organization (UNESCO)/United Nations Development Programme (UNDP) /United Nations Environment Programme (UNEP)/ International Union for Conservation of Nature (IUCN)/ World Wildlife Fund (WWF)/ African World Heritage Fund (AWHF) and EPA - UNESCO Category II Centres responsible for the promotion and sustenance of African Heritage/ CHEDA A member of International Council on Museums (ICOM)/ Interim Vice President of International Council on Monuments and Sites (ICOMOS) Zambia Chapter

11 years of Heading the Ecological, Geological and Geomorphological Heritage Divisions at National Level as Chief Natural Heritage Officer responsible for formulation and compliance of policy, standards and guidelines

Attended more than 30 international UNESCO related workshops and expert meetings in 17 countries on natural and cultural heritage and environmental protection.

EXPERIENCE IN ADVOCACY, RESOURCES AND PARTNERSHIP MOBILIZATION

2018: Currently collaborating with the Zimbabwean Embassy on the Protection and Presentation Zimbabwean Liberation Sites in Zambia.

2018: was honored for preparing and submitting a Project Proposal the Most Innovative Project Proposal for Sustainable Heritage Tourism Development at David Livingstone Memorial Site pegged at 400,000 USD in 2017. My Presentation Style has since been adopted as the ideal model for Presentations by the Ministry for Tourism Development Fund (TDF) in Zambia.

2017: Working in collaboration through the South African High Commissioner managed to secure funding from Stanbic Bank who rehabilitated the Oliver Tambo Heritage House which was launched by the Heads of States of South Africa and Zambia on 13th October 2017 in Lusaka as a Heritage House. Currently working with SARHA through my office for its dual declaration as a National Monument.

2017: Through strong advocacy I ensured the declaration of Former OR Tambo House in Lusaka as a National Monument through Statutory Instrument No 70 of 27th September 2017 signed by the Minister of Tourism and Arts.

2017: Worked on the Proposal International Summer School Proposal on African Heritage with Professor Marie-Theres-Albert for Postgraduate Students

2016: Advised a Team of 6 Cabinet Ministers their Permanent Secretaries, the Attorney General and Heads of Government Departments and Parastatals against some sensitive proposed Developments at the Mosi-oa-tunya/Victoria Falls World Heritage Site in line with the World Heritage Convention

2010-2017: Was World Heritage Convention Zambia's National Focal Person for 7 years advocating for conservation of both natural and cultural heritage in Zambia and global levels

2016: Collaborated with University of Cobbuts Germany on International Summer School for Heritage Studies for Postgraduate students in Arusha Tanzania.

2009-2014: Formulated a Project Proposal funded by Finland, Sweden and GRZ as National Focal Person in the Heritage Sector of the Environment and Natural Resources Management and Mainstreaming Programme for 4 years. Formulated and Implemented Programme work Plans

2014: Lobbied a Committee Permanent Secretaries Circa 10 to fund NHCC during Zambia 's Golden Jubilee.

2013-2014 Consecutively prepared two separate successfully funded research grant proposals at a personal level on Integrated Water Resources Management for grants funded by the University of Zambia amount to 15,000 USD

2014: Lobbied with African Group of Ministers on the protection of World Heritage in Qatar.

2013: As a member of the Technical Committee on Drafting the Zambian Constitution Thematic Group on Land, Environment and Natural Resources advocated for protection of critical natural resources features.

2008: Prepared project proposal for NHCC funded by Germany Government

2006: Prepared a proposal small grant for a Tourism Development Project at personal level amounting 12,000 USD.

ENGAGEMENTS IN AND DEDICATION TO THE AFRICAN WORLD HERITAGE AGENDA

2018: Was part of the UNESCO World Heritage Mission assessing the Erosion Risk on Makono (The Shrine and burial Site of the First Litunga (King)) of the Barotse (Lozi) Kingdom in Zambia; threatened by the Zambezi River.

2018: Facilitated at Workshop on Risk Preparedness for 8 South African World Heritage Sites

On Guidelines for Preparing Plans organized by African World Heritage Fund (AWHF) and Department of Environment - Republic of South Africa.

2018: Honoured by the Ministry of Tourism and Arts for Outstanding Performance leading the successful Declaration of Oliver Tambo Heritage House in Lusaka as National Monument and coming up with the "Most Innovative Project Proposal in the Ministry.

2018: Was nominated to represent the Minister of Tourism and Arts Republic of Zambia at a meeting on African Liberation Heritage Routes scheduled to have taken place in South Africa organized by Government South Africa and AWHF.

2018: Was nominated to attend the Benin Workshop by the UNESCO World Heritage Centre in Benin on the Effective Management of African Cultural Landscape

Rose from Conservation Geologist/Palaeontologist (7 years to Regional Manager (1 year), Chief Natural Heritage Officer (11 Years), Acting Conservation Services Director (1.5 years) and Regional Director (6 years) and Acting Executive Director (1 Year cumulatively).

Served as One of the only 2 Mentors (IUCN) Africa Nature in Enhancing our Heritage Tool Kit for

Anglophone States Parties: Mentor for sites like Lake Malawi World Heritage Site.

2015: Coordinated the first Risk Preparedness Workshop for Anglophone Natural World Heritage Site Managers a Golden Gates National Park representing12 States Parties organized by AWHF, Department of Environment – Republic of South Africa and IUCN.

Mobile: +260 977 500 243 **Email: mwamsprog@gmail.com or mwamulowe@envirodynamics.org**

2015: Participated in one-month Risk Preparedness Pilot Project for Anglophone Cultural World Heritage Site Managers with La Morne World Heritage Site –Mauritius and was very instrumental in integrating the GIS aspects into Risk Assessment sponsored by AWHF.

2015: Invited through recommendation within the UNESCO system to participate in the Vietnam Expert Workshop on the Development of Policy on Sustainable Development in World Heritage which was adopted by the UNESCO General Assembly.

2015: Invited through recommendation within the UNESCO system to present a Paper on Environment and Economic Sustainability in World Heritage - An African Quagmire in Bonn Germany on the sidelines of the World Heritage Session.

2014: invited through recommendation by the UNESCO system and IUCN by the South African Department of Environment and African World Heritage Fund to present a Paper before South African World Site Managers advising on the Buffer Zoning of 8 World Heritage Properties representing IUCN and using the MAB Buffer Zone model.

2013: Nominated by the Zambia National Commission office UNESCO to represent Zambia on lobbying Zambia to the Ratify the Convention of Underwater Heritage and contributed effectively on preparing a position paper by African UN Member States at a Maputo Workshop-Mozambique.

2011-2013: Facilitated as **Consultant for Zambia Environmental Management Agency in 9 Environmental Impact Assessment Public Hearings and Submitted 9 Professional/Expert Reports** leading to the protection of some of Zambia's critical natural resources and environments–See reports under publications.

