BIODIVERSITY OFFSET STRATEGY FOR THE MUSINA MAKHADO SPECIAL ECONOMIC ZONE

STATUS QUO AND STRATEGY REPORT

AUGUST 2020

VERSION 0

Mamadi & Company | SA

DOCUMENT CONTROL

TITLE	**BIODIVERSITY OFFSET STRATEGY FOR THE MUSINA MAKHADO SPECIAL ECONOMIC ZONE**
DATE	**AUGUST 2020**
REPORT NO	**20MC-MMSEZ-BIOD-02**

PROJECT TEAM

THE FOLLOWING PERSONNEL HAVE AUTHORED AND REVIEWED THIS DOCUMENT:

ROLE	NAME	DESIGNATION
AUTHORS	MPHO RAMALIVHANA	ECOLOGIST AND BIODIVERSITY SPECIALIST
	DR OLA AKINSHIPE	ENVIRONMENTAL SPECIALIST

REVISION RECORD

DATE	STATUS	DESCRIPTION
24TH AUGUST 2020	DRAFT	DRAFT FOR INTERNAL REVIEW
25TH AUGUST 2020	DRAFT_V0	DRAFT FOR MMSEZ REVIEW

MMSEZ APPROVAL AND SIGNOFF

APPROVED BY	RESPONSIBILITY	SIGNATURE	DATE APPROVED

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ABBREVIATIONS AND ACRONYMS

CBA	Critical biodiversity areas
ESA	Ecological support areas
FEPA	The Freshwater Ecosystem Priority Areas
IBA	Important Bird Area
IUCN	The International Union for Conservation of Nature
Mamadi	Mamadi and Company SA Proprietary Limited
MMSEZ	Musina Makhado Special Economic Zone
NFEPA	The National Freshwater Ecosystem Priority Areas
SANBI	South African National Biodiversity Institute
SCC	Species of special conservation concern

PART A

STATUS QUO REPORT

1 INTRODUCTION

Limpopo Economic Development Agency (LEDA) proposes to develop a Special Economic Zone which overlaps the Makhado and Musina Local Municipalities. The proposed Musina-Makhado SEZ will be specifically designated to focus on energy and metallurgical processing, agro-processing, petrochemical, and logistics. This SEZ will compromise of a connected pipeline of a minimum of eight catalytic projects. It will be established across eight farms. The total farm sizes add up to approximately 8000 hectares of which 6000 hectares will be used for the SEZ.

The proposed Makhado-Musina Special Economic Zone (MMSEZ) will be located across the Musina and Makhado local municipalities which fall under the Vhembe District Municipality in the Limpopo Province. The nearest towns are Makhado (which is located approximately 31 km south) and Musina (located 36 km north) of the proposed SEZ site. A locality map of the site is provided in Figure 1.

The proposed project will compromise of an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical complex will initially comprise of a power plant, steel plant, stainless steel plant, coking plant, ferrochrome plant, ferromanganese plant, ferrosilicon plant, pig iron metallurgy plant and a lime plant amongst other things.

Currently, the project is subjected to an environmental assessment process in accordance with the National Environmental Management Act, 1998 and the EIA regulations of 2017 as amended. As part of the Environmental Impact Assessment process, the competent authority has requested for the biodiversity offset strategy be conducted. Mamadi and Company SA (Pty) Ltd has been appointed by Limpopo Economic Development Agency to develop a biodiversity offset strategy for the project to ensure that the biodiversity loss within the proposed site is compensated.

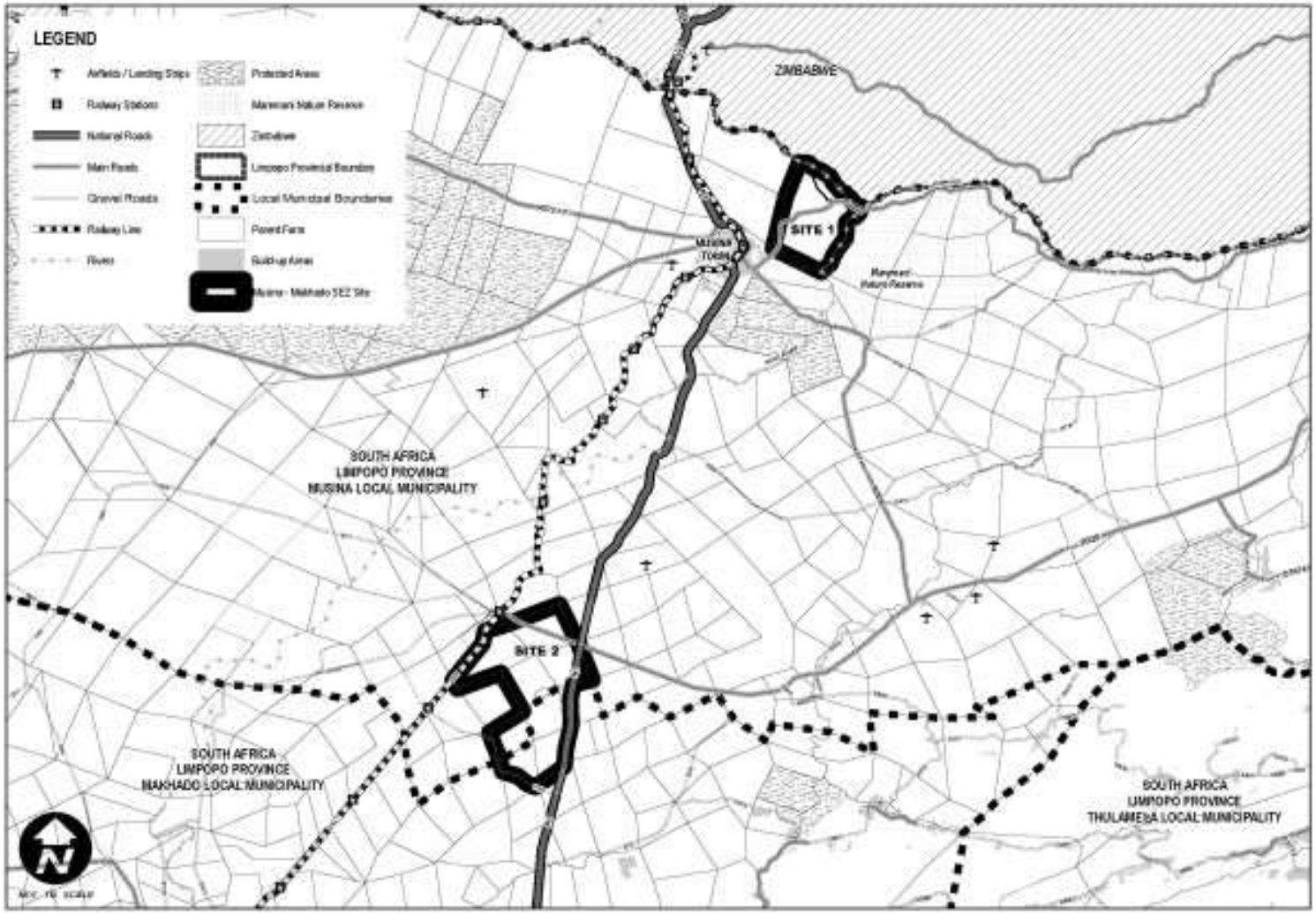

Figure 1: Musina-Makhado SEZ Locality

1.1 PURPOSE OF STUDY

The Biodiversity Offset Strategy (the Strategy) was developed to demonstrate how any unavoidable significant residual impacts from the MMSEZ to biodiversity features (including critical habitat, natural habitat and priority biodiversity features) can be compensated through the establishment of biodiversity offsets in a manner that achieves an overall net gain or no net loss in biodiversity.

This strategy will facilitate discussion with the competent authority on suitable offsets for unavoidable losses of vegetation and habitat incurred during construction and operation of MMSEZ. This study also considers planned measures to avoid and minimise impacts, the expected extent of disturbance to terrestrial environmental values, and evidence that there are opportunities to offset the estimated losses of remnant vegetation, species, and habitat.

1.2 SCOPE AND OBJECTIVES OF THE WORK

The scope and extent of work for the Project are outlined as follows:

- Review of existing studies (Biodiversity Study Reports) and literature;
- Review other EIA Specialist studies conducted;
- Undertaking of updated baseline assessments;
- Using the information to compile a collated baseline assessment of terrestrial biodiversity, bio mass, wetlands, habitat, ecosystem services and sensitive features of the proposed development sites. The collated assessment will include but not be restricted to:
    - Verification of the extent of direct and indirect impact on various biodiversity features within the development site. The degree of impact must be translated into impacted locale footprint measured in hectares;
    - Evaluation of ecosystem services impacted by the development; and
    - Affirmation and /or adjustment of potential impacts and potential losses to biodiversity and wetlands.
    - Undertake specialist site assessments for selected studies to validate rebut or correct previous assessments and existing datasets;

- Contribute to the determination of offset necessities for impacts on biomass, habitat, fauna, ecosystems, and sensitive features in terms of the Draft National Biodiversity Offset Policy;
- Contribute to the purpose of offset requirements for impacts on wetlands in terms of the wetland offset guidelines.
- Categorize potentially suitable offset receiving opportunities and/or areas/sites within the SEZ footprint area;
- From a desktop investigation the identification of 2 to 3 aspirant areas outside of the SEZ footprint area that could be considered for offset opportunities. This will be supported by an inspection of the identified areas to assess at a high level the suitability of these areas;
- Compile an offset analysis report incorporating baseline evaluation offset necessities, calculations, practicum findings and investigation of suitable offset receiving areas; and
- Compilation of an offset strategy for the proposed SEZ sites, in deliberation of offset opportunities identified within the SEZ sites and the 2 to 3 aspirant areas outside of the SEZ sites.

