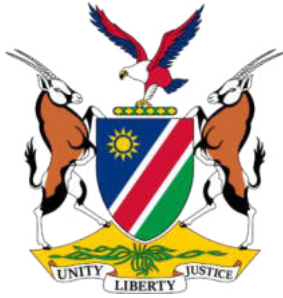


BASELINE REPORT FOR: THE BIODIVERSITY ECONOMY IN SELECTED LANDSCAPES IN NAMIBIA PROJECT

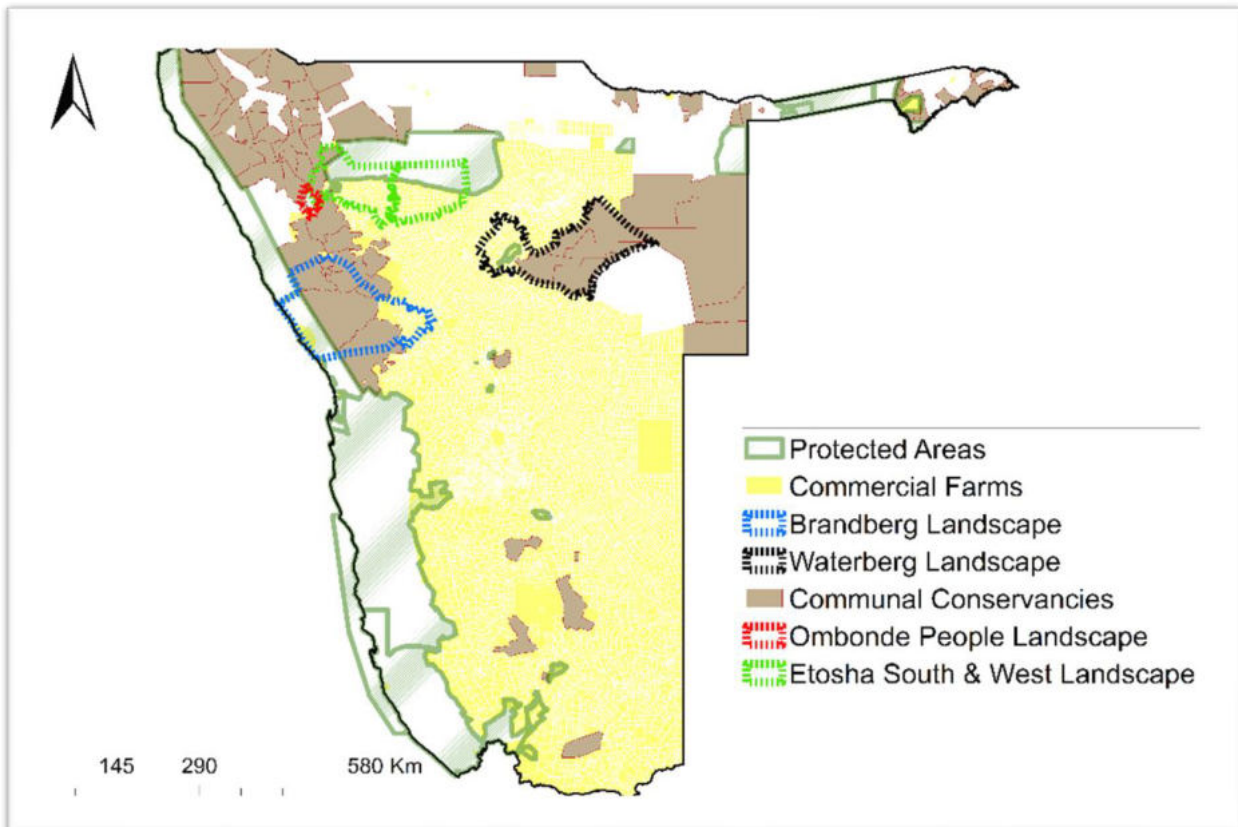


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für Internationale
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 Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

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NAMIBIA
UNIVERSITY
OF SCIENCE AND
TECHNOLOGY



Biodiversity Research Centre

EXECUTIVE SUMMARY

The “Biodiversity Economy in selected Landscapes” (Biodiversity Economy project), in cooperation with the Namibian Ministry of Environment Forestry and Tourism (MEFT), aims to develop the biodiversity economy at landscape level in Namibia. Previous projects such as Strengthening Protected Areas Network (SPAN) and Namibia Protected Areas Landscape Conservation Areas Initiative (NAMPLACE) fostered cooperation and collaborative conservation between different conservation areas, particularly in communal areas adjacent to parks. With National Parks as anchor points, it will look to identify potential enterprises and livelihoods and support increased benefits from these. The project also aims to support building capacity and research in the biodiversity economy through an increased focus on valuing ecosystem services within landscapes and realizing their true value.

Through extensive engagement of stakeholders throughout Namibia during the preceding GIZ funded Resource Mobilisation for Biodiversity Conservation in Namibia (ResMob) project the baseline situation for the Biodiversity Economy in Selected Landscapes (this project) was already identified, but not formally assessed. Four key landscapes form part of the project, and they formed the basis of this assessment. They are:

- i) The Etosha West and South Landscape;
- ii) The Ombonde People’s Landscape;
- iii) The Waterberg Landscape; and
- iv) The Geopark/Brandberg Landscape, as the core of Namibia’s bid to establish a World Heritage Geopark.

Significant disruption caused by the Covid-19 pandemic made it virtually impossible to do this formal baseline assessment before the project was initiated. In fact, the Project is lauded for starting implementation during Covid-19 under difficult circumstances. This was necessary as protected areas and the wildlife tourism sector was particularly harshly affected by a crash in their revenues, therefore support of the Biodiversity Economy project was helpful and appreciated. Notwithstanding, this report considered retrospectively the baseline environment in the selected landscapes and addresses steps one to five of the standard Monitoring and Evaluation (M&E) process.

The focus of this assessment was on developing indicators for the GIZ Biodiversity Economy in Selected Landscapes in Namibia Project. An understanding of the current state of biodiversity and ecosystem services needs to be established to fully identify potential biodiversity threats and opportunities in the selected landscapes. Previous reviews revealed that data availability and, probably even more important, data accessibility, together with the involvement of stakeholder are critical steps in developing baselines for biodiversity indicators. The methodology used in developing this baseline is consistent with key models and concepts, international best practice, lesson learned and key success factors from existing methods for collecting baseline data.

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1. INTRODUCTION

1.1 Description of the project

Around 44% of Namibia's surface area has wildlife or related biodiversity protection and use as a primary land-use. National parks have always been the flagship conservation and tourism areas, but communal conservancies and freehold game farmers have increasingly been including wildlife and eco-tourism revenues as part of their livelihoods.

The "Biodiversity Economy in selected Landscapes" (Biodiversity Economy project), in cooperation with the Namibian Ministry of Environment, Forestry and Tourism (MEFT), aims to develop the biodiversity economy at landscape level in Namibia. Previous projects such as Strengthening Protected Areas Network (SPAN) and Namibia Protected Areas Landscape Conservation Areas Initiative (NAMPLACE) fostered cooperation and collaborative conservation between different conservation areas, particularly in communal areas adjacent to parks. The Biodiversity Economy in Landscapes project aims to build on this and particularly focuses on the biodiversity economy in these areas, looking to identify potential enterprises and livelihoods and support increased benefits from these. The project also aims to support building capacity and research in the biodiversity economy through an increased focus on valuing ecosystem services within landscapes and realizing their true value.

From the Project Proposal: "The biodiversity economy builds upon sectors such as tourism that depend directly on biodiversity for their core business or that contribute directly to the conservation of biodiversity. The national parks together with the adjacent communal conservancies, private reserves and farmland form unique sceneries. The project will transform these sceneries in effectively managed landscapes. Key players in the landscapes will cooperate towards joint conservation objectives to boost the biodiversity economy, including integrated management planning, promoting eco-entrepreneurs and landscape branding. At national level, the project will mainstream the biodiversity economy approach, mobilize financial resources and upscale the concept by including other relevant sectors through supporting biodiversity-friendly business practices and greening value chains." The project outputs and intended outcomes are captured in Figures 1 and 2 below.