2018 -2010: a member the team preparing Zambia's Proposed Lower Zambezi Man and Biosphere Nomination Dossier for UNESCO Consideration.

2014: Conducted Research and wrote A Paper on the Role of Water in the Conservation of Zambia's Natural and Cultural Heritage in Zambia.

2016: Coordinator - Anglophone Africa Natural World Heritage Nomination Capacity Building in Ethiopia funded by AWHF and State Party of Ethiopia

2013: Facilitator - Anglophone Africa Natural World Heritage Nomination Capacity Building in Uganda funded by AWHF and CHEDA and Government of Uganda

2010: UNESCO consultant on Capacity Building Project for African World Heritage Site Manager, Paris, France,

2010: Presented a Position Paper on behalf the 11 SADC UNESCO World Heritage States Parties at the 2nd Cycle of Periodic Reporting Workshop at Kopanong Hotel South African.

2010: Lead Heritage Expert on the National Heritage Conservation Commission EIA Team for the Proposed Kabompo Gorge Hydro-Power Station and produced a Heritage Sector Report.

2007: Lead a 9 Member Zambian Expert Team on the Zambia-Zimbabwe Joint Technical Committee on and produced a Joint Integrated Management Plan for the Mosi-oa-tunya/Victoria Falls World Heritage Property accepted by UNESCO.

Mobile: +260 977 500 243 **Email:** mwamsprog@gmail.com **or** mwamulowe@envirodynamics.org

2007: Lead Expert (11member Team) on the Production of the first Management Plan for the Chipoma Falls–Zambia adopted by National Heritage Conservation Commission Board as a Model Management Plan

2007: Researched in Mumbwa with Dr Wolfgang and Produced a Booklet and Directed Video Documentaries aired the Zambia National Broadcasting Co-orporation on the Geological and Historical Heritage of Mumbwa funded by DANNIDA

2000: Interpreted and produced a Paleontological and Palaeo-ecological Trail of the Chirundu Fossil Forest National Monument-Zambia (a Site on the UNESCO World Heritage Tentative List adjacent to a proposed Man and Biosphere Reserves)

2000: Conducted Review of Research Papers on World Fund for Nature (WWF) paper of Dambos of Zambia.

1998-1999: a Masters' Degree Thesis on: Conservation of Zambia's Palaeontogical and Other Geological Heritage.

1994: Lead Heritage Expert on the National Heritage Conservation Commission EIA Team for the Proposed Kafue Gorge Hydro-Power Station and produced a Heritage Sector Report

1992: the first Conservation Geologist/Palaeontologist and citizen to be employed in Zambia

- The Zambian Government Collaborator in North Luangwa Palaentological Expedition with Researchers from USA's University at Albany, Florida Museum, France, RSA's Ziko University and Witwaterands University,
- Featured at University of Zambia at Symposium on the Zambia's 50 years Achievements in Natural Resources Management before Natural Science Students.
- Lectured to visiting Germany Students at University of Zambia on Zambia's Geological Heritage.

TEAMWORK AND INTERPERSONAL SKILLS

Led the Commission at Director and Executive Director Levels in Multi-displinary research teams

Led at International and National Levels in various capacities:

2016-2018: (Currently) Vice President of ICOMOS Zambia Chapter

2010-2017: Led a number of State of Conservation Reporting Exercise and Implementing World Heritage Resolutions and responding to various queries

2010-2017: Have engaged Traditional Chiefs and other local community representatives on a number heritage resources protection and management programmes including heritage policy formulation.

2009-2017: Focal Person for Zambia's UNESCO World Heritage Programmes. Prepared State of Conservation Reports and Implemented UNESCO World Heritage Committee Decisions.

2000-2017: Diplomatically ensured the protection of the Mosi-oa-tunya by lobbying with Civic and Traditional leaders at all levels.

2016 – 2019: Currently President of EBAFOSA-Zambia with focus on Ecosystem based Adaptation and Climate Change

2016: African Technical Collaborator on Capacity Building for Post-graduate Students in African Studies was involved in designing course progromme.

2015: Was Zambia's Chairperson of the First Africa World Heritage Committee commemoration after spearheading the adoption of the day as a National Day in Zambia and was adopted as such by Cabinet.

2014-2013: Anglophone Africa Nature Mentor on Enhancing Our Heritage Tool Kit.

2013: Anglophone - Coordinator of Risk Preparedness Programme Workshop held in Golden Gates National Park in RSA for Natural World Heritage Site Managers from 12 African States Parties.

2014: Defended the Barotse Plains Cultural Landscape Nomination Dossier from deferral to referral status.

2011 -2010: Led the Zambia Heritage Policy Formulation Process. This policy has been adopted by Cabinet this year.

2011: Championed formation Zambia World Heritage Committee by drafting its Constitution and determining its membership.

INTERACTION AND NETWORKING LEVELS

2018-1992: Regularly Interact with UNESCO/UNDP/UNEP/IUCN/ WWF/AWHF/ CHEDA/EPA

Adaptable to different cultural and disciplinary setups. Currently part of the History Slave Trade Documentation in Zambia by UNESCO Zambia Natcom and also championing the Documentation of Southern Africa Liberation Sites in Zambia.

2018: Have for the past 3 years been engaging with the South African High Commission with my office being the main link with my Organization on Liberation Heritage related matters.

INTELLECTUAL/MANAGERIAL, PROFESSIONAL LEADERSHIP SKILL

He is founder and Managing Director of 3 Business entities/organization in addition to his Government Job as Director in Heritage Conservation and Management

Have led the National Heritage Conservation Commission as Acting Executive Director with an establishment of 260 with an annual budget of over 1.8 million USD for more than 7 months.

2017: Part of the UNESCO Zambia Natcom Project Research Team on the Documentation of The History of Slave Trade in Zambia -responsible for GIS Mapping and Thematic Spatial & Environmental Analysis relating to Events, Routes and Places during slave trade days.

2017: Working with UNESCO Zambia to Lobby Stakeholders for Zambia to ratify the 2003

Mobile: +260 977 500 243 **Email:** mwamsprog@gmail.com **or** mwamulowe@envirodynamics.org

Convention on Protection of Underwater Cultural Heritage.

2014-2017: was once the Lead Researcher on the Barotse Cultural Landscape Nomination UNESCO Process.

2016: Planned as Working Group Member and Facilitated at an International and National Workshop on Ngorongoro UNESCO Declaration on the Sustainable Development in African Heritage was one 5 Individual Experts.

2016: Successfully chaired a Session on Donors and Partners at an International African Conference on Sustainable Development in African Heritage in Arusha Tanzania.

2016 & 2014: UNESCO Capacity building (Training) Natural World Heritage Site Managers in Conservation and Nomination Programes in Ethiopia and Uganda respectively.