2 STUDY APPROACH AND REGULATORY FRAMEWORK

2.1 APPROACH TO THE STUDY

The approach applied in undertaking the offset strategy is as follows:

1. A comprehensive review of the existing Biodiversity study reports, literature and specialist studies conducted for the environmental authorization was undertaken. This evaluation set the tone for the Strategy and presented a baseline for the study area.
2. Relevant information was sourced from the Limpopo Economic Development Agency regarding previous studies conducted:
    a. the review of the biodiversity report and the Freshwater impact report – both compiled by Digby Wells; and
    b. the review of the protected trees survey for the proposed Musina – Makhado Special Economic Zone compiled by The Biodiversity Company.

c. review of various regulations and policies that informs biodiversity offsets

3. A site visit was undertaken to identify and verify biodiversity features on site (including critical habitat, natural habitat, and priority biodiversity features).
4. The compilation of a biodiversity strategy report detailing suitable offsets for unavoidable losses of vegetation and habitat incurred during construction and operation of MMSEZ.

2.2 REGULATORY FRAMEWORK AND POLICY REVIEW

A review of regulations and policies that informs and directs biodiversity offsets and ground-truthing is presented in this section. These regulations and policies apply to direct and/ or indirect biodiversity offset measures and other compensatory measures.

Table 1: Applicable laws and regulations informing and directing Biodiversity Offsets

Regulations/ Policies	Brief Description
Constitution of the Republic of South Africa, 1996, article 24 (b) – (c)	"everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act,1998 (Act 107, 1998) states in section 2(4)(k) that The environment is held in public trust for the people, the beneficial use of resources must serve the public interest and the environment must be protected as the people's common heritage. Section 2(4)(a) ('the NEMA principles') specifies that sustainable development requires the consideration of all relevant factors including the following: - that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; - that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; - that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions

	- that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied; and - that equitable access to environmental resources, benefits and services be pursued to meet basic human needs and ensure well-being. Special measures may be taken to ensure access by categories of persons disadvantaged by unfair discrimination. Section 2(4)(p) states that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment. According to section 24(P), an applicant for an environmental authorization relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the environmental authorization, comply with the prescribed financial provision for the management of negative environmental impacts. 'Financial provision' is defined (section 1) as the insurance, bank guarantee, trust fund or cash that applicants for an environmental authorization must provide in terms of this Act guaranteeing the availability of sufficient funds to undertake, amongst others, the 'remediation of any other negative environmental impacts'.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The objectives of this Act are within the framework of the National Environmental Management Act, include: - The management and conservation of biological diversity within the Republic of South Africa and the components of such biological diversity - The use of indigenous biological resources in a sustainable18 manner; and - The fair and equitable sharing among stakeholders of benefits arising from bio- prospecting involving indigenous biological resources; and - Giving effect to ratified international agreements relating to biodiversity which are binding on the Republic. The Act, amongst others, provides the framework for biodiversity management and planning, comprising a national biodiversity framework, bioregions and bioregional plans, and biodiversity management plans and agreements. Threatened and protected ecosystems (section 52) have been listed (December 2011) and activities or processes within those ecosystems may be listed as 'threatening processes', thus triggering the need to comply with the NEMA EIA

	regulations. Lists of critically endangered, endangered, vulnerable and protected species have also been promulgated in terms of this Act (2007), covering species affected by 'restricted' activities; effectively those species hunted, bred or traded for economic gain. In addition, regulations addressing alien and invasive species and their management/ control were promulgated in 2014. The Act further provides (section 43) for 'biodiversity management plans' approved by the Minister to manage ecosystems or species that warrant special conservation attention. The Act establishes the South African National Biodiversity Institute (SANBI), with a range of functions and powers (Chapter 2 Part 1).
National Environmental Management Protected Areas Act,2003 (Act No.57 of 2003)	The objectives of this Act within the framework of the National Environmental Management Act, include the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in order to: - Protect areas with significant natural features or biodiversity - Protect areas in need of long-term protection for the provision of environmental goods and services - Provide for sustainable flow of natural products and services to meet the needs of a local community involvement of private landowners. The Act provides for the involvement of parties other than organs of State in the declaration and management of protected areas.
Spatial Planning and Land Use Management Act,2003 (Act No. 16 of 2013)	Sustainability and resilience principles apply to all aspects of spatial development planning, land development and land use management, specifically with reference to ensuring sustainable livelihoods in communities most likely to suffer the impacts of environmental shocks.
National Forests Act, 1998 (Act No. 84 of 1998)	Permits required for damage or destruction of protected tree species, natural forest. Offsets may be required where damage or loss is deemed significant
The Conservation of Agricultural Resources Act,1983 (Act No. 43 of 1983)	Addresses the need to protect soils, wetlands and water resources, natural vegetation through its gazing capacity regulations as well as the categorization and supporting regulations pertaining to weeds and alien and invasive plants.
Income Tax Act,1962 (Act No. 58 of 1962)	Inclusion of 'conservation, rehabilitation or protection of the natural environment, including flora, fauna or the biosphere' as approved public benefit activities for purposes of section18A (1) (a) of the Income Tax Act (GN 403 of 26 April 2006). [In order to qualify as a 'public benefit organisation' under this Act and thus qualify for tax exemptions or reductions, the organisation must, amongst others, be a trust or association of persons, be incorporated under Section 21 of the Companies Act, register as a non-profit organisation under the Non-profit

	Organisations Act, and the organisation's sole objective must be to carry on a 'public benefit activity'.]
Revenue Laws Amendment Act,2008 (Act No. 60 of 2008)	Insertion of section 37C into the Income Tax Act, 1962: "Deductions in respect of environmental conservation and maintenance": Tax relief for expenditure incurred by the taxpayer in conserving or maintaining land that forms part of either (i) a biodiversity management agreement of at least 5 years' duration in terms of s44 of the NEM Biodiversity Act, (ii) a declaration of at least 30 years' duration in terms of s20, 23 or 28 of the NEM Protected Areas Act; or (iii) a national park or nature reserve in terms of an agreement under section 20(3) or 23(3) of the NEMPAA and the declaration has been endorsed on the title deed for a period of 99 years.
National Biodiversity Strategy and Action Plan 2015	The National Biodiversity Strategy and Action Plan (NBSAP) is a requirement of contracting parties to the Convention on Biological Diversity (CBD). NBSAPs set out a strategy and plan for contracting parties to fulfil the objectives of the Convention. With the adoption of the CBD's Strategic Plan for Biodiversity for 2011-2020, parties agreed to revise and align their NBSAPs to the Strategic Plan and the Aichi Targets. This document is South Africa's revised NBSAP for the period 2015 – 2025. It identifies the priorities for biodiversity management in South Africa for this period, aligning these with the priorities and targets in the global agenda, as well as national development imperatives.
Limpopo Environmental Management Act (Act no. 7 of 2003) (LEMA) Limpopo Conservation Plan Version 2 (C-Plan 2)	The Limpopo Environmental Management Act (LEMA) was compiled to consolidate and amend the environmental management of the Limpopo Province. This act includes regulations which call for the protection of indigenous plants and animals which require a permit from the provincial authority for its picking, selling, removal, donation, and/or export in the province. The list of protected plants and animals are itemised under Schedule 8, 11 and 12.

3 ENVIRONMENTAL ATTRIBUTES AT MMSEZ

3.1 CLIMATIC CONDITIONS

The proposed MMSEZ location falls within a semi-arid climatic zone of Southpansberg, which is characterized by warm to hot summers and with cool, dry winters (May to August). Rainfall occurs mainly during the summer months (October to March), with April and September being transition months. The mean annual precipitation is between 246 mm to 348 mm, the lowest rainfall (0 mm) occurs in June and the highest (55mm) in January. The area is generally frost free, with temperature ranges from 9°C to 40°C. The proposed site is dominated by south-eastern wind with speeds ranging from 0.5 – 3.6 m/s and 2.1 - 3.6m/s. Secondary winds have been noted coming from the east.

3.2 LAND-USE AND COVER

According to the South African National Biodiversity Institute (SANBI) Land Cover, 2008; available satellite imagery and the site visit conducted the land cover of the study area comprises:

- Largely natural area
- Degraded land
- Natural Areas
- Water Bodies.

In proximity to the project area is a small settlement in Mopane; the Syferfontein Dolomite opencast mine, which is 8 km from the N1/R525 intersection and about 40 km south of Musina; the Nzhelele Nature Reserve.

Figure 2: Indication of the natural dominating area

3.3 TOPOGRAPHY AND DRAINAGE

The area within the Limpopo Water Management Area is characterised by a flat topography with grassland, sparse bushveld shrubs and trees. Consequently, in addition to the prevalence of sandy soils in the area, surface runoff is regarded as low despite the presence of some loam and clay soils.

The project area is predominantly located in the A71K quaternary catchment with a smaller portion on the south which falls within A80F quaternary catchment, both the two catchments are within the Limpopo Water Management Area as revised in the 2012 water management area boundary descriptions. The Mokolo, Lephalala, Mogalakwane, Sand and Nzhelele are the main rivers of the water management area. These rivers together with a few small tributaries, flow northwards into the Limpopo River. However, the Sand River is the only major river within this quaternary catchment (approximately 8 km North-west of the project area). The Sand River flows from the South-west side of the project area towards the north-east side where it eventually joins the Limpopo River approximately 50 km away from the project area.

Few drainage lines exist towards the northern boundary of the demarcated project area and runoff from this area flows towards the northern direction via these drainage line and finally reports to the Sand River approximately 8 km west of the project site. The flows in the lower Sand River (adjacent to the project area), its tributaries and minor streams are highly intermittent. Run-off occurs after rainfall events, with flow in the main stem of longer duration after major, wide-spread rainfall in its catchment area.

3.4 WETLANDS

Based on current outputs of the National Freshwater Ecosystem Priority Areas (NFEPA) project, the sub-quaternary catchment associated with the Sand River was defined as a FEPA catchment, as a result of both river and wetland ecosystem types, as well as a few wetland clusters. These catchments help to achieve national biodiversity targets, as the ecological condition of the associated systems are currently regarded as being in a good condition (A or B ecological category). According to the finds of the Digby Wells Fresh Water Impact Report, it is evident that the wetlands and freshwater features within the project area consist mostly of pans, ephemeral drainage lines and artificial impoundments.