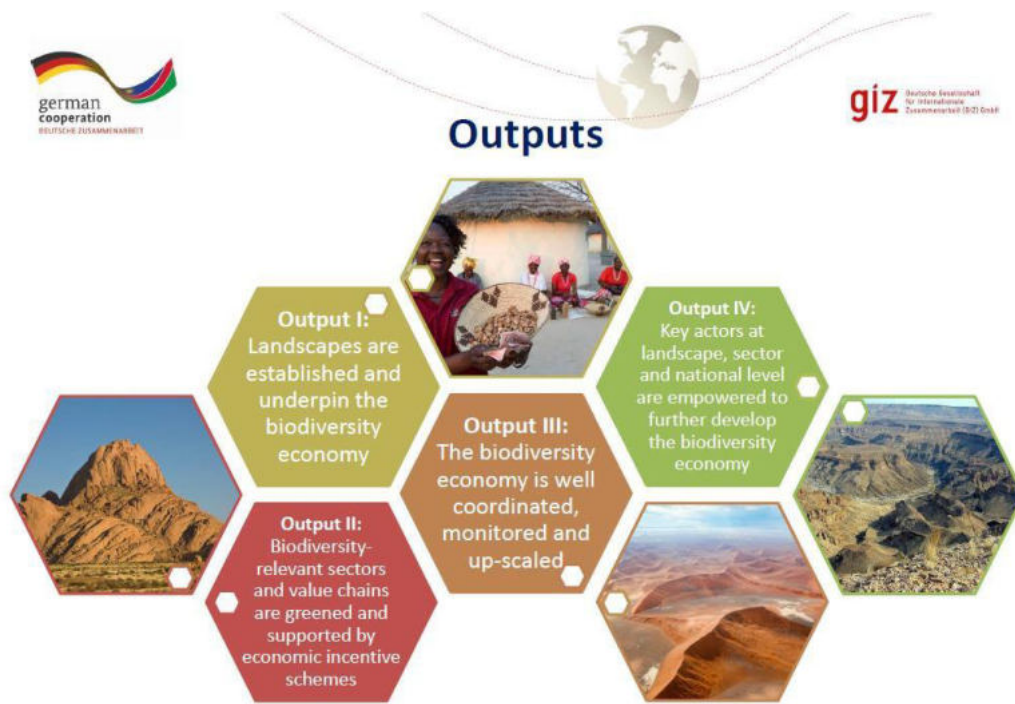


Figure 1: Schematic representation of the project outputs.

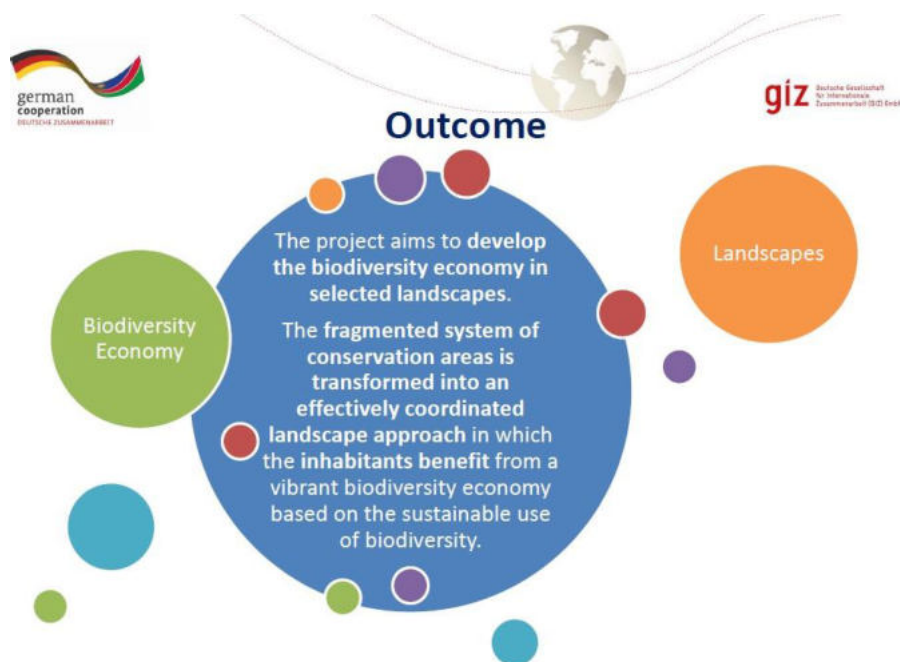


Figure 2: Schematic representation of the project's intended outcomes.

1.2 Purpose of this baseline report

Through extensive engagement of stakeholders throughout Namibia during the preceding GIZ funded Resource Mobilisation for Biodiversity Conservation in Namibia (ResMob) project the baseline situation for the Biodiversity Economy in Selected Landscapes (this project) was already identified, but not formally assessed. Significant disruption caused by the Covid-19 pandemic made it virtually impossible to do this formal baseline assessment before the project was initiated. In fact, the Project is lauded for starting implementation during Covid-19 under difficult circumstances. This was necessary as protected areas and the wildlife tourism sector was particularly harshly affected by a crash in their revenues, therefore support of the Biodiversity Economy project was helpful and appreciated. Notwithstanding, this report considered retrospectively the baseline environment in the selected landscapes and addresses steps one to five of the standard Monitoring and Evaluation (M&E) process (Figure 3).

2. METHODOLOGY

2.1 Flexible approach accounting for Covid-19 limitations

A normal linear methodology is provided in Figure 3 below, with this assessment being steps three and four of the diagram. Disruptions caused by responses to curb the Covid-19 pandemic resulted in an unusual methodology to develop, implement and monitor the Biodiversity economy in Selected Landscapes Project. This was unavoidable under the circumstances and showed flexibility and innovation by the project to ensure landscape benefits could still be realised. The baseline assessment was therefore conducted in parallel to implementation of the project. Despite this, preliminary baseline conditions and indicators were considered in the planning of the project and the project proposal. There were merely expanded on and fleshed out in more detail



Figure 3: Steps in the development of results-based monitoring and evaluation (source: World Bank 2004).

The focus of this assessment was on developing indicators for the GIZ Biodiversity Economy in Selected Landscapes in Namibia Project. An understanding of the current state of biodiversity and ecosystem services needs to be established to fully identify potential biodiversity threats and opportunities in the selected landscapes. Previous reviews revealed that data availability and, probably even more important, data accessibility, together with the involvement of stakeholder are critical steps in developing baselines for biodiversity indicators (Rochette et al., 2019). The methodology used in developing this baseline (Figure 4) is consistent with key models and concepts, international best practice, lesson learned and key success factors from existing methods for collecting baseline data (Figure 3).