2011: Was a Guest of Honor at the closing session of the UNESCO Joint Man and Biosphere Workshop between Zambia and Zimbabwe at Tecla Lodge as Acting Executive Director for NHCC.

COMMUNICATION AND ORATORY SKILLS

- Have taken on conducted tours and interpreted heritage to 13 Heads of States (India, Turkey, Republic of Zarawi, Zambia, Uganda, Malawi, Angola, Mauritius, Democratic Republic of Congo, South Africa, Ghana, Rwanda and Zimbabwe at different occasions during awareness programmes as a State Functionary in Lusaka Zambia.
- Have presented at various conferences on behalf of Zambia and Africa ion World Heritage related issues most of them facilitated by UNESCO and AWHF.
- Nominated by Government as a National Expert/Speaker on the sidelines of the Minister of Tourism and Arts at forthcoming ITB International Conference in Berlin Germany the largest tourism Conference **in March 2018**
- Featured on more than 20 times on television programmes on news, live phone programmes, documentaries on Heritage, Natural resources Management, Climate Change, Tourism, Cultural Heritage Preservation.
- Featured on more than 20 live radio programs on Zambia history and ecosystems
- Featured more than 20 times on Television Programmes on heritage related matters
- Directed and scripted more than 15 video documentaries on Heritage, Natural resources Management, Climate Change, Tourism, Cultural heritage Preservation
- Have featured or been cited more than 20 times in Zambian print media

NEGOTIATION AND LOBBYING SKILLS

Successfully Lobbying UNESCO World Heritage Committee, IUCN and ICOMOS, AWHF, State House, Zambian Ministers, Permanent Secretaries, Diplomats Multinational Companies on the Conservation of Zambia's World and National Heritage –the Mosi-oa-tunya/Victoria Falls World Heritage Properties.

2019: Currently leading the NHCC negotiating team on the proposed power generation at Heritage Sites.

Mobile: +260 977 500 243 **Email:** mwamsprog@gmail.com **or** mwamulowe@envirodynamics.org

2017: Initiated discussions with Zambian National Broadcasting Corporation (ZNBC) and prepared a concept note that led my Institution NHCC to sign a Memorandum of Cooperation with ZNBC for heritage awareness campaign in Zambia.

2017: Initiated a process of preparation of 3 memorandum of Understanding with external collaborators including Royal Establishments, Forestry Department, Leopards Hill Memorial Park the Management of Heritage in Zambia.

Involved in forging corporations with Finnish Embassy, NORAD Embassy, RSA High Commission and Zimbabwean Embassy on Heritage Conservation and Presentation

2017-2014: NHCC Team leader in the negotiations e.g. with Copperbelt Energy Corporation on the proposed development of hydropower development

2014: Represented Zambia and debated effectively at the Second UNESCO Geographical Representation General Assembly on World Heritage Committee.

OTHER ENGAGEMENTS AS A CONSULTANT

Managing Director of Envirodynamics Consulting Limited an environmental consulting firm registered in 2018

2019: Lead Consultant - Heritage Impact Assessment, Feasibility Study, MMINC - Rankin Engineering USTDA 130-140 MW Wind Power Project Serenje Ongoing EIA, Lusaka Zambia.

2018: Lead Consultant - Proposed Wind Power Project in Katete for Mphepo Power -Ongoing EIA, Lusaka Zambia.

2018: Lead Consultant - Brand naming Survey and Report production contracted by Mercy Corps for ZANACO account for Small Holder Farmers in Zambia (March 2019), Lusaka Zambia.

2018: Lead Consultant - Proposed Lusaka - Kafue By-Pass Road Project, Heritage Impact Assessment Report for China Complete Engineering Co-operation, Lusaka Zambia.

2018: Lead Consultant - Heritage Impact Assessment, Feasibility Study of the Proposed Kawana Solar Project, as Subcontracted by DH Engineering, Lusaka Zambia.

2018: Lead Consultant - Heritage Impact Assessment, Feasibility Study of the Proposed Kafue Solar Project, as Subcontracted by DH Engineering, Lusaka Zambia.

2018: Lead Consultant - Heritage Impact Assessment, Feasibility Study of the Proposed Nampundwe Solar Project, as Subcontracted by DH Engineering, Lusaka Zambia.

Mobile: +260 977 500 243 **Email: mwamsprog@gmail.com or mwamulowe@envirodynamics.org**

PUBLICATIONS

1. Currently writing 3 publications on Liberation Heritage of Zambia i.e. Liberation Heritage of South Africa and Zimbabwe and Zambia's Bedtime Stories based which are all based on cross-cultural settings.
2. Mwamulowe, K. et. Al History of Slave Trade in Zambia, UNESCO Natcom Zambia.
3. Mwamulowe, K. (2016), The Dilemma of Zambia's Barotse Plains Cultural Landscape Nomination: implications for Sustainable Development in Heritage Studies - Going Beyond, Springer India (Pvt) Ltd New Delhi
4. Mwamulowe, K. (2015), Zambia's Potential for Underwater Cultural Heritage Research and Protection based on the 2001 UNESCO Convention UNESCO Zambia Annual Report 2016 (in Press).
5. Mwamulowe, K. (2015), Nominating World Heritage Sites: The Case of Zambia- A Publication in a Zambia and UNESCO 2015 Annual Report –Zambia National Commission for UNESCO Republic of Zambia.
6. Taruvinga P. & K. Mwamulowe (2016), Ethiopia Anglophone World Heritage Nomination Workshop Report - AWHF, RSA.
7. Mwamulowe, K. (2015), Economic and Environmental Sustainability in World Heritage: An African Quagmire: A Case Study of Zambia and Other African States Parties an International Symposium on Heritage and Sustainability University of Technology, Germany.
8. Mwamulowe, K. (2015), The Role of National Heritage Conservation Commission and the Challenges faced in the Conservation and Management of Zambia's Water Related Heritage.Zambia Water Forum and Exhibition (ZAWAFE): "The critical role of Water in Sustainable Development" Lusaka, Zambia
9. Mwamulowe, K. (2011), World Heritage Sites Capacity Assessment Consultancy Report on 20Anglophone Natural World Heritage Sites Design Workshop African Nature Programme UNESCO Paris, France.
10. Nyambe, I & Mwamulowe K. (2004), Geological heritage and tourism; examples and issues inZambia. International Geological Congress, Abstracts-Congres Geologique International, Resumes 32, Part 1: 235
11. Nyambe, I & Mwamulowe, K. (2004), Targeting Victoria Falls –one of the Seven Wonders of the. World - as Possible Geopark in. Zambia UNZA, Lusaka
12. Mwamulowe, K. (2013), Enhancing Our Heritage Project-Lake Malawi National Park Natural World Heritage Site - UNESCO and IUCN, Nairobi
13. Mwamulowe K. et al (2014), Barotse Cultural Landscape Zambia Nomination File UNESCO WHC, Paris.
14. Mwamulowe, K. (2013), Risk Preparedness for Africa's Anglophone Natural World Site Managers –A Workshop Report, AWHF, IUCN, UNESCO & Government of Flanders.
15. Mwamulowe, K. (2013), *et. al.* Physical Environment and GIS Report- Environmental Impact Assessment Proposed Construction Power Transmission Line for Copperbelt Energy Corporation, Lusaka.
16. Mwamulowe, K. (2013), Public Hearing Meeting on the Environmental Impact Assessment of the Proposed Kansanshi Smelter by the Kasanshi Mining Plc in Solwezi, ZEMA, Lusaka.
17. Mwamulowe, K. (2013), Public Hearing Meeting on the EIA of the Proposed Kangaluwi Mining Project in Lower Zambezi National Park by Mwembeshi Mineral Resources ZEMA, Lusaka.