A total of 17 pans, covering a total area of 1.3 hectares were observed within the proposed project area at the time of the assessment. Pans were observed to be largely homogenous within the project area and were relatively small. Variances were attributed to land use differences and not vegetation or structure. Most pans were bare, with limited grass cover and surrounded by woody vegetation. Few pans were inundated with water at the time of the assessment.

An extensive network of drainage lines, covering approximately 296.21 ha, was observed within the proposed project area. These ranged from wide, deep, sandy ephemeral systems to small rocky features in isolated parts of the proposed project area. The addition of dams within drainage lines has resulted in the impoundment of water.

Several artificial impoundments were noted within the Project area, amounting to a total area of 6.23 ha. Most of these were inundated with water, but not to a great extent. Utilisation by cattle was high, with cattle being present at almost all of the dams. Therefore, this equates to 303.74 hectares that is sought to be covered with water.

3.4.1 WETLAND SENSITIVITY

The Freshwater Impact Report indicates that pans were observed to be largely homogenous within the project area. For assessment of sensitivity and health, pans were grouped according to land use practices as that aspect was the only differentiation between the pans. The present ecological status (PES) of the pans on the farm portion ANTROBUS 566 – East of N1 was categorised as Category A (Natural) displayed no visible impacts. This was attributed to general access restrictions due to the private access of the game reserve.

The remainder of wetlands on all portions was categorised with the pans categorised as Category B (Largely natural) included heavy grazing activities. Cattle-grazing activities were observed to have resulted in impacts such as overgrazing, trampling and erosion. Furthermore, impacts to water quality of the wetlands associated with the site were expected.

All the pans on site have achieved high biodiversity scores (Ecological sensitive score of 2.4 and 2.3 on pans at Antrobus 566 and all remaining farms respectively), as they were observed to provide habitat for various plant and animal species. Most notably, several branchiopod crustaceans, which are specially adapted to temporary systems such as pans, were observed to occur within these systems, which has increased the ecological importance of these pans.

The pans on Farm Antrobus 566 (East of N1) have tourism benefits, as well as water for animals, whereas the remainder of the farms are utilised for cattle watering and grazing.

4 BIODIVERSITY FEATURES AT MMSEZ

4.1 FLORA

4.1.1 REGIONAL VEGETATION

According to Mucina and Rutherford (2006), the study area is located within the Limpopo Ridge Bushveld (SVmp 2) and Musina Mopane Bushveld (SVmp 1). The largest portion is covered by the Musina Mopane Bushveld with the Limpopo Ridge Bushveld covering a smaller section of the site.

- The Musina Mopane Bushveld vegetation unit is distributed in Limpopo Province on undulating plains from around Baines Drift and Alldays in the west, remaining north of the Soutpansberg and south of the Limpopo River (but also occurring to the north of Zimbabwe), through Musina and Tshipise to Malongavlakte, Masis and Banyini Pan in the east. It is characterised by undulate terrain to very irregular plains, and some hills. In the western section, open woodland to moderately closed shrubveld dominated by *Colophospermum mopane* on clayey bottomlands and *Combretum apiculatum* on hills. In the eastern section on basalt, moderately closed to open shrub-veld is dominated by *Colophospermum mopane and Terminalia prunioides*. On areas with deep sandy soils, moderately open savanna dominated by *Colophospermum mopane, Terminalia sericea, Grewia flava and Combretum apiculatum*.

- The Limpopo Ridge Bushveld vegetation unit is distributed in Limpopo province and occurs on hills and ridges such as in the lower Mogalakwena River basin. The Altitude from 300m to 700m in the east and the west at around 1000m with the top of a few hills. Vegetation occurs on hills and ridges characterized by moderately open savanna where the grass layer is underdeveloped and large trees such as *Adansonia digitate (Baobab) and Sclerocarya birrea subsp caffra* (Marula) dominate the landscape. This vegetation unit is enclosed by the Musina Mopani Bushveld and therefore share some of the species. Although not threatened, ridges are usually characterized by high biodiversity and therefore their protection contributes to conservation of biodiversity.

Both vegetation units are categorised as least threatened with about 19% statutorily conserved mainly in the Kruger and Mapungubwe National Parks as well as Nwanedi and Honnet Nature Reserved

4.1.2 PROTECTED TREES

The Protected Trees Survey for the proposed MMSEZ conducted by The Biodiversity Company (2020) indicated that the site has four (4) protected tree species. These are *Adansonia digitata (*Boabab*), Combretum imberbe (*Leadwood*), Boscia albitrunca (*Shepherd tree*) and Sclerocarya birrea subsp. Caffra (*Marula*).*

In the Limpopo Ridge Bushveld habitat, the dominant species was the *B. albitrunca* (Shepherds tree) species of which majority of the specimens found were in an adult form, a total of 6.3 trees per hectare was found. In the Musina Mopane Bushveld habitat the Marula was the dominant species (5.6 trees/ha), followed by the Shepherds tree (4.1 trees/ha). Sub-adults and juvenile trees were also high of both these species, with a total of 4878 sub adult Shepherd trees and 2904 Marula trees found. The riparian habitat had the highest densities of Shepard trees (11.7 trees/ha) as well as Baobab trees (1.7 trees/ha) of all the habitat types. A total of 507 Baobab individuals were observed in the riparian habitat.

The total number of species recorded in the area were 109034, of which 51.3% consisted of Marula trees, 41.9% of Shepherds trees, 5.2% of Baobab and 1.65% of Leadwood trees. The Musina Mopane Bushveld habitat were the largest and consequently had the highest number of protected trees 96336. The Limpopo Ridge Bushveld and the riparian habitat had 8034 and 4661 trees respectively.

Figure 3: Adansonia digitata

Figure 4: Boscia albitrunca

4.2 FAUNA

Digby Wells (2019) completed an Environmental Impact Assessment for the Musina-Makhado Energy and Metallurgy Special Economic Zone Development (Fauna and Flora Impact Assessment).

4.2.1 MAMMALS

The report highlights that a total of seventeen (17) mammal species are listed (meaning expected to occur) for the project area, this includes one monkey species, one squirrel species, seven carnivore species, and eight even toed ungulate species. Three of these species are listed as Red Data species, *i.e.* two of the species (*Aonyx capensis* and *Parahyaena brunnea*) are listed as "near-threatened", whereas the *Panthera pardus* is listed as "Vulnerable".

4.2.2 AVI-FAUNA

Recently acquired data (according to Southern African Bird Atlas Project 2) of the project area corresponding to 2229DB (Mopane) as well as old records from Southern African Bird Atlas Project 1 indicate that approximately 262 bird species are expected to occur in the study area. This is also supported by the presence of suitable habitat in the study area as well as the proximity of the Soutspanesberg Important Bird Area (IBA). Of these 262 species, a total of thirteen (13) species are listed as Red Data species.

4.2.3 IMPORTANT BIRD AND BIODIVERSITY AREAS

The IBA programme identifies and works to conserve a network of sites that are critical for the long-term survival of bird species that are globally threatened, have restricted range, and are restricted to specific biomes/vegetation types or sites that have a significant population. The Project area does not traverse any IBA however, on the southern side of the project area, approximately 9 km from the project area lies the Soutspansberg IBA.

4.2.4 HERPETOFAUNA

Based on the results of the ADU database search, a total of twenty-seven herpetofauna species are listed for the QDS 2229DB. This includes four frog species; one tortoise species; and twenty-two reptile species. Two of these species are listed as Red Data species (*Homopholis mulleri* and *Crocodylus niloticus*).

4.2.5 INVERTEBRATES

A total of thirty-nine (39) invertebrates are listed for the QDS 2229DB [1] . This includes three scorpion species, one spider species, four dragonfly species, one antlion species, one dung beetle species, twenty-six butterfly species; and three moth species.

4.3 DESCRIPTION OF THE CBAS

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007).

[1] Website link: www.vmus.adu.org.za

These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision-making tools.

The primary purpose of CBA's is to inform land-use planning and the land-use guidelines attached to CBA's aim to promote sustainable development by avoiding loss or degradation of important natural habitat and landscapes in these areas and the landscape as a whole. CBA's can also be used to inform protected area expansion and development plans. The use of CBA's here follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- "**Critical biodiversity areas** (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses".
- **Ecological support areas** (ESA) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas."

According to the Limpopo Conservation plan (2013), most of the site is located within an Ecological Support Area 1 with the lower section of the site categorised as Critical Biodiversity Area 2. A smaller portion of the site is regarded as Other Natural Area. The sensitivity of the area can be correlated to the number of protected species (those that are for provincial as well as national importance) found on site as well as due to the area still being natural and harbouring potential to provide different habitats for animals.

PART B

BIODIVERSITY OFFSET STRATEGY

5 IMPACT OF THE PROJECT AND NEED FOR AN OFFSET

The proposed project will compromise of an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical components will initially comprise of power, steel, stainless steel, coking, ferrochrome, ferromanganese, ferrosilicon, pig iron metallurgy and lime plants amongst other things.

Digby Wells (2019) completed an Environmental Impact Assessment for the Musina-Makhado Energy and Metallurgy Special Economic Zone Development (Fauna and Flora Impact Assessment). In the study, the following activities pertaining to the fauna and flora specialist report with special reference to proposed activities listed in EIA Regulations were considered in assessing the impact of the Project:

- Activity 27 of GNR 327 LN 1: Cumulative removal of indigenous vegetation, for the development of infrastructure and cultivated areas, will account for more than 20 ha.
- Activity 12 of GNR 324 LN 3: The vegetation of the proposed development site meets the definition of indigenous vegetation, as contained in the EIA Regulations, 2014 (as amended).
- Removal of indigenous vegetation, in an area that traverses a Limpopo Conservation Plan v2 (LCPv2) Critical Biodiversity Area (CBA) 2 for the development of the 18-day storage Dam will account for more than 300 m^2.