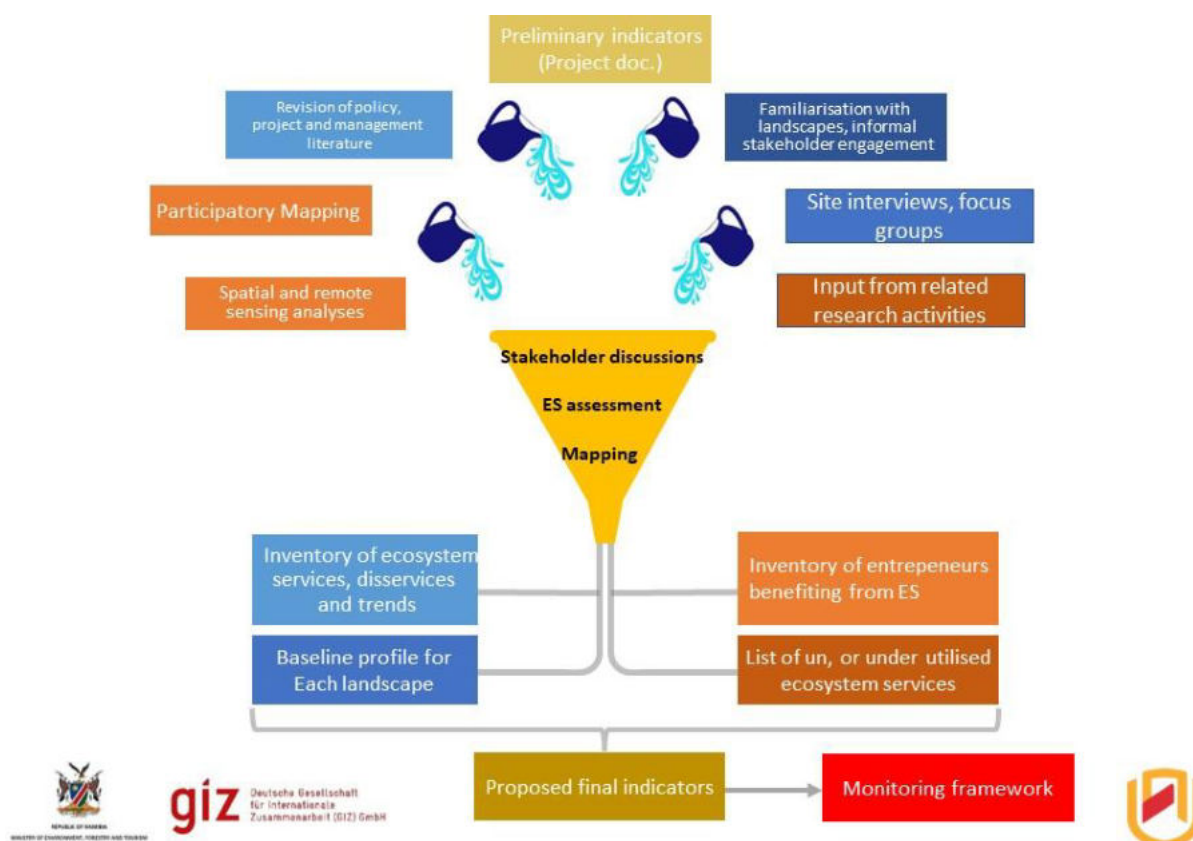


Figure 4: Methodology of the baseline assessment.

2.2 Assumptions and limitations

As previously stated, this assessment was conducted in parallel to the implementation of the project. It did however attempt to assess conditions prior to implementation. The extensive interaction between the project and landscape stakeholders was taken advantage of to develop this assessment, and already indicated that many stakeholders were excited about the positive impact the project is having and would have in future.

It is impossible to list in detail all beneficiaries and potential beneficiaries of biological resources within the selected landscapes. This assessment therefore took a sample of these based on the availability of stakeholders at meetings within each landscape during the assessment period and the routes taken on site visits. These routes were however carefully selected based on the availability of high-value ecosystem services, and areas purported to have specific opportunities for maximum impact by the project.

3. BASELINE PROFILES

An important component of the baseline assessment is an understanding of the physical and biological profiles of each landscape. This assessment identified that the selected landscapes do not have fixed boundaries, and that during project implementation, it is suggested that the boundaries remain dynamic, since ecological flows and stakeholder cooperation will always be in flux. Despite this, the initial guideline boundaries are used below.

3.1 Etosha West and South Landscape

3.1.1 Geography

The Etosha West and South Landscape covers an area of over 25 000 km² with Etosha National Park as an anchor point. The landscape is the largest of those proposed in the project. It also contains the most diverse set of management and land-use types. In addition to the National Park, these are a tourism concession (Hobatere), two private nature reserves, communal conservancies, communal non-conservancy farmland, commercial cattle and game farms, and resettlement farms.

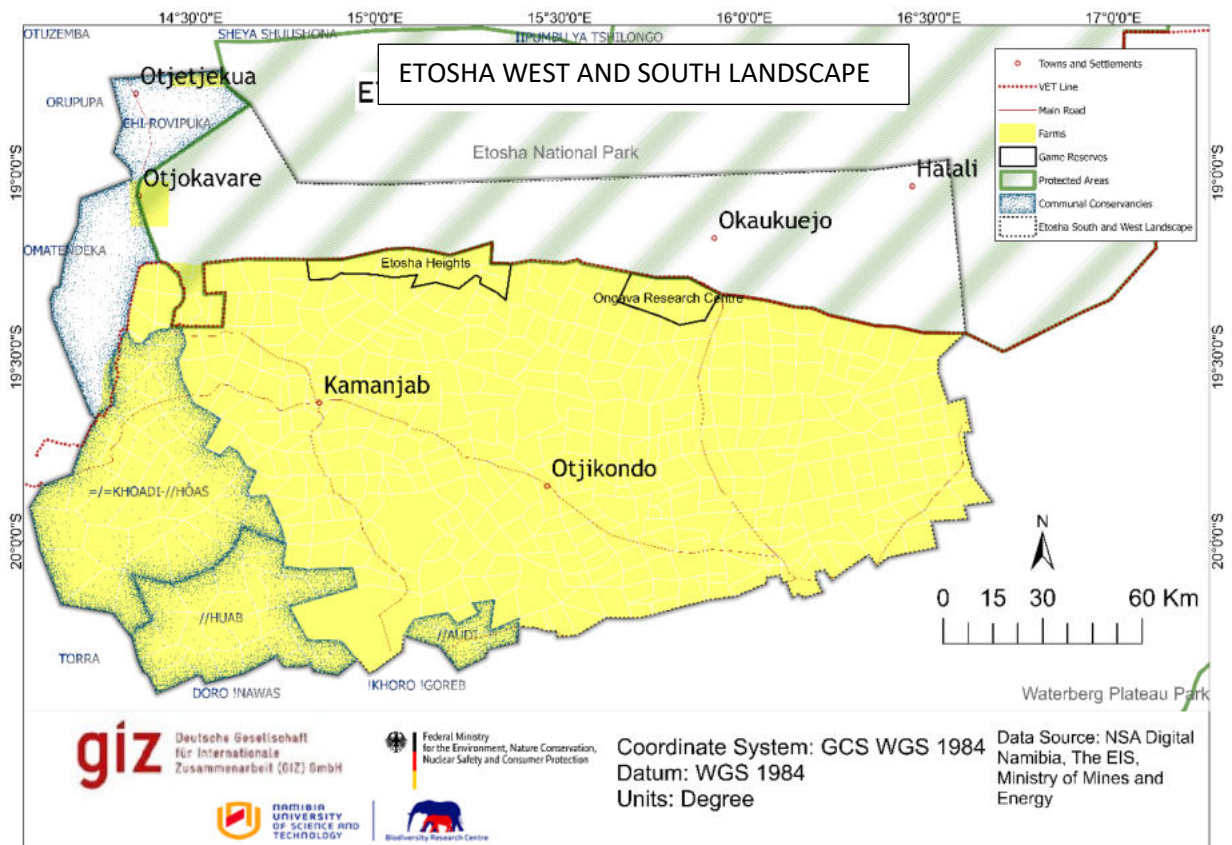


Figure 5: Overview of the Etosha West and South Landscape. Boundaries are fluid and merely an indication of the possible landscape extent.

3.1.2 Climate

The area is characterized by an arid climate with hot summers and cold winters. It receives rainfall ranging between 100mm and 450 mm increasing from southwest to northeast of the landscape. The annual temperature in the landscape also increases with annual rainfall ranging between 19 and 22 degrees, with the lowest temperature observed in the southwest of the landscape compared to the northern part. The hottest month in the landscape is February, which is mostly over 30 degrees Celsius

while the coldest month is July which can be as low as 6 degrees. The landscape is potentially already showing negative impacts of climate change including but not limited to declining rainfall, extreme temperatures, and degrading rangelands.