18. Mwamulowe, K. (2013), Public Hearing Meeting on the EIA on the Proposed 132KV transmission line from the Leopards Hill Substation to connect to the proposed Chitope sub-station ZEMA, Lusaka.
19. Mwamulowe, K. (2013), Public Hearing Meeting Report on the EIA of the Proposed Mushiwemba Intermediate Dam-Mkushi, ZEMA, Lusaka.
20. Mwamulowe, K. (2005), The Role and mandate of National Heritage in Environmental Conservation - Workshop on Consultative Forum Environmental Conservation Lusaka.
21. Mwamulowe, K. Wolfgang, W. & Sinvula M. (2007), Mumbwa Heritage Sites A geological and historical guide Environmental Conservation Society of Zambia Review, Vol.14, Issue 1. 3rd Quarter.
22. Kaiser T. M., Strait, D. Mangin, A. Rudolph B. & Mwamulowe K. (2007), New Fossil-Bearing Pleistocene Cave Breccias From Zambia (Central Africa) - Excavations at Kalenda Hill Cave, 2007 Zambia Paleokarst Research Project University at Albany USA and University Hamburg Germany.
23. Mwamulowe K. (2007), The Geological and Geomorphological Heritage of Kifubwa Stream National Monument: A Proposed Conservation Approach. NHCC, Lusaka.
24. Mwamulowe, K. (1998), The Conservation of Palaeontological and Other Geological heritage in Zambia: a comparative approach. A Thesis submitted to the Manchester for the degree of MSc in the Faculty of Science and Engineering. Manchester.
25. Mwamulowe, K. (1994), The Paleontological and Archaeological Impact Assessment on the proposed Lower Kafue Hydroelectric Power Project, ZESCO/World Bank, Lusaka.

PROFESSIONAL SOCIETIES

- Vice President of ICOMOS Zambia and a Member of ICOMOS International and
- Current President of Ecosystems Based Adaptation for Food Security (EBAFOSA) - Zambia
- A Member of International Council on Museums
- Member of Association of Critical Heritage Studies
- A Member of Man and Biosphere National Committee - Zambia
- A Member of Geoparks National Committee-Zambia

PROFESSIONAL REFERENCES

1. Professor Imasiku Anayawa Nyambe Board Chairperson National Heritage Conservation Commission, C/O University of Zambia, Directorate of Research and Graduate Studies, Geology Department, School of Mines, University of Zambia, University of Zambia Lusaka – Mobile: 0966012379; 0955793600; E-mail: inyambe@gmail.com;

2. Prof. David A. Polya, School of Earth, Atmospheric and Environmental, The University of Manchester, Williamson Building, Oxford Road, Manchester M13 9PL, UK, +44(0)161 275 3181
   Email: david.polya@manchester.ac.uk
3. Ambassador Getrude Takwira, Embassy of the Republic of Zimbabwe, Box 33491, Lusaka. Moble: +260 974275625

Kagosi Mwamulowe Signed by: …… Date: 9/5/2019

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E-mail: geoffreymwanza2014@gmail.com, geofrey@envirodynamics.org

Name	**Geoffrey Mwanza**
Sex	**Male**
Age	**27**
Nationality	**Zambian**
NID	**176593/18/1**

OVERVIEW OF QUALIFICATIONS

- 7+ years' experience providing outstanding, administrative and personal support to many senior executives at different Administrative levels.
- Good skill in research proposal and report writing.
- A motivated self-starter, able to quickly grasp issues and attend to details while maintaining a view of the bigger picture. Expert in juggling multiple projects and achieving on time completion within budget.
- Creative, resourceful and flexible, able to adapt to changing priorities and maintain a positive attitude and strong work ethic.
- A clear and logical communicator, able to establish rapport with both clients and colleagues, and motivate individuals to achieve organizational objectives. I also have leadership qualities while also the skills and respect to be a team player.

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E-mail: geoffreymwanza2014@gmail.com

- Conversant with computer softwares and manipulations such as the usage of ArcGis and ArcMap.

EMPLOYMENT HISTORY

➢ AMOS YOUTH CENTRE

June 2011- July 2012. Project Officer

- Community Mobilisation Officer
- Headed the HIV/AIDS campaign team of the organisation.
- Taught Reproductive Health Services and Mathematics.
- Offered motivation talks, Career development Talks.
- Held talks with the youths on cultural transitions such as effects of tribalism

➢ NATIONAL HERITAGE CONSERVATION COMMISSION

January 2018 until present

- Conduced archaeological works with a German firm under Max-Plank Institute for two months in central province of Zambia
- Drafted a Management Plan for David Livingstone Memorial National Monument

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- Scripted and produced the documentary that was running on the national Television on the Central province Investment Forum and Expo.
- Excavated at Greater Kalambo Falls with Prof. Larry Barham from the University of Liverpool.
- Reproduced David Livingstone's maps in all his three journeys on te continent of Africa using Arc Map software.

➢ ENVIRODYNAMICS CONSULTING LIMITED

Director of Operations from 2018 till present;

- Conducted Feasibility study for the proposed Viewing deck glass bridge at Victoria Falls World Heritage site.
- Conducted a Heritage Impact Assessment in a solar power project in Nampundwe contracted by DH engineering.
- Conducted a Heritage Impact Assessment for in a solar power project in Solwezi contracted by DH engineering.
- Conducted a Heritage Impact Assessment for the 'Unika' wind power project in Katete contracted by DH engineering.
- Conducted a Heritage Impact Assessment in a solar power project in Kafue contracted by DH engineering
- Conducted a Heritage Impact Assessment for the proposed Kafue Mazabuka Bypass road contracted by China Complete Engineering Corporation.

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E-mail: geoffreymwanza2014@gmail.com

- Conducted a Heritage Impact Assessment for wind power in Katete contracted by a South African consulting firm Mphepo power Limited
- Was part of the team that conducted a Conducted a feasibility study for the proposed pedestrian glass bridge at Victoria Falls as a HIA and Visual Impact Assessment expert.
- Conducted a Brand naming/Testing survey for ZANACO contracted by Mercy Corps, a Non-governmental Organization involved in Agro-fin related programmes.
- Co-facilitated a Public hearing for the proposed Mukuba Resort in Livingstone as consultant contracted by Zambia Environmental Management Agency (ZEMA).