Clearing of vegetation during the construction phase of the Project will directly remove some wetland and important riparian woodland habitat and their buffer areas. Construction and clearing of this vegetation will disturb these natural environments and compromise the ecological services they provide, which are of significance in the context of the area. These include water attenuation, flood protection, habitat creation, foodstuffs provisioning etc. Operational phase of the project will also result in continuous adverse impact on the project. The following are potential impacts listed in Figure 5 that the proposed MMSEZ activities that may exert on the project.

The impact ratings generated as part of the Fauna and Flora Impact Assessment for the Project is presented in Figure 5 (Digby Wells (2019)). The assessment yielded an impact rating of “moderate’ for most of the impact areas or issues post-mitigation.

Issues and impacts	Construction Phase		Operational Phase		Decommissioning Phase	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Impact 1.1: Loss of Natural Habitat and SSC						
1: Loss of Mopane Bushveld	Major	Moderate	N/A	N/A	N/A	N/A
2: Loss of Ridge Bushveld	Major	Moderate	N/A	N/A	N/A	N/A
3: Loss of Riparian Vegetation	Major	Moderate	N/A	N/A	N/A	N/A
4: Loss of Floral SSC	Major	Moderate	N/A	N/A	N/A	N/A
5: Loss of Faunal SSC	Major	Moderate	N/A	N/A	N/A	N/A
Impact 1.2: Loss of Loss of Ecological services						
6: Loss of Wetlands and Riparian Habitat services	Moderate	Moderate	N/A	N/A	N/A	N/A
Impact 1.3: Indirect Impact to Natural Areas						
7: Road deaths of animals, dust creation.	Moderate	Moderate	N/A	N/A	N/A	N/A
Impact 2.1: Habitat loss and continual pressure on the ecosystem and species						
8: Impacts on remaining species	N/A	N/A	Moderate	Minor	N/A	N/A
Impact 2.2: Pollution and Waste Generation	N/A	N/A	Moderate	Minor	N/A	N/A
Impact 2.3: AIP infestation						
9: Further reduction of natural Habitat	N/A	N/A	Moderate	Minor		
Impact 3.1: Habitat loss and continual pressure on the ecosystem and species						
10: Clearing of infrastructure	N/A	N/A	N/A	N/A	Moderate	Minor
11: Road deaths	N/A	N/A	N/A	N/A	Moderate	Minor
Impact 3.2: Impacts due to correct rehabilitation practices						
Improvement of Natural Habitat	N/A	N/A	N/A	N/A	Positive	Positive

Figure 5: Impact ratings generated as part of the Fauna and Flora Impact Assessment for the Project (Digby Wells (2019)

6 OFFSET FRAMEWORK AND DESIGN

6.1 FRAMEWORK FOR OFFSET DESIGN AND IMPLEMENTATION

The following principles for designing and implementing biodiversity offsets and verifying their success have been considered in this strategy. The biodiversity offsets were designed to comply with all relevant regulation, with implementation plans and design set out in accordance with the Convention on biodiversity offsets, as articulated in the draft National Biodiversity Strategy and Action Plans.

1 **No net loss:** The biodiversity offset was designed to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity (where possible). Offset liabilities of each biodiversity feature were assessed against the most stringent requirement (worst case scenario).

2 **Additional conservation outcomes:** The biodiversity offset was designed to achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place.

3 **Adherence to the mitigation hierarchy:** The biodiversity offset was designed as a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimization and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

4 **Limits to what can be offset:** There maybe situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected. This has been given due consideration in the strategy

5 **Landscape context:** The biodiversity offset was designed considering the landscape context of the area to achieve the expected measurable conservation outcomes considering available information on the full range of biological, social, and cultural values of biodiversity and supporting an ecosystem approach.

6 **Stakeholder participation:** In developing the strategy, stakeholder participation, as part of the environmental authorization and specialist studies for the project, was considered. Further protocol for stakeholder engagement in implementing biodiversity offset at an off-site location was considered.

7 **Equity:** The biodiversity offset was designed in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project

and offset in a fair and balanced way, respecting legal and customary arrangements as well as recognized rights of indigenous peoples and local communities.

8 **Long-term outcomes:** The design and implementation of the biodiversity offset was based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last as long as the project's impacts and preferably in perpetuity.

9 **Establishing 'like-for-like' (in-kind) conservation outcomes:** The impact and offset areas must be compared in the field with respect to current and similar vegetation patterns. The rationale is that in situations of similar impact and land use, a similar (or dissimilar) remnant vegetation composition and structure or similar (or dissimilar) 'reaction' to the impact would indicate that the original state in both areas was likely similar (or dissimilar). Survey element included landscape position, land use history, vegetation structure, dominant woody and grass species, alien species etc.

6.2 OFFSET DESIGN FOR THE MMSEZ

The design of the MMSEZ biodiversity offset is based on the mitigation hierarchy published in the Draft National Biodiversity Offset Policy, 2017, depicted in Figure 6.

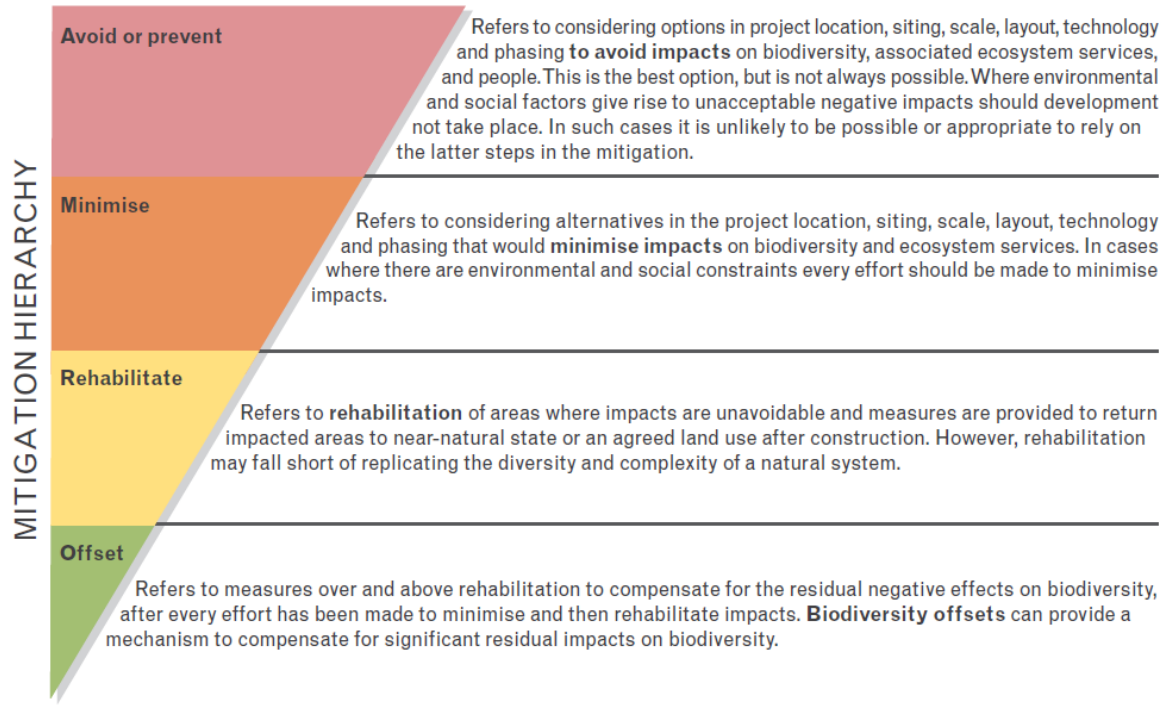

Figure 6: Offset mitigation hierarchy

The hierarchy considers the following steps:

- "Avoid or prevent" – is aimed at considering options in project location, siting, scale, layout, technology, and phasing to avoid or prevent impacts on biodiversity features and ecosystem services in the area. Where this is not possible, the "minimize" option is considered.
- "Minimize" – is aimed at considering options in project location, siting, scale, layout, technology, and phasing to reduce impacts on biodiversity features and ecosystem services in the area. Where this is inadequate, the "rehabilitate" option is considered.
- "Rehabilitate" – is aimed at providing measures to restore impacted areas to near-natural state or pre-development state. However, should rehabilitation measures fall short or be deemed to fall short of replicating the diversity and complexity of a natural system, then "offset" option is considered as a last resort.
- "Offset" – is aimed at providing measures over and above rehabilitation that will compensate for the residual effects on biodiversity after every effort has been made to minimize and rehabilitate impacts.

The matrix for assessing offset mitigation hierarchy to ensure biodiversity offset gains are achieved is presented in Figure 7. In designing and implementing the biodiversity offset for the MMSEZ, the steps highlighted in Figure 8 was followed. These steps were undertaken as part of this study or adopted from specialist studies conducted as part of the environmental authorization process.