3.1.3 Geology

The landscape is characterized by flat plains on the northern side and mountains on the southwest. There are several ephemeral drainage lines on the southern part of the landscape, including the Huab, Aba-Huab, and Ombonde rivers. The landscape is underlain by Kalahari surficial deposits that comprise of unconsolidated to semi-consolidated sand, calcrete and gravel rock types covering the Etosha plains on the north and east of the landscape. It also has metamorphic rocks including granite, quartzite, gneiss, and andesitic forming mountains found on the west and south of the landscape. The middle of the landscape is comprised of rocks deposited from the Mulden and Otavi groups including dolomite, limestone, shale, phyllite, quartzite, and schist. This diverse geology in the west results in diverse vegetation and reptile types, with much of this biodiversity underexplored to date.

The landscape is dominated by rock outcrops, litric Leptosol, ferrallic Aeronosol, and mollic Leptosol soil type. Crop cultivation is highly influenced by the soil type and its water holding capacity. Leptosols are coarse-grained soil underlain by continuous rocks and therefore have low water holding capacity and thus the vegetation in this area is prone to drought. Aeronosols are sandy grained consisting of sandy and silt soil type which allows for water to drain through the soil fast and therefore leaving less water for the vegetation found in the area. This in addition to low rainfall explains why the landscape has low crop cultivation suitability.

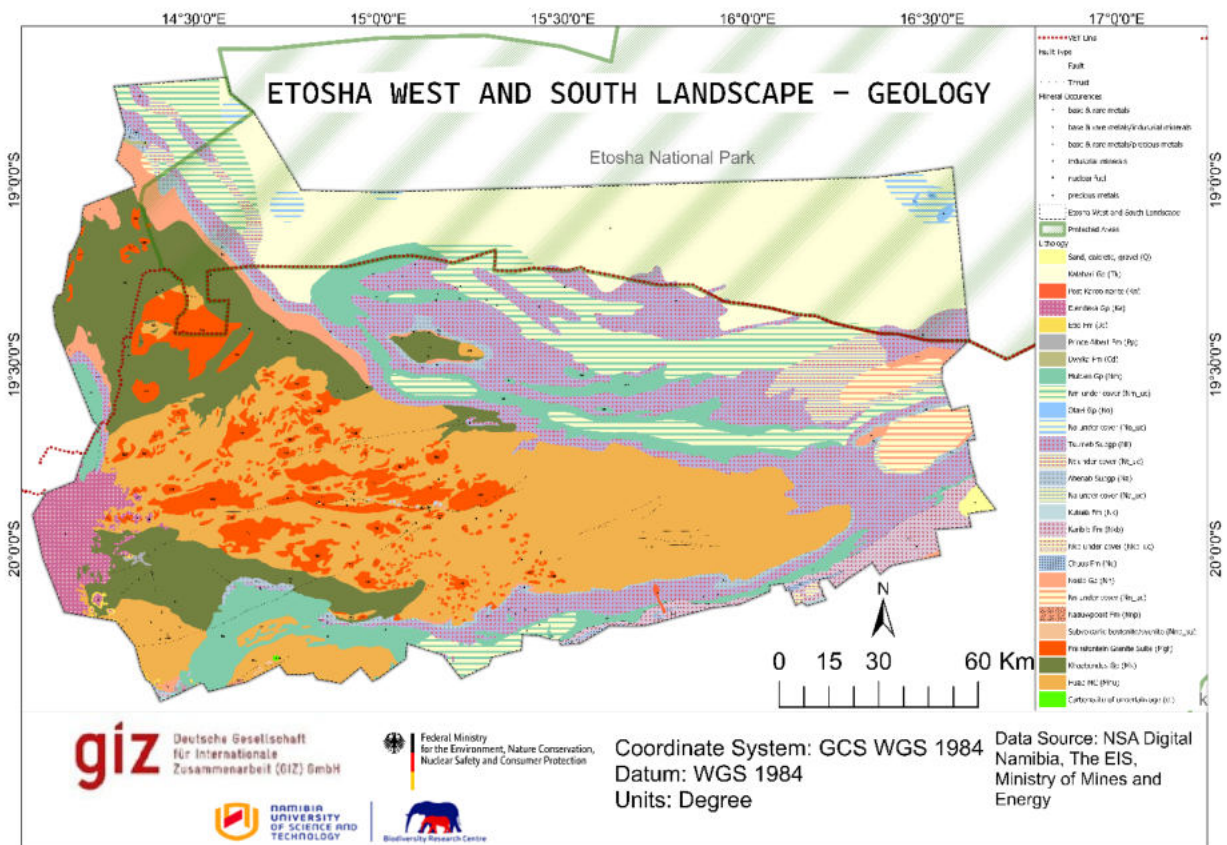


Figure 6: Geology of the Etosha West and South Landscape.

3.1.4 Distribution of people

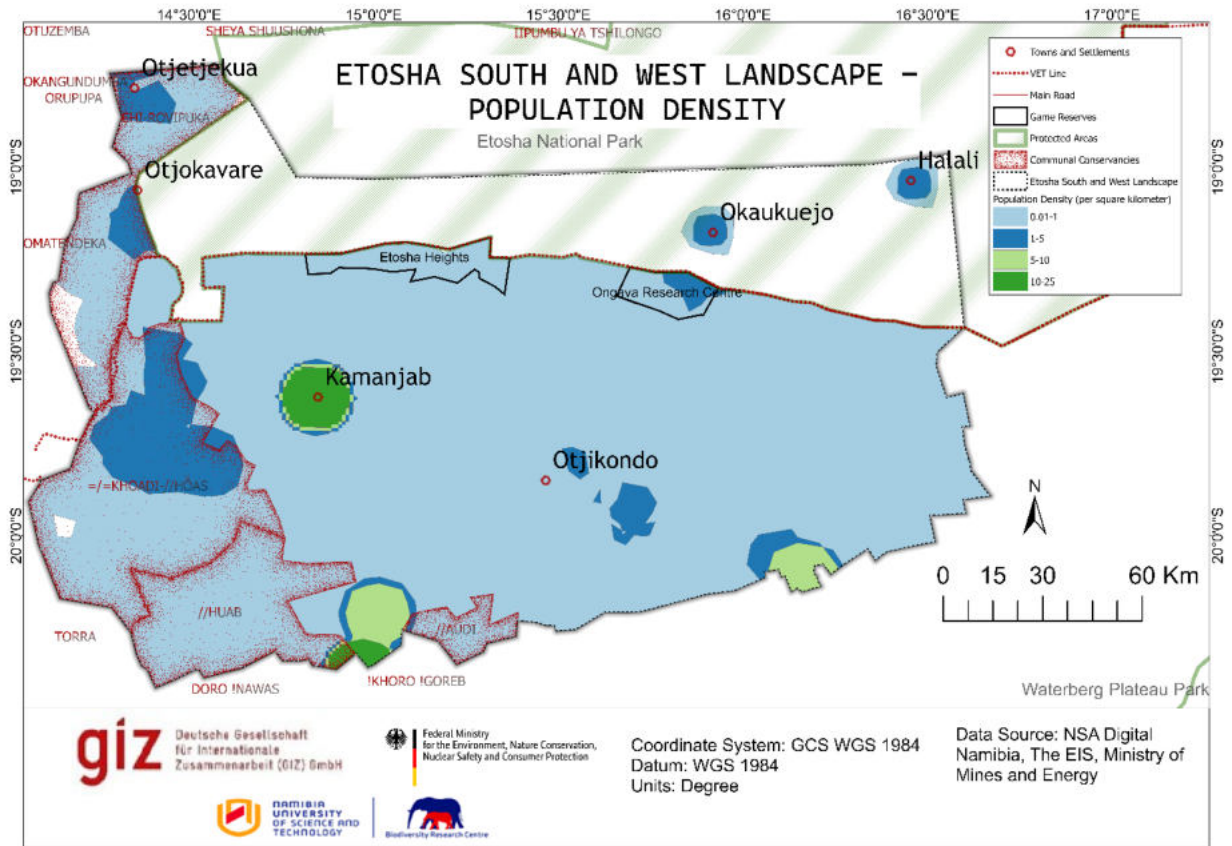


Figure 7: Human population density in the Etosha West and South Landscape (persons per km²).