EDUCATION AND TRAINING

2013-2017: The University of Zambia (Main Campus), Lusaka.

Bachelor of Education in cultural Studies with History.

2008-2010: Kafue Day High School, Kafue, Zambia

General Certificate of Education (Full Grade Twelve (12) School Certificate).

2006-2007: Malundu Secondary School, Kafue, Zambia

Full Grade Nine (9) Certificate.

1999-2005: ST. John Community School, Kafue, Zambia

Full Grade Seven (7) Certificate.

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REFERENCES

Ms. Florence Chileshe,

District Cultural officer for Livingstone City

Contact : 0977506569

Kagosi Mwamulowe,

Director Northern Region-National Heritage Conservation Commission

P.O. Box 320013

Contact Number: +260977500243

E-mail :mwamsprog@gmail.com

Mr Frederick Kamanya,

Programmes Director: Amos Youth Centre (A.Y.C), African Education Program,

P.O. Box 360002,

Kafue, Zambia.

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Mr. Donald Chikumbi-

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former Chief Executive officer for National Heritage Conservation Commission and currently a lecturer at the Copper belt University in the department of Natural resources studies.

Contact: +260977777342

Email: donaldchikumbi@yahoo.com

DECLARATION

I Geoffrey Mwanza do hereby declare that the information contained herein is true to the best of my knowledge.

Conroy van der Riet (Report Authors)	**Conroy van der Riet** (Project Manager)	**Stuart Heather-Clark** Reviewer)
		

AFRICAN OFFICES

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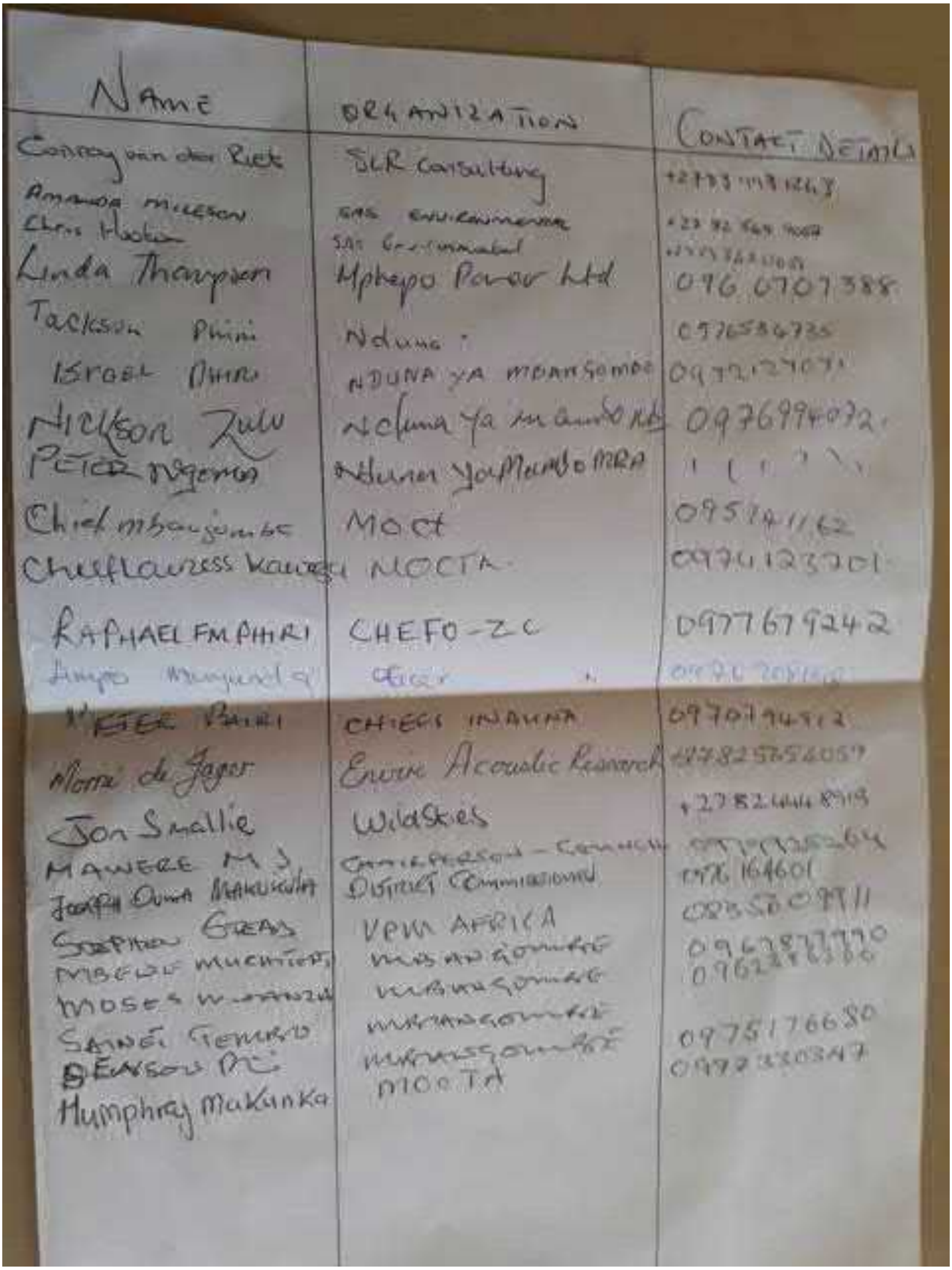
ANNEXURE C: OTHER PUBLIC PARTICIPATION INFORMATION

12 February 2018: Attendance Registers for initial meetings with the Katete council and local traditional leaders of the Project Site.