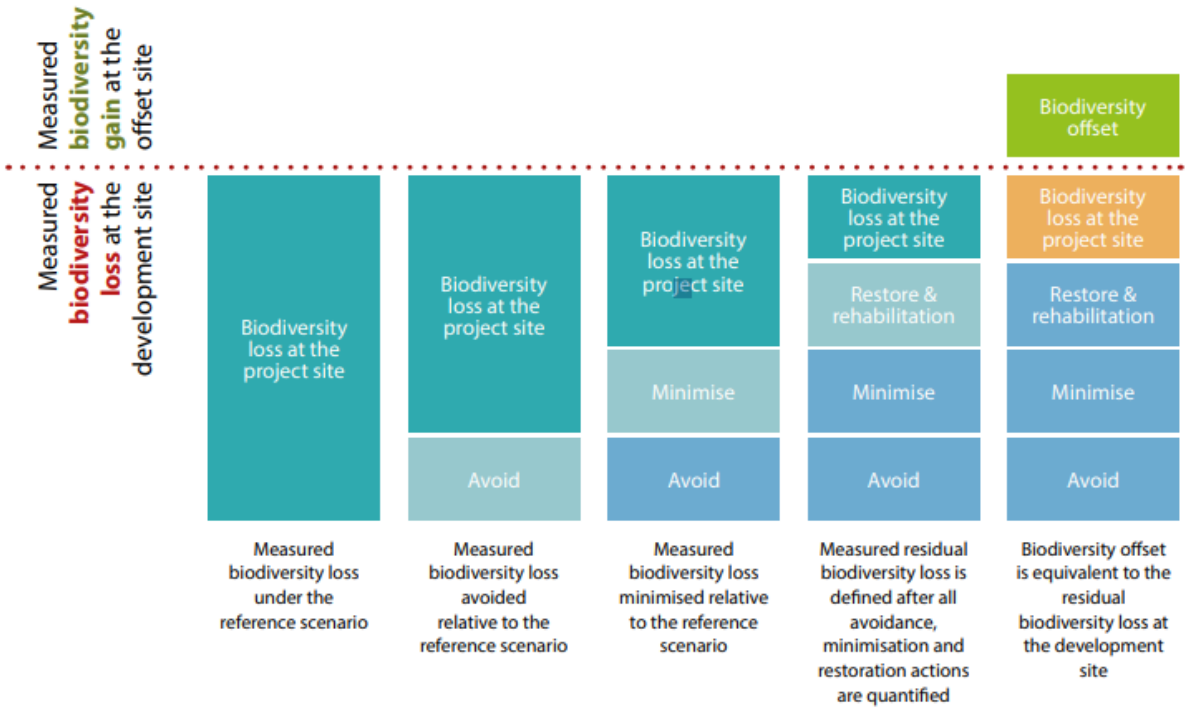

Figure 7: The mitigation hierarchy matrix for Biodiversity Offsets utilized for MMSEZ

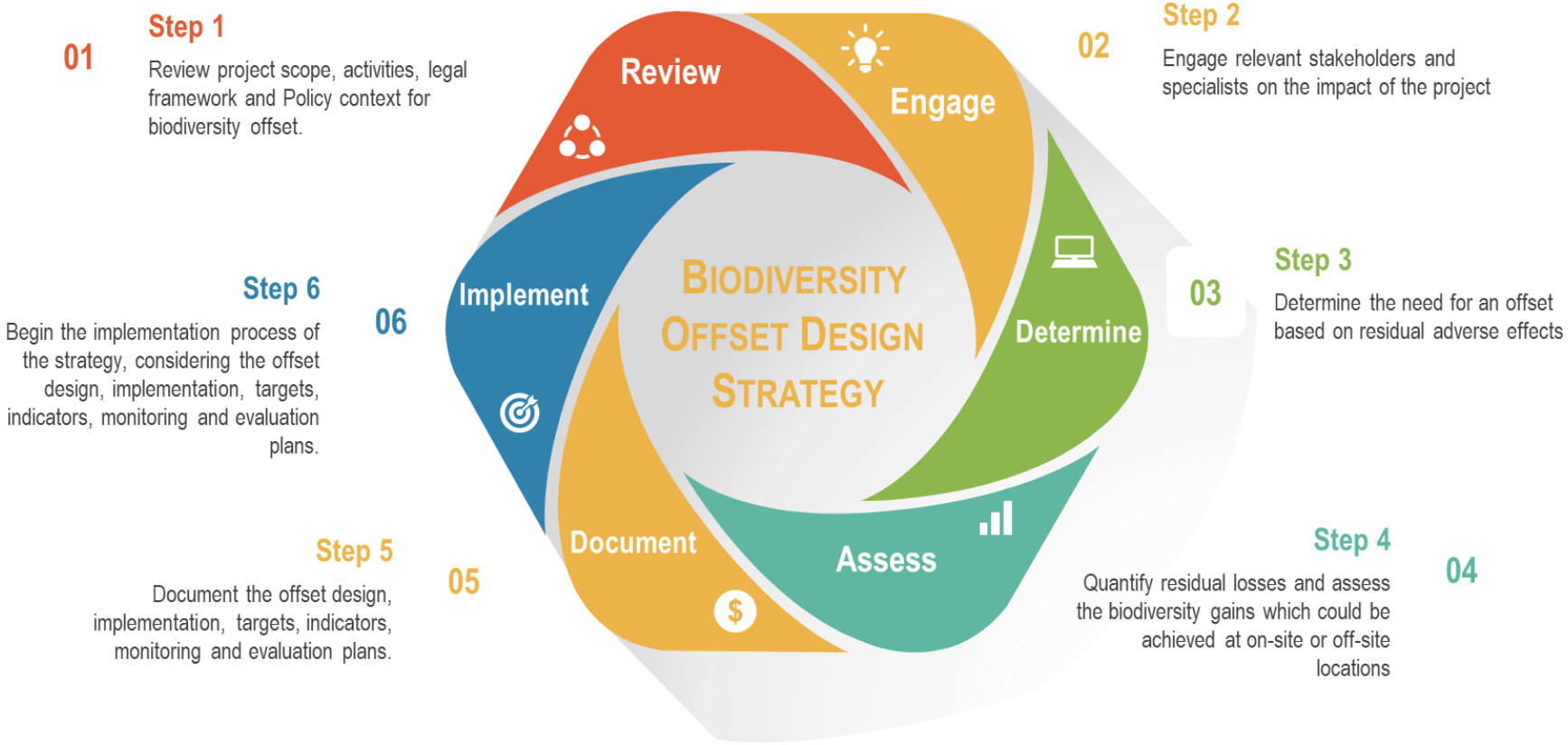

Figure 8: Steps towards developing the biodiversity offset strategy for the MMSEZ

6.2.1 FLORAL SPECIES OFFSET DESIGN

The Biodiversity Company (2020) completed a Protected Tree Survey for the Musina-Makhado Energy and Metallurgy Special Economic Zone (SEZ) Development. In the study, they identified and surveyed the presence of four protected trees in the area and quantified their occurrence. These survey and quantification formed the basis for the floral offset design.

The protected tree species identified and counted in the project area were: Adansonia digitata (Baobab), Combretum imberbe (Leadwood), Boscia albitrunca (Shepherds tree) and Sclerocarya birrea subsp. caffra (Marula). According to the National Forest Act, all these species are categorised as protected. The study utilized vehicular drive-through and walk-through surveys to transverse a total of 25 transects covering 141.7 hectares, as a prototype for the study area. Heat maps were utilised in analysing the density of the study area and quantifying the protected trees as presented in Table 2. The trees were aged using height as the subjective parameter. The age classes used were as follows:

- Juvenile: 0 – 2 m
- Sub-adult: 2.0 – 3.5 m
- Adult: > 3.5 m

Table 2: Quantified number of trees per habitat (adapted from The Biodiversity Company (2020))

Trees distribution by Habitat				
Tree species	**Limpopo Ridge Bushveld**	**Musina Mopane Bushveld**	**Riparian Area**	**Total trees**
Marula	651	54 819	405	55 875
Shepherds tree	6 949	35 307	3 445	45 700
Baobab	271	4 878	507	5 656
Leadwood	163	1 336	304	1 802
Total trees	**8 034**	**96 339**	**4 661**	**109 034**
Trees distribution by Age				
Tree species	**Total Adult**	**Total sub-adult**	**Total Juvenile**	**Total trees**
Marula	40 390	12 583	2904	55 875
Shepherds tree	36 670	6814	2216	45 700
Baobab	3142	1829	740	5 656
Leadwood	1291	1686	116	1 802
Total trees	**81 493**	**22 912**	**5 976**	**109 034**

The total number of species recorded in the area were 109 034, of which 51.3% consisted of Marula trees, 41.9% of Shepherds trees, 5.2% of Baobab and 1.65% of Leadwood trees.