3.1.5 Distribution of livestock

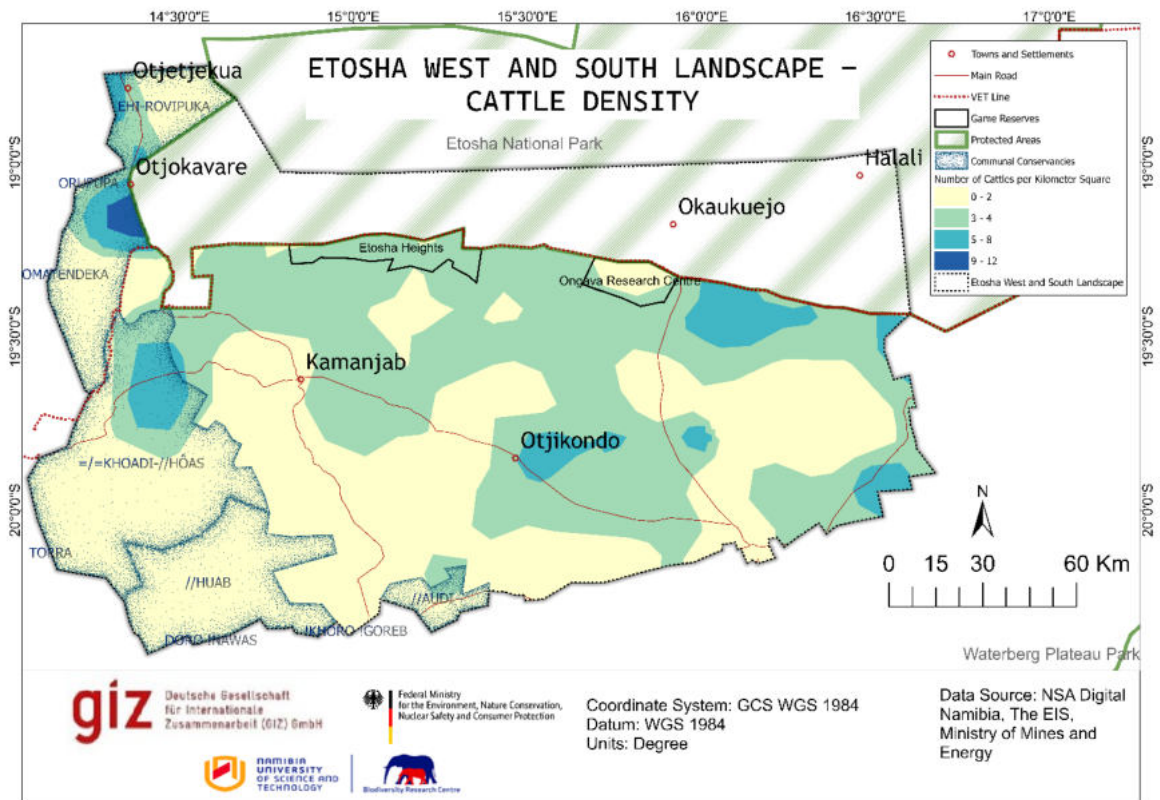


Figure 8: Cattle density in the Etosha West and South Landscape.

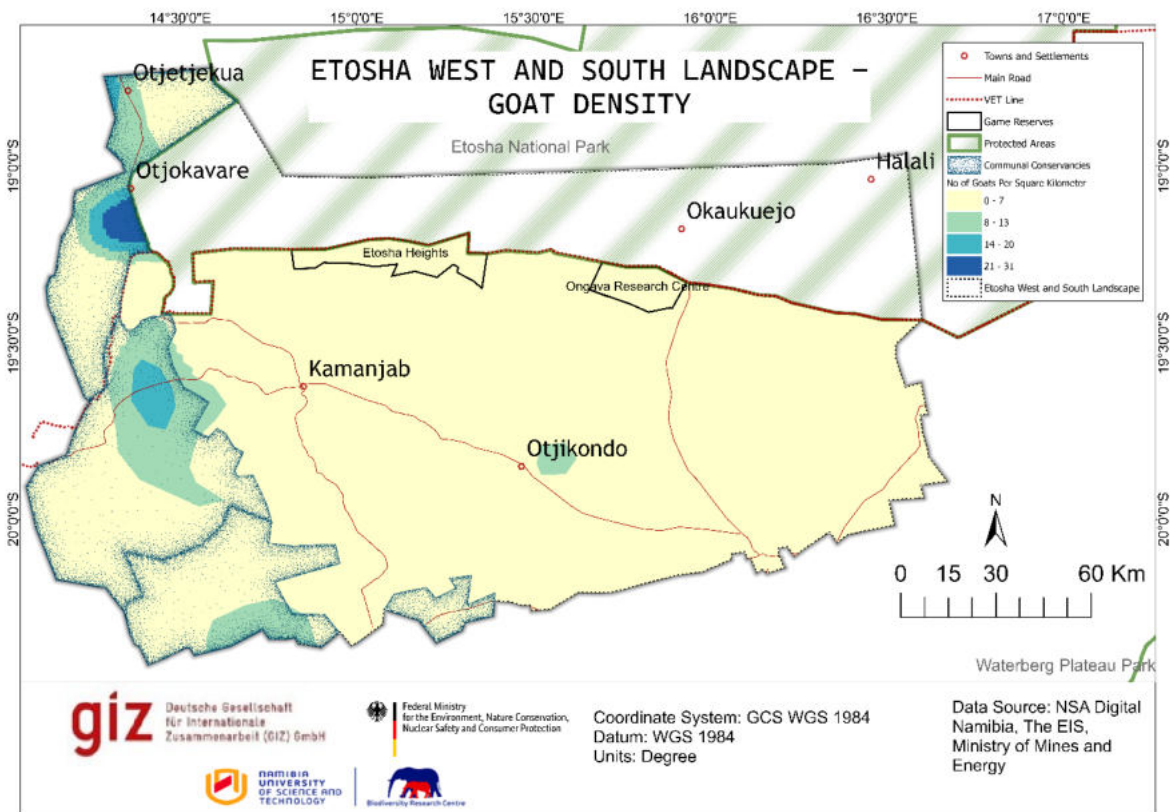


Figure 9: Goat density in the Etosha West and South Landscape.