Name	Organization	Contact Details
Conroy van der Riet	SLR Consulting	+27 73 193 1263
Amanda Mileson	SAS Environmental	+27 82 569 9067
Chris Hooker	SAS Environmental	[illegible]
Linda Thompson	Mphepo Power Ltd	096 6707388
Jackson Phiri	Nduna	0976586735
Israel Phiri	Nduna ya Mbangombe	0977127071
Nickson Zulu	Nduna ya Mbangombe	0976994072
Peter Ngoma	Nduna ya Mbangombe	[illegible]
Chief Mbangombe	MoCT	0957411162
Chieftainess Kawaza	MOCTA	0974123201
Raphael FM Phiri	CHEFO-ZC	0977679242
[illegible]	[illegible]	[illegible]
Peter Phiri	Chiefs Induna	0970794512
Morne de Jager	Enviro Acoustic Research	+27 82 565 4059
Jon Smallie	WildSkies	+27 82 444 8919
Mawere M J	Chairperson – Council	[illegible]
Joseph Ouma Makuskina	District Commissioner	0976164601
Stephen Gerads	VPM Africa	0955809711
Mbelwa Muchitoti	Mbangombe	0967877770
Moses [illegible]	Mbangombe	0962286366
Samuel Tembo	Mbangombe	0975176680
Benson Phiri	Mbangombe	0977330347
Humphrey Makunka	MOCTA	

NAME	ORGANIZATION	CONTACT DETAILS
[illegible] van [illegible] Riet	SLR Consulting	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Linda Thompson	Mphepo Power Ltd	096 0707 [illegible]
[illegible] Phiri	Nduna	[illegible]
[illegible] Phiri	Nduna ya [illegible]	[illegible]
Nickson Zulu	Nduna ya [illegible]	0976994072
Peter [illegible]	Nduna ya [illegible]	[illegible]
Chief [illegible]	MOCA	095741162
[illegible]	MOCTA	0979123201
Raphael Fm Phiri	CHEFO-ZC	0977679242
[illegible]	[illegible]	[illegible]
Peter Banda	Chiefs Induna	0970746912
[illegible] de Jager	Enviro Acoustic Research	[illegible]
Jon Smallie	Wildskies	+2782[illegible]
Mawere M J	[illegible]	[illegible]
[illegible]	District Commissioner	097 [illegible]
Stephen [illegible]	VPM Africa	0955609711
[illegible]	[illegible]	096[illegible]
Moses [illegible]	[illegible]	0962[illegible]
[illegible]	[illegible]	
Benson P C	[illegible]	0975176650
Humphrey Makunko	MOCTA	0977320247

09 April 2018: Attendance register of the meeting with District Joint Operations Committee (DJOC) members, Heads of Department from Government agencies and District Council Members.

MPHEPO POWER

Mphepo Power / Katete District Stakeholders Meeting
Minutes

Date: 9 April 2019
Time: 14.00 CAT
Location: Katete District Council Offices, Katete, Eastern Province

Chair: District Commissioner, Katete District – Jospeh Duma Makukula
Attendees:

Name	Position
Joseph Duma Makukula (Chair)	District Commissioner
Mulenga Simbao	Council Secretary
Major K Mujiwa	DJOC Chairman
Mr M Sepiso	DJOC Secretary
Lt MK Nyundu	DJOC Liaison Officer
Enock Yamboto	District Officer in Charge of Correctional Services / DJOC member
Mukuka Oscar	Director of Works, Katete Town Council
Stanley Kakisa	Acting Officer in Charge of Police
Quabaniso Ndhlovu	Education Standards Officer
Astridah Lupiya	District Environmental Planner
Mr J Tembo	DJOC member
W Sikazwe	Officer in Charge, Immigration
Kelvin Ndhlovu	Engineering Assistant
Lydia Muvindi Sambo	Senior Livestock Officer
Lewis Mbewe	Assistant Programmes Officer
Josphat Banda	Ag DHD
Hope Bwalya	District Information Officer, ZANIS
Natasha Ndumba	Town Planner
Dismus Banda	Community Liaison Officer, Mphepo Power
Charlie Troughton	Director, Mphepo Power

05 – 12 June 2018: Notice letters, Newspaper Notices and Background Information Document to inform identified stakeholders of the Project and the Public Scoping Meeting.

DH ENGINEERING CONSULTANTS

Consulting Engineers and Project Managers

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Email: muyabat@gmail.com.com

24 May 2019

Dear Stakeholder

EIA SCOPING MEETING FOR THE PROPOSED UNIKA WIND FARM (PHASE 1) PROPOSED BY MHEPO POWER LIMITED IN KATETE ZAMBIA

Mphepo Power Limited ("Mphepo") proposes to develop a wind farm facility near Katete, Eastern Province, Zambia. The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid. Mphepo Power Limited is a Special Purpose Vehicle (SPV) consisting of a consortium of companies including, Buffalo Energy Ltd., Oswald and Kapata CC, Western Renewable Power Ltd. and the Chewa Development Trust (on behalf of Chewa King, Kalonga Gawa Undi, and the Chewa People). Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the ZESCO and grid connection. Phase 1 ("Unika I") will include the development of an 80 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW. It is also proposed to build an on-site substation for Phase 1, and power transmission line running from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project Site.

As part of the Environmental Impact Assessment (EIA) process and in compliance with section 29 of the Environmental Management Act (No. 12 of 2011) and appropriate international best practices, SLR Consulting (Africa) Pty Ltd in collaboration with DH Engineers Consultants have been appointed by Mhpepo Power Limited to undertake the EIA process. DH Engineering Consultants will coordinate and assist in public participation. As such, DH Engineering Consultants will hold an EIA Scoping Meeting to which you are cordially invited. The venue and time for the meetings are as given below.

At Pangani Lodge, *Mozambique RD (T6) starting at 09:30 on Wednesday 12th June 2019*. Lunch and a tea break will be provided.
Please confirm if you are able to attend either of the meetings or will be sending one or more representatives by emailing **Tobias Muyaba** at the contact details above.

The Background Information Document is available on the SLR website: https://slrconsulting.com/za/slr-documents

We would appreciative your participation and thank you in anticipation. For further queries please do not hesitate to contact the undersigned.

Tobias Muyaba, Environmental Officer, DH Engineering Consultants, Lusaka

DH ENGINEERING CONSULTANTS
226A Napsa Housing Complex, Nyumba Yanga, Off Leopards Hill Road,
Lusaka, Zambia

Newspaper Notice: Daily Mail – 05/06/2019

DH ENGINEERING CONSULTANTS

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SLR Consulting (Africa) Pty Ltd is working in collaboration with DH Engineering Consultants to coordinate the scoping process and assist in public participation. As such, DH Engineering Consultants will hold an EIA Scoping Meeting to which you are cordially invited. Mphepo Power Limited warmly invites stakeholders from governmental agencies, local authorities, traditional and civil leadership, non-governmental organizations, community-based organizations, potentially affected communities and other individuals to participate in the process.

The venue and time of the Scoping Meeting are as reflected below:

Pangani Lodge, Mozambique Rd (T6):

Wednesday 19th June 2019 at 09:30 hrs

The Background Information Document is available on the SLR website: https://slrconsulting.com/za/slr-documents

For further details or clarifications, please contact Tobias Muyaba at the following numbers:
Tel: +260 9779 69748, or +260 (0211) 229555 /227176
Email: Tobias Muyaba (Social and Environmental Officer) at muyabat@gmail.com

Address: DH ENGINEERING CONSULTANTS
226A Napsa Housing Complex
Nyumba Yanga
Off Leopards Hill Road
Lusaka, Zambia.