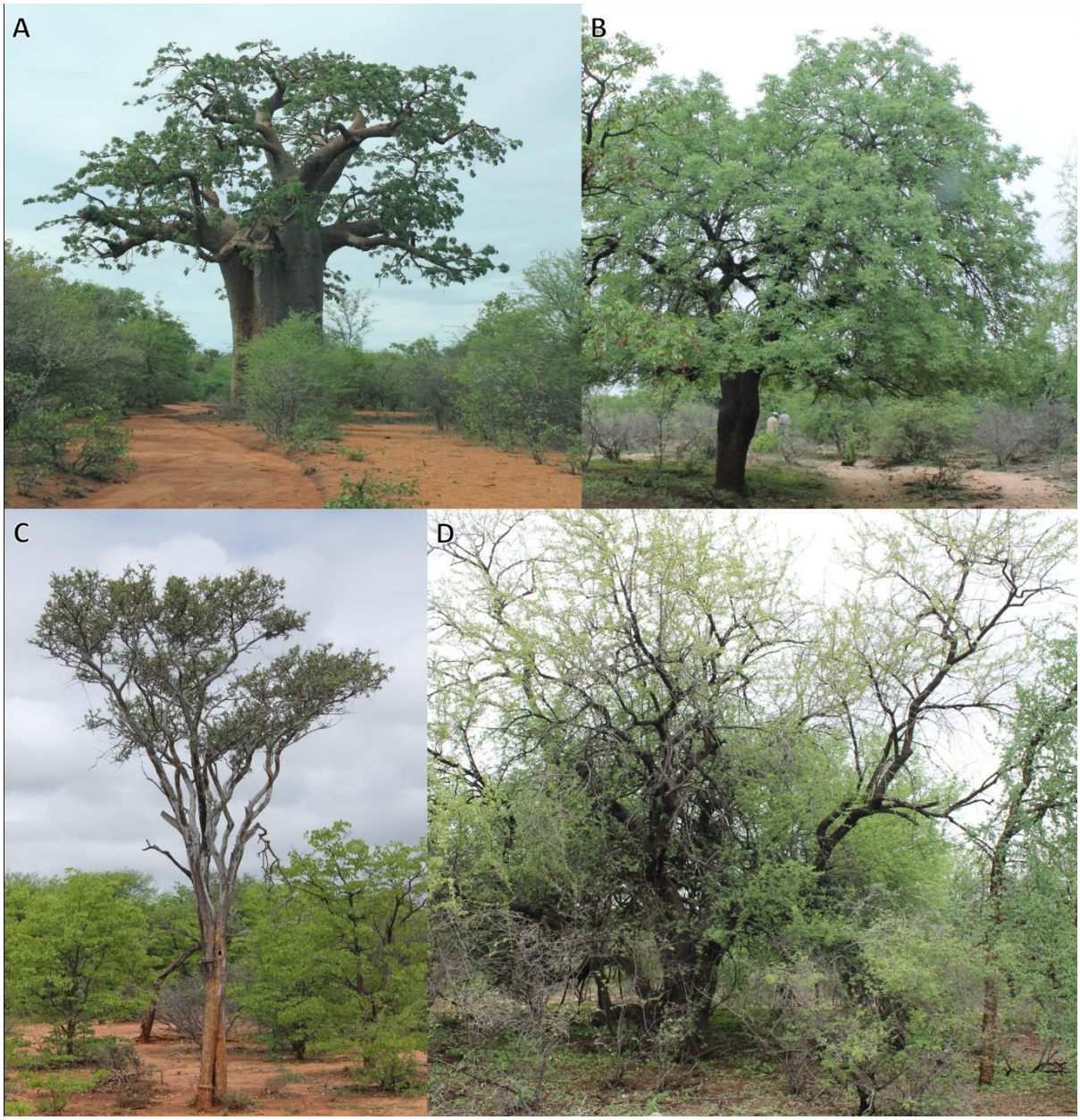

Figure 9: Example of the protected trees observed: A) *Adansonia digitata* (Baobab), *B) Sclerocarya birrea subsp. caffra* (Marula), C) *Boscia albitrunca* (Shepherds tree) and D) *Combretum imberbe* (Leadwood) – The Biodiversity Company (2020)

6.2.1.1 ADULT TREES

The International Union for Conservation of Nature (IUCN)'s version 3.1 of the redlist categories and Criteria stipulates that adult individuals of species of concern, including protected species, should be considered for conservation status assessments. According to the IUCN Criteria for Red List assessment, adult protected plants should not be disturbed. Therefore, the proposed construction and operation of MMSEZ should preserve most adult trees on the project site to continue stabilizing the population, as presented in Figure 10. The risk associated with attempting to translocating adult trees are high and the chance of survival in a new habitat is low. Long-term offset requirements were quantified based on quantified residual impacts for the proposed project activities.

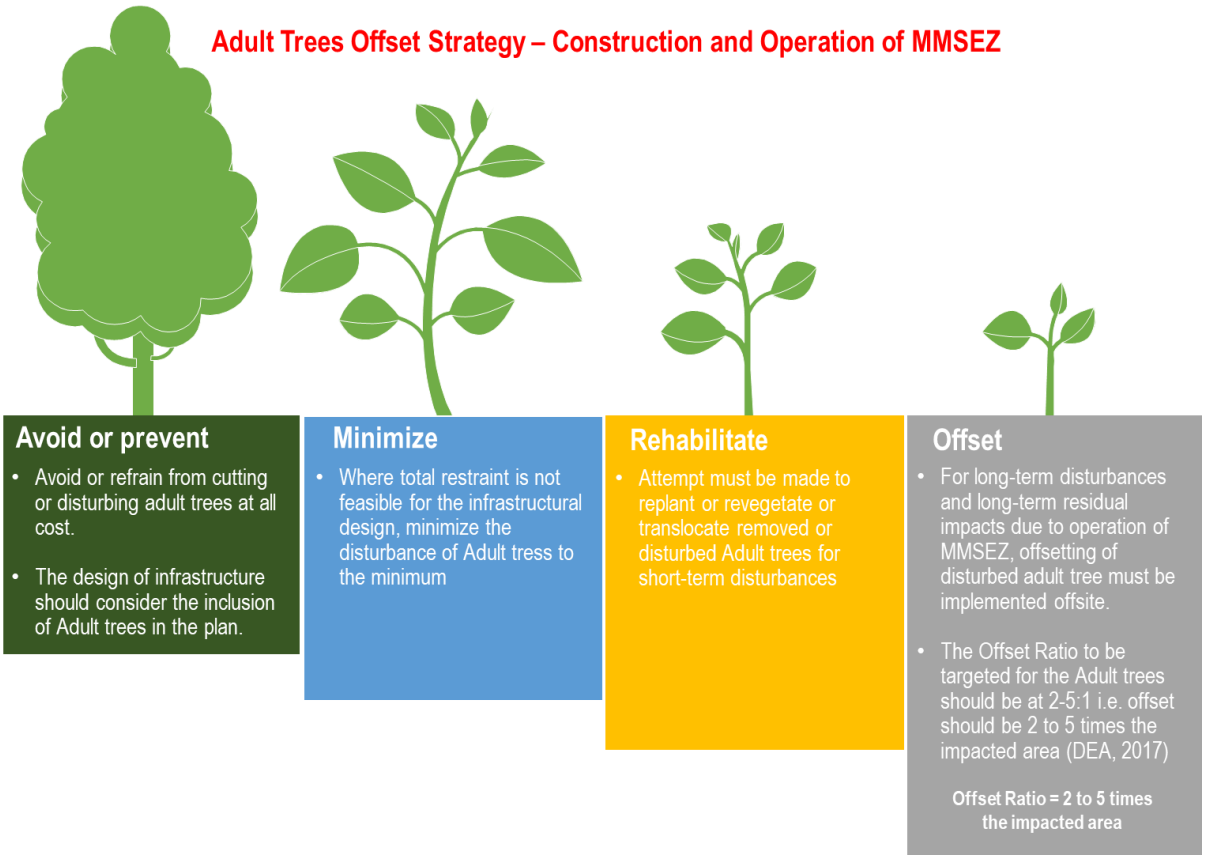

Figure 10: Adult Trees Offset Strategy – Construction and Operation of MMSEZ

6.2.1.2 SUB-ADULT AND JUVENILE TREES

The sub-adult and juvenile plant species can thrive in a new and similar habitat and the risk of translocating is little, compared to the adult trees. Therefore, the proposed construction activities should

target the disturbance of juvenile as well as sub-adult protected plant species in the area, to ensure preservation of the most adult trees onsite. The strategy is illustrated in Figure 11. Long-term offset requirements were quantified based on quantified residual impacts for the proposed project activities.

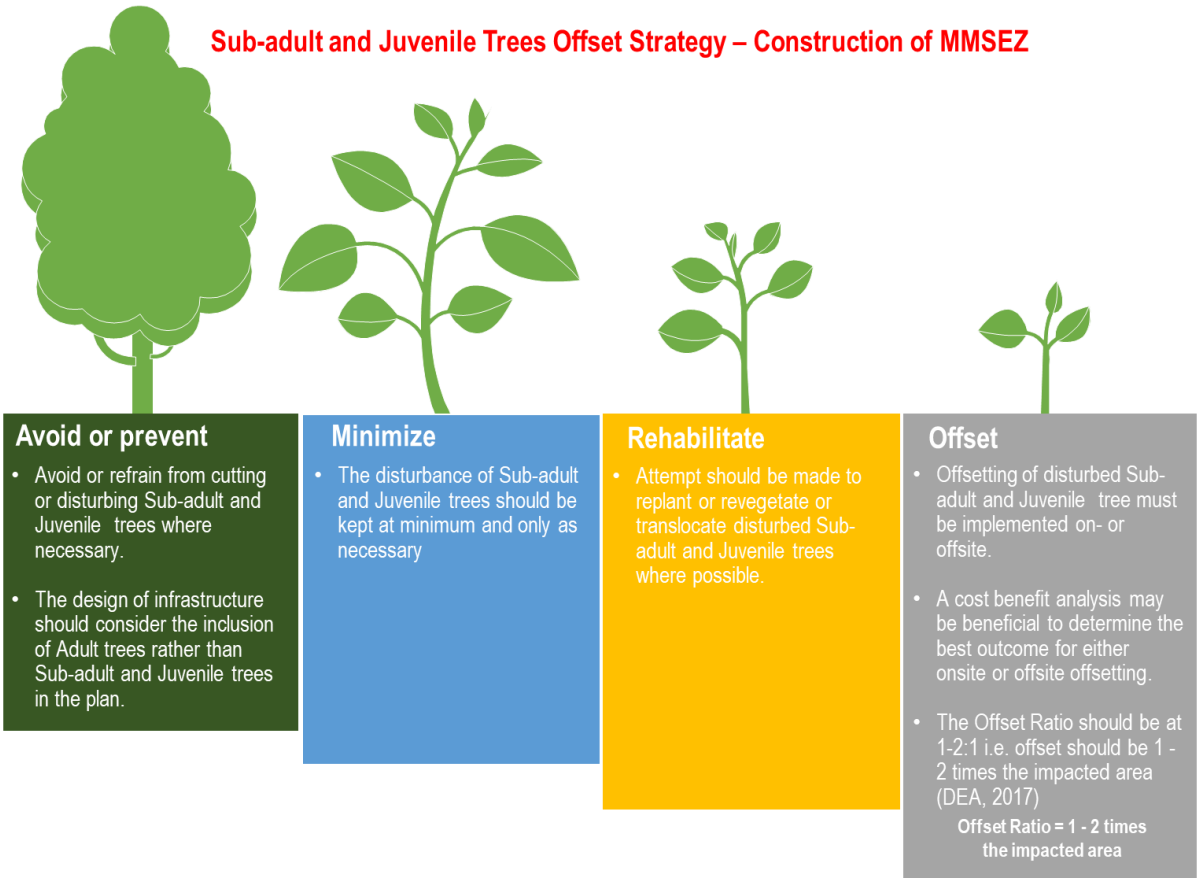

Figure 11: Sub-adult and Juvenile Trees Offset Strategy – Construction and Operation of MMSEZ

6.2.1.3 GENERAL VEGETATION

As indicated in the impact assessment conducted by Digby Wells (2019), approximately 177 ha of Limpopo Ridge Bushveld, 4422.2 ha of Musina Mopane Bushveld and 145 ha of Riparian vegetation may be permanently lost. The following offset design should be considered for large-scale vegetation lost:

- An Offset Ratio of 1 - 2:1 i.e. offset should be 1 - 2 times the impacted area (DEA, 2017).
- Hence, the offset area for large scale vegetation is quantified as:
    - 177 – 354 ha of Limpopo Ridge Bushveld to be offset for 177 ha that will be potentially lost.
    - 4422.2 – 8844.4 ha of Musina Mopane Bushveld to be offset for 4422.2 ha that will be potentially lost.