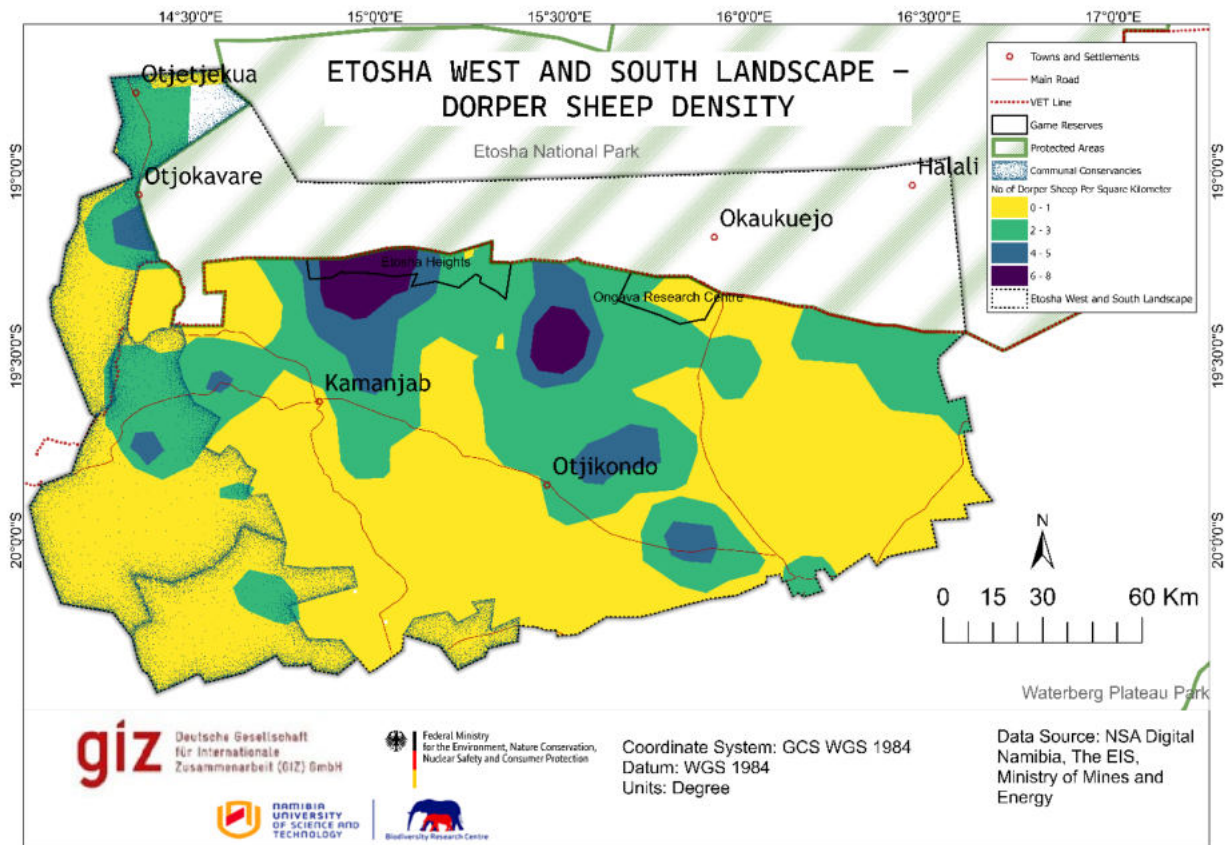


Figure 10: Sheep density in the Etosha West and South Landscape.

3.2 Ombonde People’s Landscape

3.2.1 Topography

The Ombonde People’s Landscape is located on state protected land between the Omatendeka and Ehirovipuka Communal Conservancies also comprising parts of these conservancies. As also mentioned for specifically the Etosha West and South Landscape and the Geopark/Brandberg Landscape, since the park is not officially recognised and developed, boundaries are likely to change as communities, enterprises or biodiversity become better known and engaged through the GIZ Biodiversity economy project. The area is known for the desert-adapted lions and human-wildlife conflict is common (see Section 6 of this report).

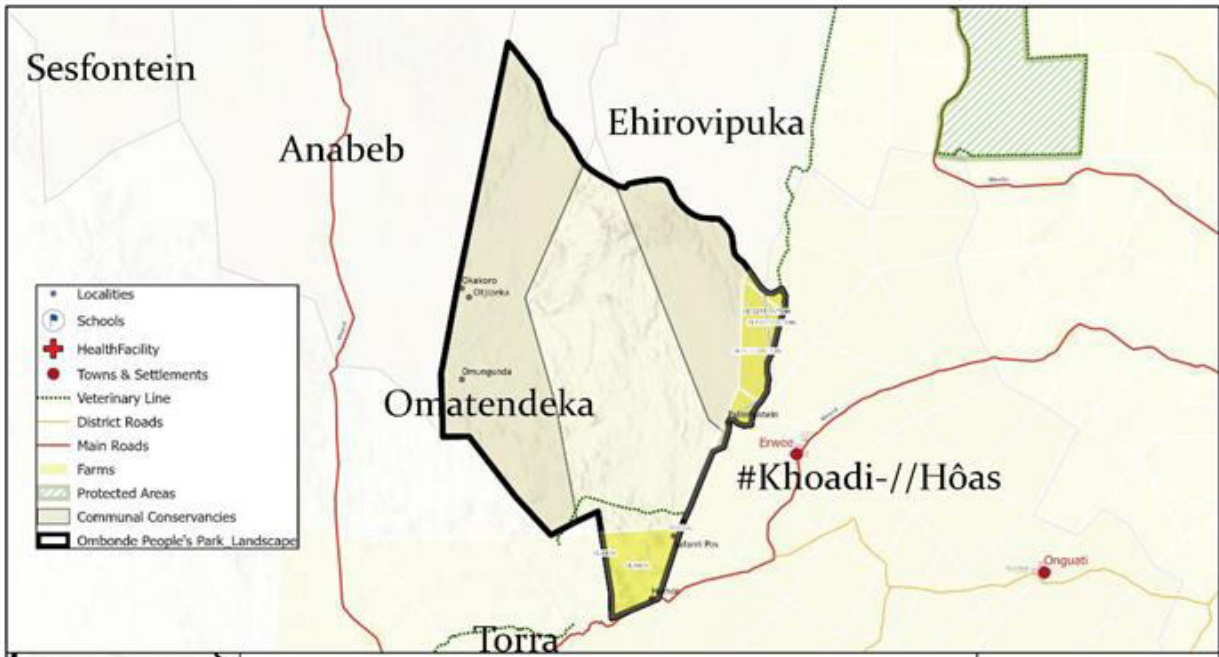


Figure 11: The pre-project estimated boundaries of the Ombonde People's Landscape.

3.2.2 Climate

The landscape is characterized by extreme temperatures and low rainfall of around 150 to 200mm per year.

3.2.3 Geology

The landscape is mainly dominated by the Mulden Gp at the centre and Etendeka Gp on the west of the landscape as well as the Tsumeb on the east side of the landscape. The landscape is mostly mountainous with a rugged terrain and shallow soils.

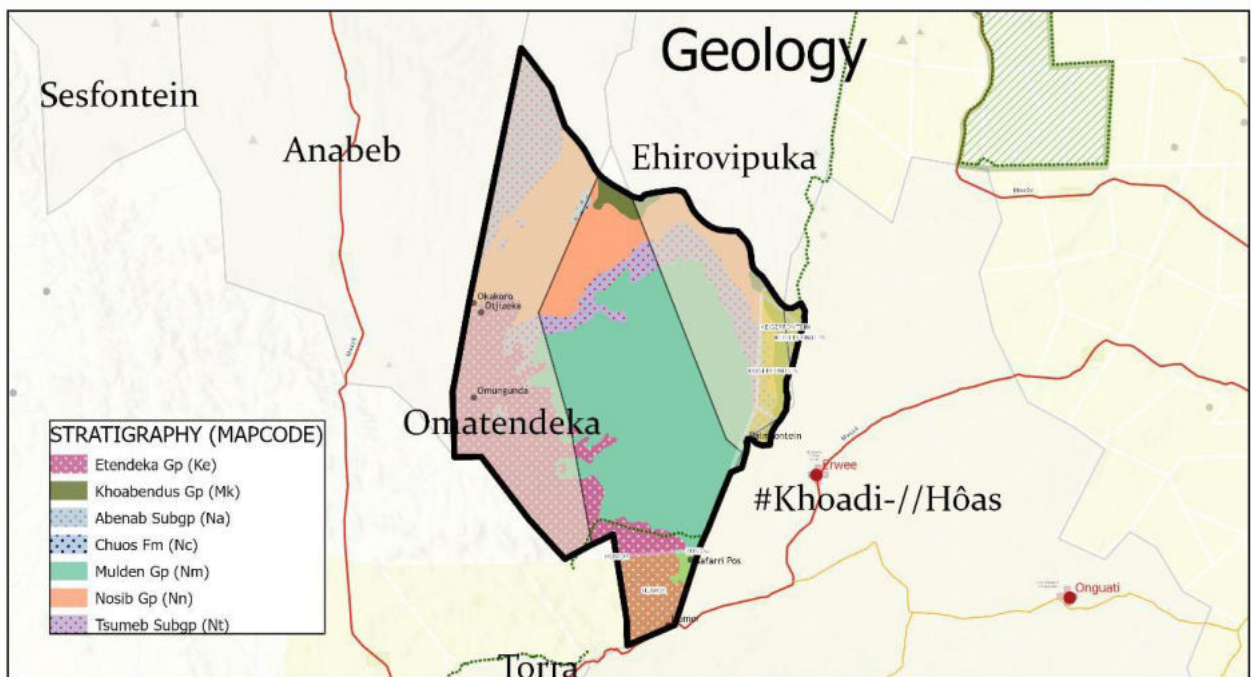


Figure 12: Geology of the Ombonde People's Landscape.