Newspaper Notice: Daily Nation – 05/06/2019

DH ENGINEERING CONSULTANTS

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226A Napsa Housing Complex, Nyumba Yanga, Off Leopards Hill Road, Lusaka, Zambia.

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Background Information Document:

BACKGROUND INFORMATION DOCUMENT

PROPOSED UNIKA WIND FARM PROJECT (PHASE 1), ZAMBIA

1. INTRODUCTION

Mphepo Power Limited (Mphepo) proposes to develop a wind farm near Katete, Eastern Province, Zambia (the "Project Site"). The proposed facility would utilise wind turbines to generate electricity that will be fed into the National Power Grid. The Zambia Electricity Supply Corporation Limited (ZESCO) has an objective to provide affordable and stable power to the Zambian people. As Zambia's energy generation has historically been dominated by hydropower, the Government is looking to diversify and incorporate other resources, including wind energy.

Phase 1 ("Unika I") will include the development of an 80 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all the phases have been completed the project will have a capacity of approximately 450 MW.

An example of typical wind turbine is provided in Figure 1, and an example of a typical wind farm operating in a rural landscape is provided in Figure 2.

SLR Consulting (Africa) (Pty) Ltd (SLR), in collaboration with DH Engineering Consultants Ltd, have been appointed as the independent Environmental Assessment Practitioner to conduct the Environmental and Social Impact Assessment (ESIA) process for this project.

2. PURPOSE OF THIS DOCUMENT

This Background Information Document (BID) has been compiled and distributed to:

- Inform affected communities and other stakeholders about the legislative processes that the applicant is required to comply with;
- provide a high level description of the proposed project;
- describe the ESIA process to be followed;
- provide an overview of the key issues to be investigated; and
- describe how affected communities and other stakeholders can participate in the process.

3. WHAT AUTHORISATION IS REQUIRED?

Compliance with Zambian legislation will be required. In this regard, an Environmental Impact Assessment (EIA) needs to be compiled, and the EIA process will be undertaken according to the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations (SI No.28 of 1997) and the Environmental Management Act, 2011, Section 29, which requires registration and authorisation by the Zambia Environmental Management Agency (ZEMA).

In addition, the project must also be designed and implemented in accordance with International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012), which includes IFC Performance Standards 1 to 8 and relevant World Bank Environment Health and Safety (EHS) Guidelines.

As a result of the dual compliance requirements an Environmental and Social Impact Assessment (ESIA) will be undertaken.

Figure 1: A typical wind turbine.

Figure 2: A typical renewable energy facility operating in a rural landscape.

4. PROJECT DESCRIPTION

The Project Site is located directly north of Katete (Eastern Province, Zambia) and approximately 440 km east of Lusaka, Zambia (Figure 3).

Based on initial investigations the Project Site has potential to generate approximately 450 MW; however, Mphepo will adopt a phased approach to the development due to the current need from the ZESCO and grid connection. Phase 1 ("Unika I") will include the development of an 80 – 200 MW wind farm, with Phase 2 ("Unika II") and Phase 3 ("Unika III") considering a further 150MW each. Once all three phases have been completed the project will have a capacity of approximately 450 MW.

Phase 1 ("Unika I") has been prioritised for development and is the focus of this ESIA. It is also proposed to build an on-site substation and transmission line. The transmission line will be from the on-site substation to the existing Msoro substation located approximately 30 km north-west of the Project site. The current preferred route for the power transmission line runs mainly along the existing road leading from the Project site to the Msoro substation (Figure 4).

The site is located on traditional land, owned by Kalonga Gawa Undi Mkhomo V, the King of the Chewa people. Land marks within the Project site include Kachingwe Cobalt and the Mtetezi military camp, with the town of Katete located directly south west of the Project site.

6. KEY ISSUES FOR CONSIDERATION

There are a number of environmental and social impacts and benefits associated with the construction, operation and decommissioning of a wind farm, and the ESIA will assess the likely positive and negative impacts of the project. These include some of the following:

- Impacts on birds and bats;
- Impacts on terrestrial and aquatic ecology;
- Nuisance dust and noise during construction;
- Impacts on landscape and land capability;
- Community and worker health and safety;
- Change in landscape;
- Soil and ground water contamination;
- Change in land use and land ownership;
- Job creation during construction and operation; and
- Socio-economic development in the surrounding communities.

Potential impacts and benefits related to the project will be identified in the Scoping Report, which will also set out the Term of Reference for the EIA study. These impacts and benefits will be assessed in the EIA and appropriate mitigation measures will be recommended. The mitigation and monitoring measures will be included in an Environmental and Social Management Plan for the various phases of the project.

7. INVITATION TO COMMENT ON THE PROPOSED PROJECT

You and/or your organisation are hereby invited to register as an Interested and Affected Party and provide input with regard the proposed project.

You can become involved as follows:

- by reading this document and letting us know of any initial issues or concerns that you may have;
- by providing us with contact particulars of any other organisations or persons who may be affected by or interested in the proposed project; and
- by registering as an Interested and Affected Party (see attached Registration Form).

Should you wish to register or comment, kindly forward your details to DH Engineering Consultants Ltd at the contact details below.

DH Engineering Consultants
PO Box 37928
Lusaka, Zambia
Telephone: +260 211 229555
Mobile: +260 977 874162/ +260 955 913315
Email: dhec.lusaka@gmail.com