- 145 – 290 ha of Riparian vegetation to be offset for 145 ha that will be potentially lost.

Long-term offset requirements were quantified based on quantified residual impacts for the proposed project activities.

6.2.2 FAUNAL SPECIES OFFSET STRATEGY

Of the 17 mammals, 26 avifauna, 19 invertebrate and 12 herpetofauna species identified, three species were listed according to the IUCN Red List of Threatened species, as well as the Baboon spiders, which are classified as *'Commercially Threatened'*. Clearance operations and site preparation will cause permanent displacement of fauna, including SCC (Baboon Spider) that are present on site. Baboon spider can survive in a variety of habitats, such as dry scrubland, savannah woodland or grassland but prefer lightly wooded areas. Baboon spiders rarely interact with humans as they prefer staying in a natural habitat, hence, the remaining savannah woodland on site, approximately 2000 hectares, would exist to cater for the onsite conservation of the species.

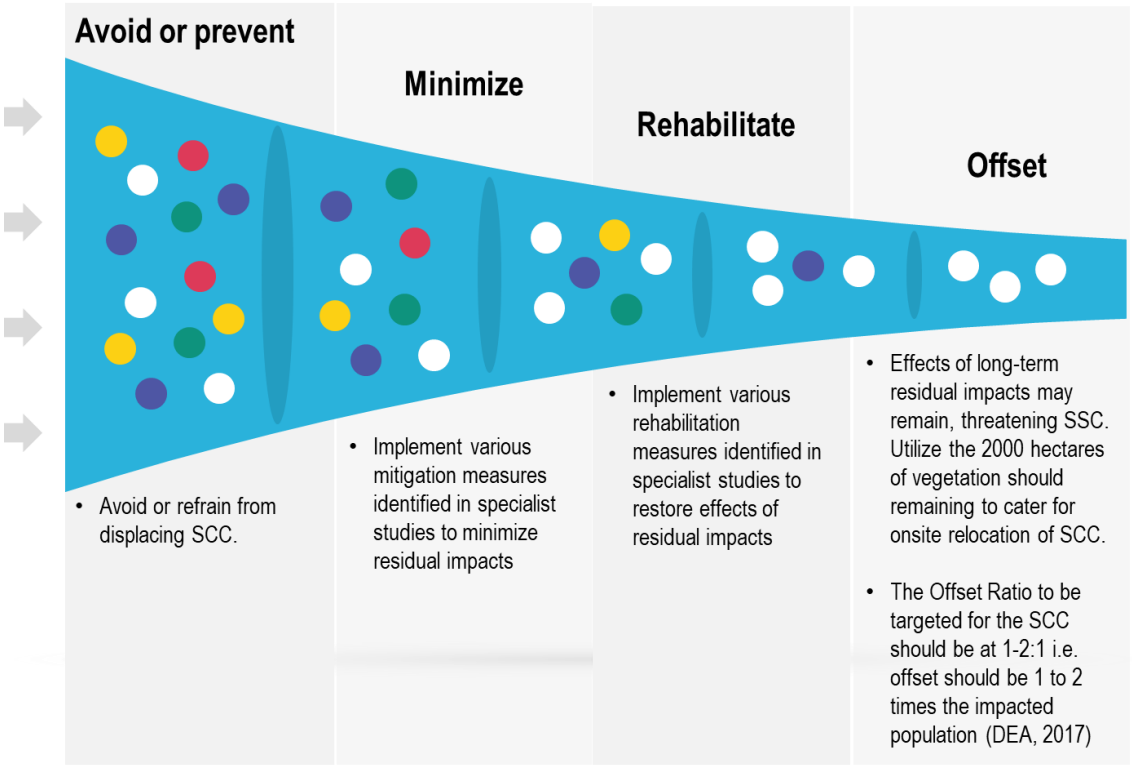

Figure 12: Faunal Species Offset Strategy – Species of Special conservation concern (SCC)

6.2.3 OFFSET DESIGN FOR WETLANDS

The Digby Wells Fresh Water Impact Report (2019) identified a total of 17 pans, covering a total area of 1.3 hectares; extensive network of drainage lines, covering approximately 296.21 ha; and artificial impoundments amounting to a total area of 6.23 ha. This equates to 303.74 hectares that is sought to be covered with water. The pans on the farm portion ANTROBUS 566 – East of N1 was categorised as Category A (Natural) displayed no visible impacts while the remainder of pans have a Present Ecological Status (PES) of B. All of these pans have an Ecological sensitivity and importance recorded as high and as such these pans need to be conserved as indicated in Figure 13. Long-term offset requirements were quantified based on quantified residual impacts for the proposed project activities.

Conservation will not be required for wetlands that are manmade (artificial impoundments) features where it can be demonstrated to the satisfaction of Competent Authority, that the wetland or feature does not provide any of the following features or functions:

- A significant groundwater hydrologic linkage to an adjacent key hydrologic or protected feature
- A significant component of or ecological linkage to an adjacent key natural wetland feature
- A significant surface water hydrologic linkage (permanent or intermittent surface water connection) between the wetland and an adjacent key hydrologic or protected feature.

It will be ideal to avoid these areas due to their sensitivity and ensure that there is a linkage between these wetland and other sensitive features on site.

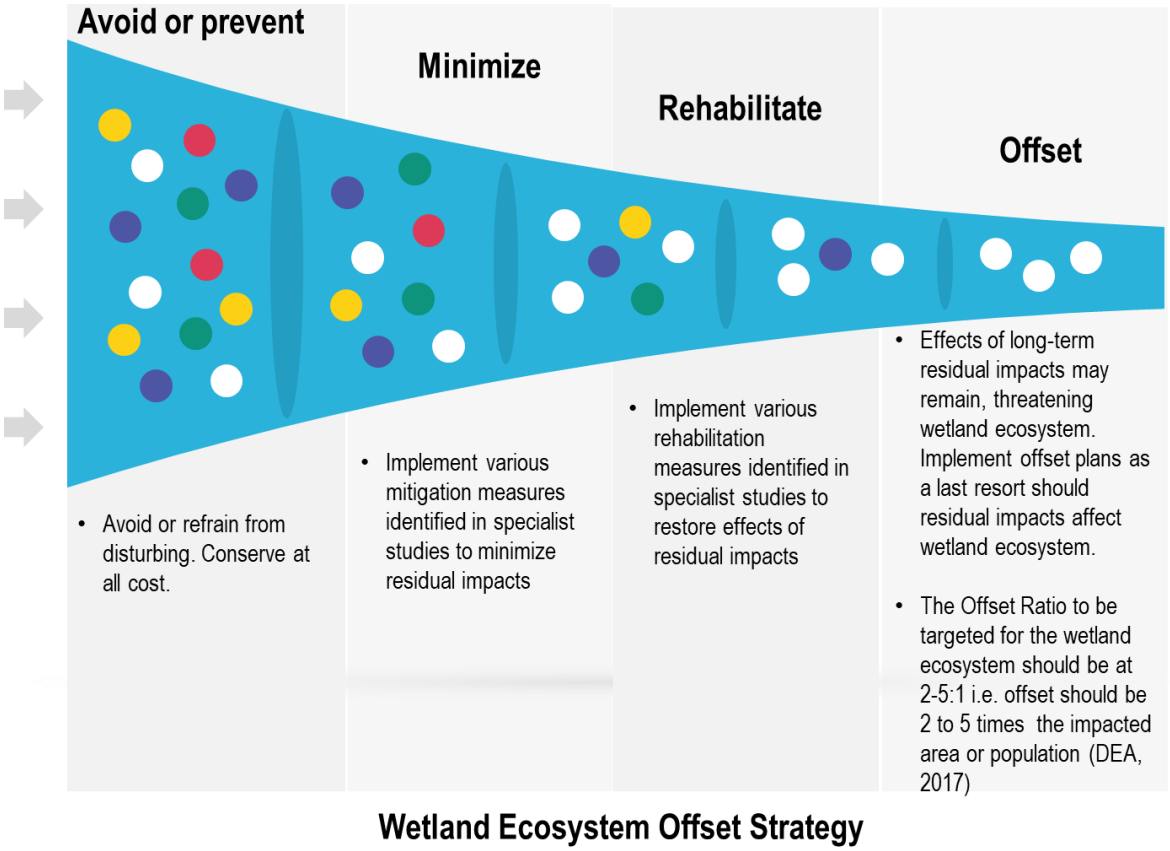

Figure 13: Wetland Ecosystem Offset Strategy

6.3 OFFSET IMPLEMENTATION

The plan of action to follow in implementing the MMSEZ biodiversity offset, which the Strategy consider, is presented in Figure 14.