3.2.4 Distribution of people

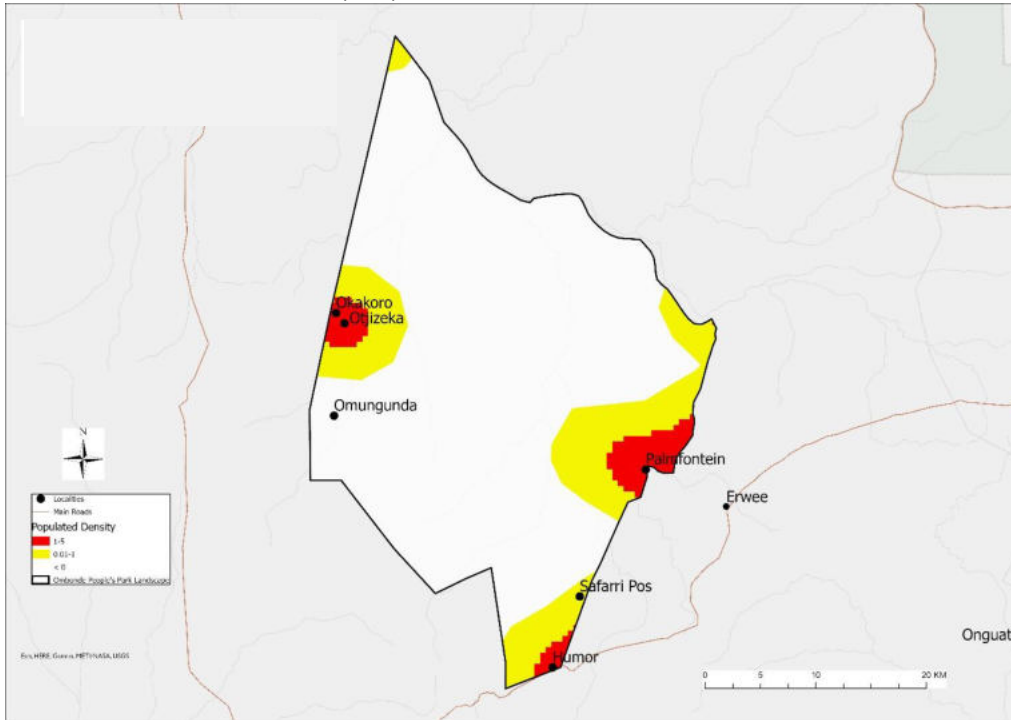


Figure 13: Human population density in the Ombonde People's Landscape.

3.2.5 Distribution of livestock

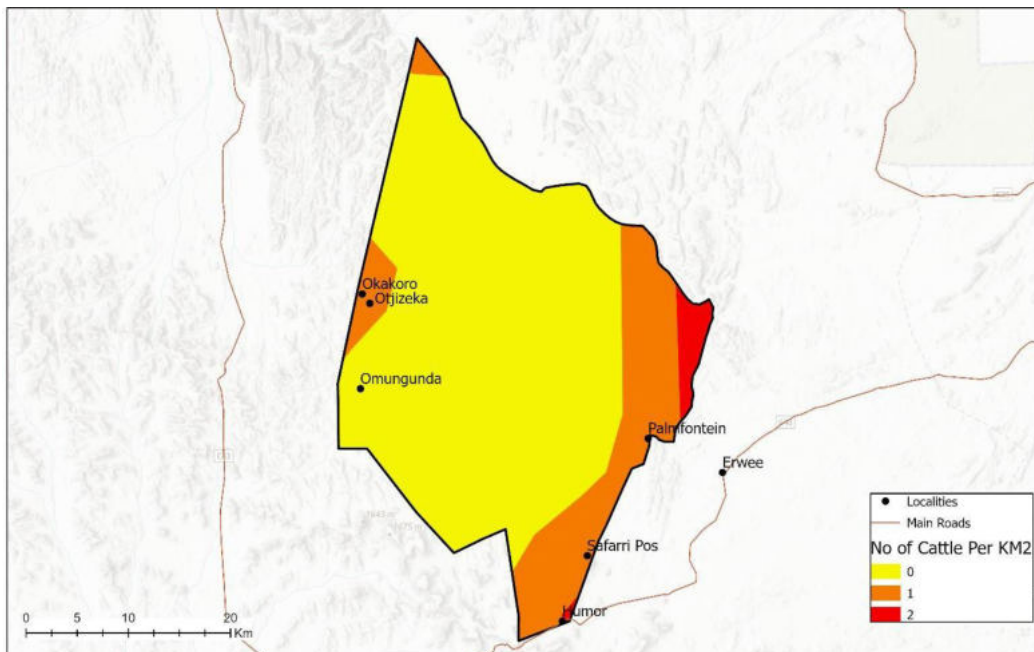


Figure 14: Density of cattle in the Ombonde People's Landscape.

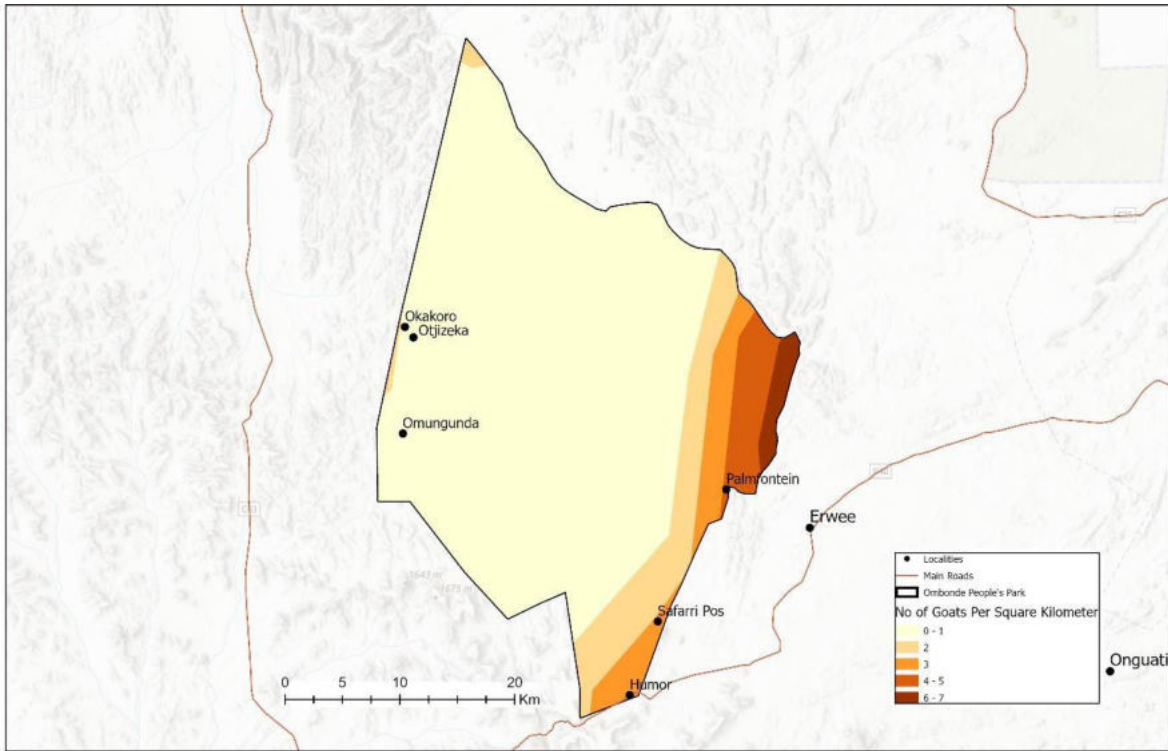


Figure 15: Density of goats in the Ombonde People's Landscape.