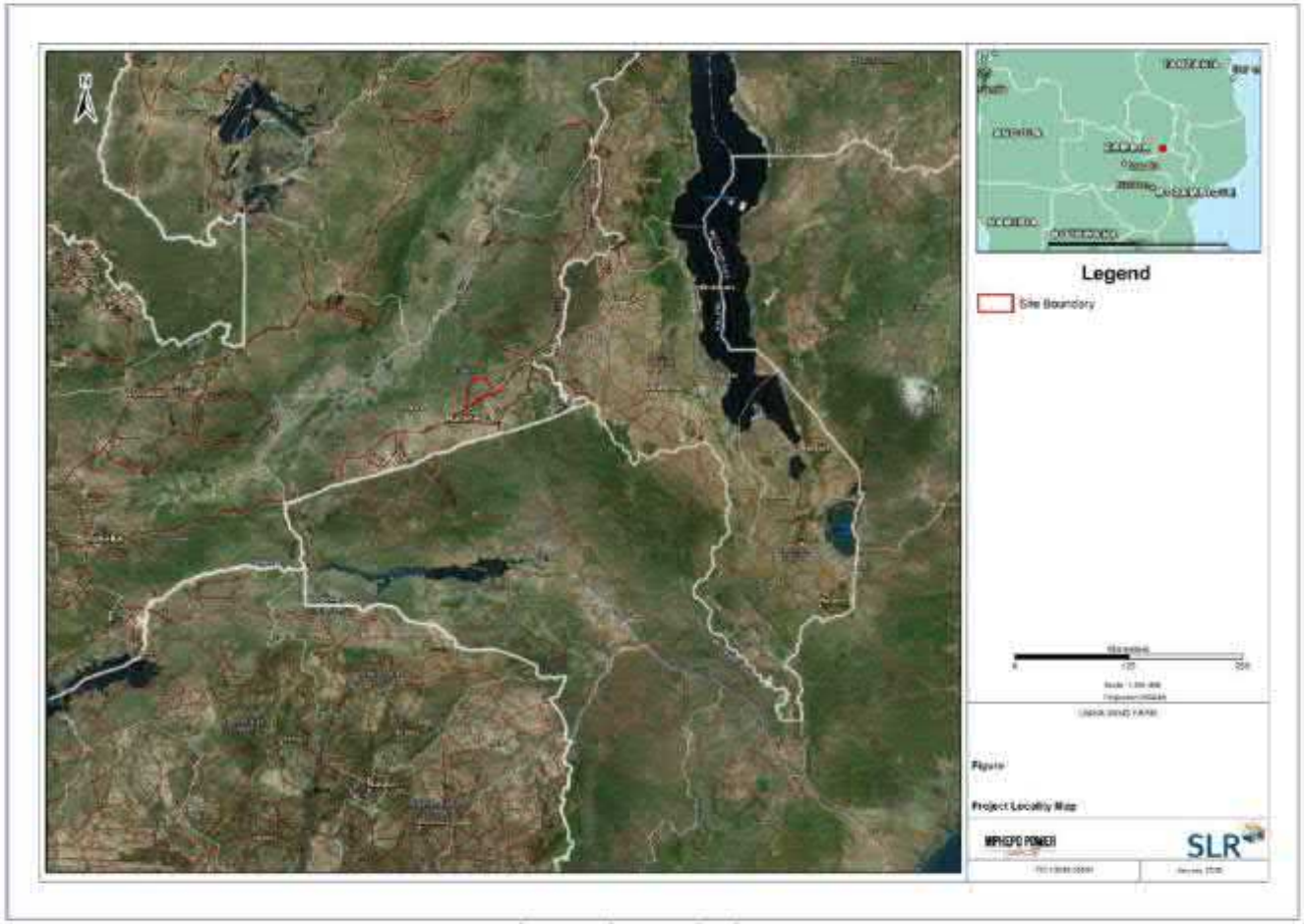

Figure 3: Location of the Unika Wind Farm

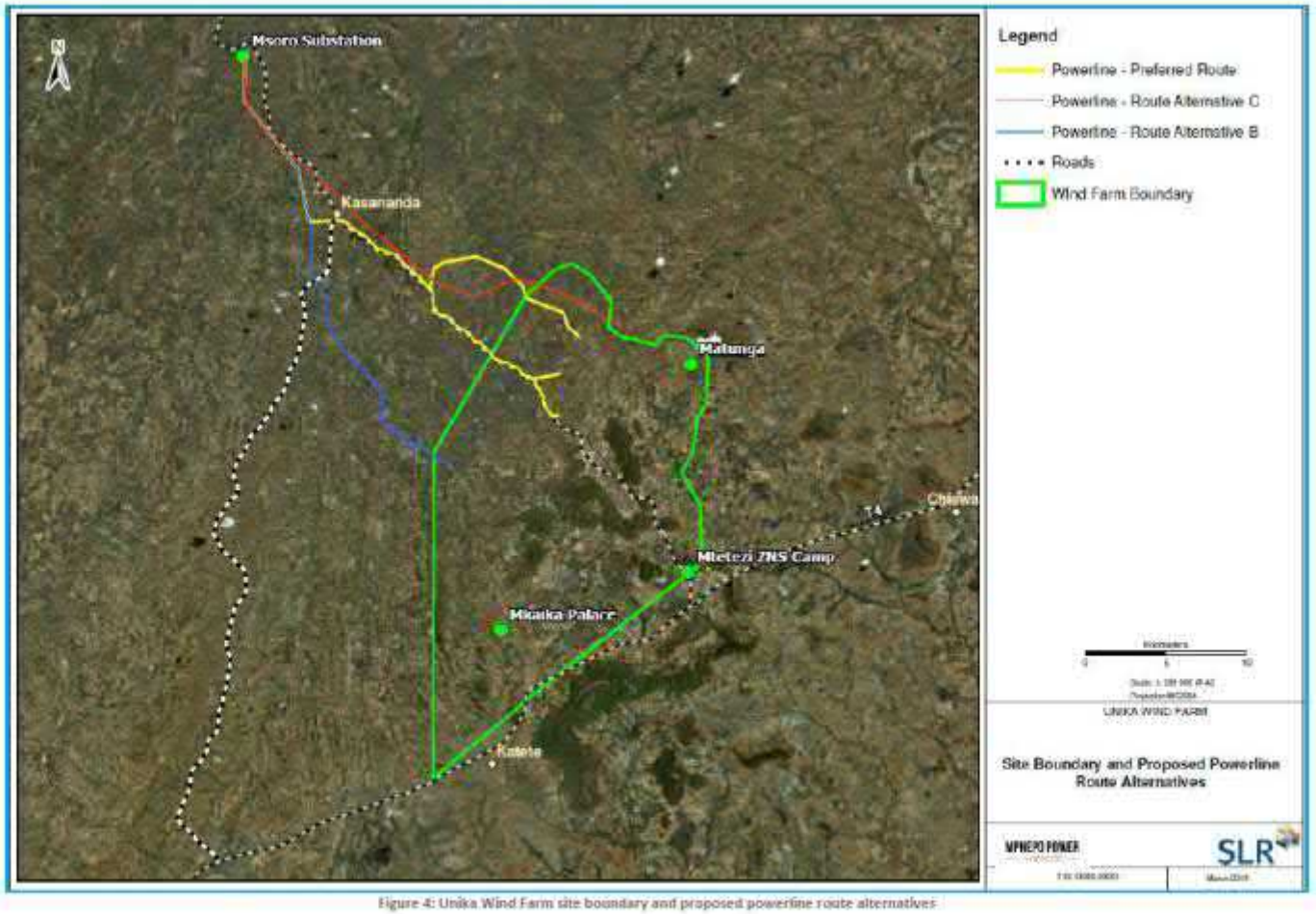

Figure 4: Unika Wind Farm site boundary and proposed powerline route alternatives

PROPOSED UNIKA WIND FARM PROJECT, ZAMBIA
INTERESTED AND AFFECTED PARTY (I&AP)
REGISTRATION AND RESPONSE FORM

Would you or your organisation like to become a registered I&AP and continue to receive information on the proposed project?

Yes _____ No _____

Name :

Organisation:

Postal address:

Email address:

Mobile number: Fax number:

Do you or your organisation have any issues or concerns regarding the proposed project?

Yes _____ No _____ If yes, please provide details below:

DH Engineering Consultants
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