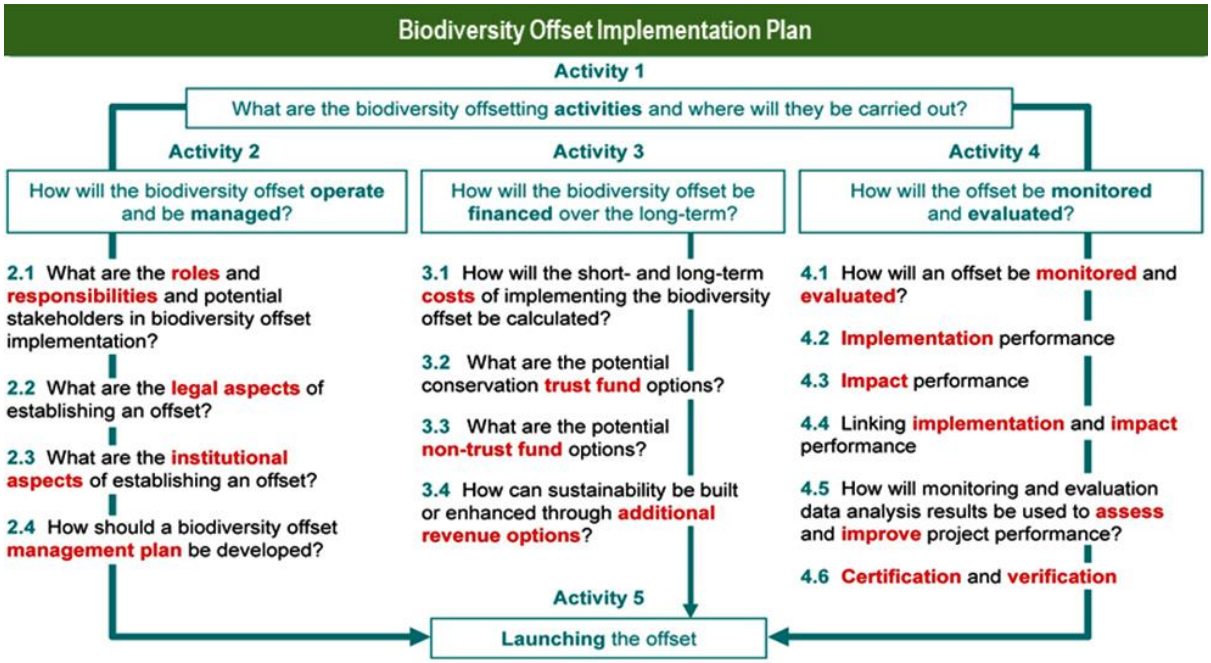

Figure 14: Offset implementation plan

6.3.1 OFFSET MANAGEMENT, MONITORING, AND INSTITUTIONAL ARRANGEMENT

It is the duty of LEDA and the management of MMSEZ to establish and commission an offset management team or committee to oversee the implementation of the offset strategy. All aspects of the offset implementation, including offset risk assessment, offset funding, offset monitoring, and evaluation will be undertaken by the offset management team or committee. A requirement for submission of quarterly or annual offset report as required by LEDA and the management of MMSEZ must be instituted.

Effective monitoring requires quarterly or annual performance reports on the implementation of the set targets and objectives. These performance reports must include the extent to which the target or plan has been implemented during the period, new initiatives and protocols undertaken during the reporting period, gaps and challenges encountered during the reporting period.

6.3.2 IDENTIFICATION OF POTENTIAL OFFSET AREAS

The choice of offset area and activity will be constrained by land and resource availability. In identifying potential offset areas for the MMSEZ, the following must be considered:

- **Onsite –** According to the Biodiversity Company (2020) and Digby Wells (2019), a portion (~2000 ha) of the MMSEZ on site vegetation would not be disturbed. This leaves ample vegetation to implement a portion of the offset or achieve conservation onsite, (especially for biodiversity features that are rarely affected by residual impacts). This is also a cost-effective approach as the cost of purchase or rental is removed.
- **Nearby or adjoining areas or farmlands –** In order to follow a 'like for like' approach in determining suitable locations for potential biodiversity offset areas, the identification of areas in proximity of the MMSEZ site with similar biodiversity pattern and ecological process components must be considered.
- **Areas of high conservation priority –** Areas of high conservation priority may be considered for offsetting activities should "like for like" outcome be achievable.
    - Vhembe Biosphere Reserve
    - The Soutpansberg
    - The Mapungubwe National Park
    - The Blouberg Range.
    - The Makgabeng Plateau.
    - The Makuleke Wetlands.

AT THE TIME OF COMPILING THIS STRATEGY, AN ONGOING EXERCISE TO IDENTIFY SUITABLE BIODIVERSITY OFFSET AREAS IN THE REGION WAS ONGOING. THIS STRATEGY WILL BE UPDATED ACCORDINGLY

6.3.2.1 OFFSET SITE SELECTION MUST INCLUDE CONSIDERATION OF ECOSYSTEM FUNCTION

Ecosystem functions are the range of functions that result from ecosystem processes and benefit life, such as supporting food chains and providing refuge and nursery grounds for species. These functions include the ecosystem services on which human lives, livelihoods and wellbeing depend, such as clean water supply, pollination, and spiritual inspiration. Just because an area is the right size and habitat does

not mean it will perform the right function in the landscape. Offset site selection must include consideration of functionality (FFI International, 2015).

6.3.2.2 OFFSET SITE SELECTION MUST CONSIDER EXTERNAL THREATS AND THE POTENTIAL TO ADDRESS

In a number of cases the selection of an offset site has not taken into account wider spatial or development planning, and the effects that third party or external impacts would have on the offset site and on the adequacy of financial provision for its management. For example, where adjacent land uses have been earmarked for e.g. commercial forestry, settlement, or agricultural expansion, the costs of effective management (burning regime, invasive alien species removal, control of poaching) may increase significantly over time. Local population growth, which is almost inevitable where a major extractive operation is established, must also be factored into offsets planning – whether averted loss or restoration offsets – because of the pressure that population growth will place on the ecological integrity of offset sites (FFI International, 2015).

6.3.3 OFFSETS RISK MANAGEMENT PLANS

Offsets risk management plans must include the identification of assumptions and risks associated with the inherent activities and outputs and evaluating how various activities will achieve the outcomes and whether the outcomes are sufficient to meet the objectives. Offset evaluation must make provision for risks such as fire, or storm damage that are beyond human control and may affect the compliance with contractual commitments.

Offsets risk management plans and mitigation actions may comprise a system model, including risk assessment (e.g. what are some of the key implementation issues and concerns; what is the likelihood that these would arise?): Once a common purpose and goals have been defined, adaptive management requires information to be gathered and analysed on project area, how various project components should be managed, anticipated project risks and measures that could be taken to avoid and mitigate them. The analysis would also consider the socioeconomic, cultural, and political variables which will determine the success of a project. Given the often complex and unpredictable contexts of many conservation projects, it is important to anticipate potential risks (ecological, socioeconomic, and political) and plot potential courses of action to mitigate or avoid them from adversely affecting project implementation.

6.3.4 OFFSETS FUNDING MODEL

The funding model for the MMSEZ offset is based on the strategy costing. An ongoing exercise to determine where the financial resources to meet these costs will come from, and how they will be managed. The assessment of revenue options represents a key step in the implementation of offset. The following long-term financing options is being considered by MMSEZ:

- Creating a fund that can be designed to provide consistent funding over a specific time to implement offset management activities.
- Using standard annual project financing.
- Using combination of both approaches etc.

6.4 ASSUMPTIONS, LIMITATIONS AND GAPS IN INFORMATION

The assumptions, limitations, and gaps in information should be noted regarding the study:

- Significant aspects of the information regarding the study will be sourced from technical reports and specialist assessment conducted by third-party in 2019 and 2020. While every effort was made to verify the information obtained, it is however assumed that all information and data obtained from third-party specialist are valid (citations of sourced information and data are adequately provided).
- Data deficiency on accurate population numbers of certain species are noted and therefore provides an uncertainty in determining the actual biodiversity metrics for specific species o\r features.
- A direct extrapolation from the surveyed area to the entire site was made when quantifying population count for floral and fauna species. The gap in data provides an uncertainty in determining the actual population count for flora and fauna species.

6.5 CONCLUSION

The biodiversity offset strategy for the MMSEZ is based on the ecosystem approach to biodiversity management. This approach promotes the integrated management of land, water, and natural capital to achieve optimal conservation and sustainable use of biodiversity. It is aimed at strengthening co-operation between the three parties towards the conservation and sustainable development of the MMSEZ Site. It is also aimed at maintaining the integrity of the site and ensuring that the negative impacts of development are avoided, minimised, or remedied in the pursuit of sustainable development.

The strategy provided offset design hierarchies for protected tree species, Faunal species, as well as for wetland ecosystems.

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8 DETAILS OF THE AUTHORS

Biodiversity, Environmental and Strategy Team			
Name	**Qualifications**	**Experience**	**Skills**
Mpho Ramalivhana	Over 10 years' experience • BSc Hons Botany (Plant Ecology • BSc., Ecology and Microbiology • Pr.Sci.Nat (SACNASP)	Mpho has extensive experience in conducting biodiversity studies, ecological assessments, environmental impact assessment, environmental management plans, environmental audit, environmental due diligence, land quality assessment, environmental site assessment, environmental compliance monitoring, bio-monitoring of water resources and implementation of environmental monitoring systems. Mpho has worked with the South African National Biodiversity Institute and Limpopo Department of Economic, Environment and Tourism where his professional working career started. Mpho is a member of the South African Council of Natural Scientific, Profession and South African Association of Botanists	• Biodiversity studies • Ecological assessments • Environmental impact assessment • Environmental management plans • Environmental audit • Biomonitoring • Environmental monitoring systems
Dr Ola Akinshipe	11 years' experience • PhD Chemical Technology (Pretoria)	Ola is an experienced in environmental, climate change and strategic environmental specialist with projects cutting across various industries in South Africa, and beyond. These projects cut across various public and private	• Environmental assessments • Strategy development • Implementation plan, monitoring and evaluation

	• MSc Environmental Technology (Pretoria) • BSc Hons. Environmental Technology • Pr.Sci.Nat (SACNASP)	institutions, including mining and ore handling, metal recovery, power generation, exploration, chemical/metallurgical, construction, clay brick, transport, processing, waste management and recycling. His typical projects include baseline assessments, impact assessments, health risk screening, management planning, climate change assessment. Ola has also worked on specialized environmental projects involving strategy development, baseline, and feasibility studies, country-wide chemical inventory, environmental and waste management strategies	• Baseline assessments • Feasibility and research studies • Impact assessments • Health and environmental risk screening • Management planning • Greenhouse gas and climate change assessment