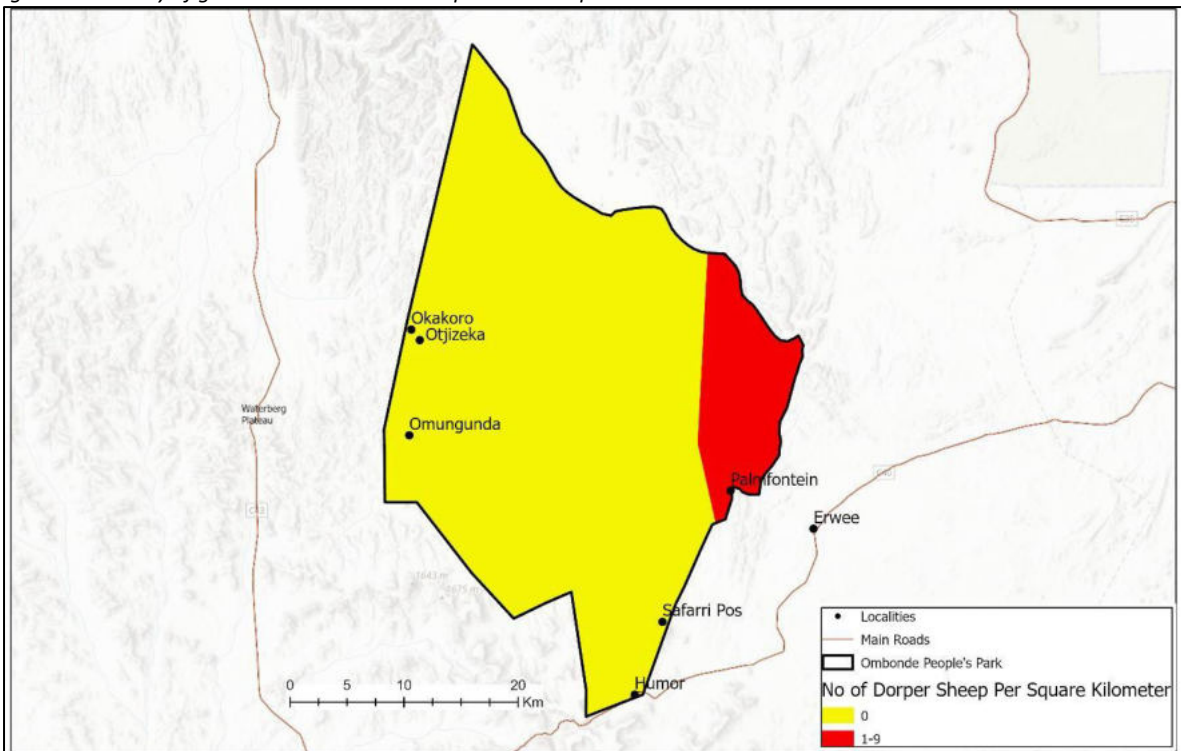


Figure 16: Density of sheep in the Ombonde People's Landscape.

3.3 Waterberg Landscape

3.3.1 Topography

The Waterberg landscape is situated in central Namibia around the Waterberg Plateau Park. The landscape is surrounded by some of Namibia's largest towns such as Otjiwarongo, Otavi, and Grootfontein, however, Okakarara is the biggest town found in the landscape. The landscape covers an area of approximately 2 600 km², consisting of the Waterberg National Park, four communal conservancies: Okamatapati, Ozonehe, Otjituuu, and African Wild dog. The landscape is flat and undulating, except for the Waterberg sandstone plateau. The landscape has no perennial river, but it is sourced by two ephemeral rivers including the Omatoko River which runs north to west in the middle of the landscape, and the Otjondjou-Omuramba River which marks the eastern boundary of the landscape.

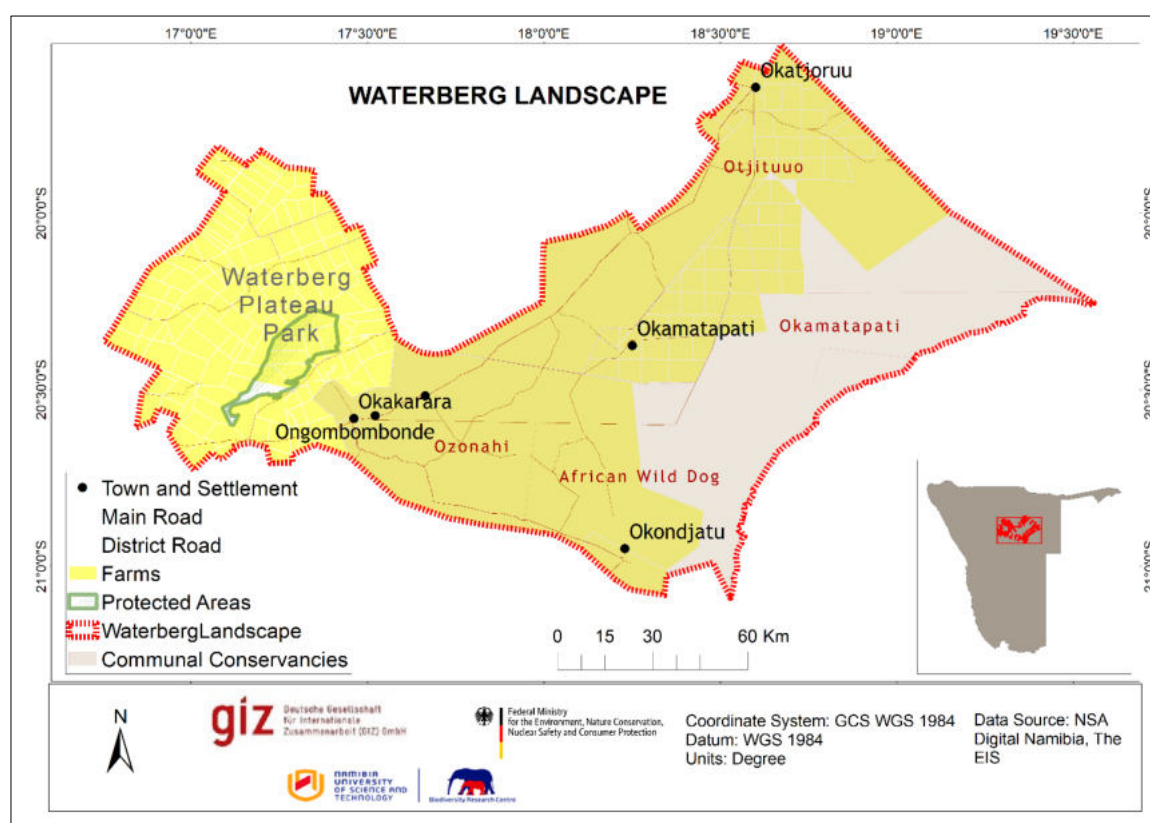


Figure 17: The Waterberg Landscape. Source: Atlas of Namibia, 2001

3.3.2 Climate

The Waterberg landscape is characterized by warm summers from December to February and cold winters from June to August, July being the coldest and December the hottest month (Mendelsohn, 2001). The landscape annual rainfall ranges from 350 to 500mm, providing some of the best livestock grazing productivity in the country. The mean annual temperature ranges from 20-21 degrees. All parts of the landscape experience heavy bush encroachment, a factor that is discussed in more detail in section 6 of this report.

3.3.3 Geology

The landscape is dominated by the surficial deposits from the Kalahari, Namib, and Waterberg basins consisting of sands, calcrete, and gravel rock types. Meanwhile, on the southwest, it is characterized by marbles, schist, and quartzite rock types.

The landscape consists of small patches of fertile soil found around Okakarara and west of the Waterberg Plateau Park. This area is dominated by the Cambisol soil group which has the highest potential for crop cultivation due to its ability to hold water. The dominant soil type that covers more than half of the area is ferrallic soil which is known to be characterized by sandy texture thus leaving little moisture for crops and grass production. There are also patches of the shallow gravel Leptosols found on the north of the landscape.

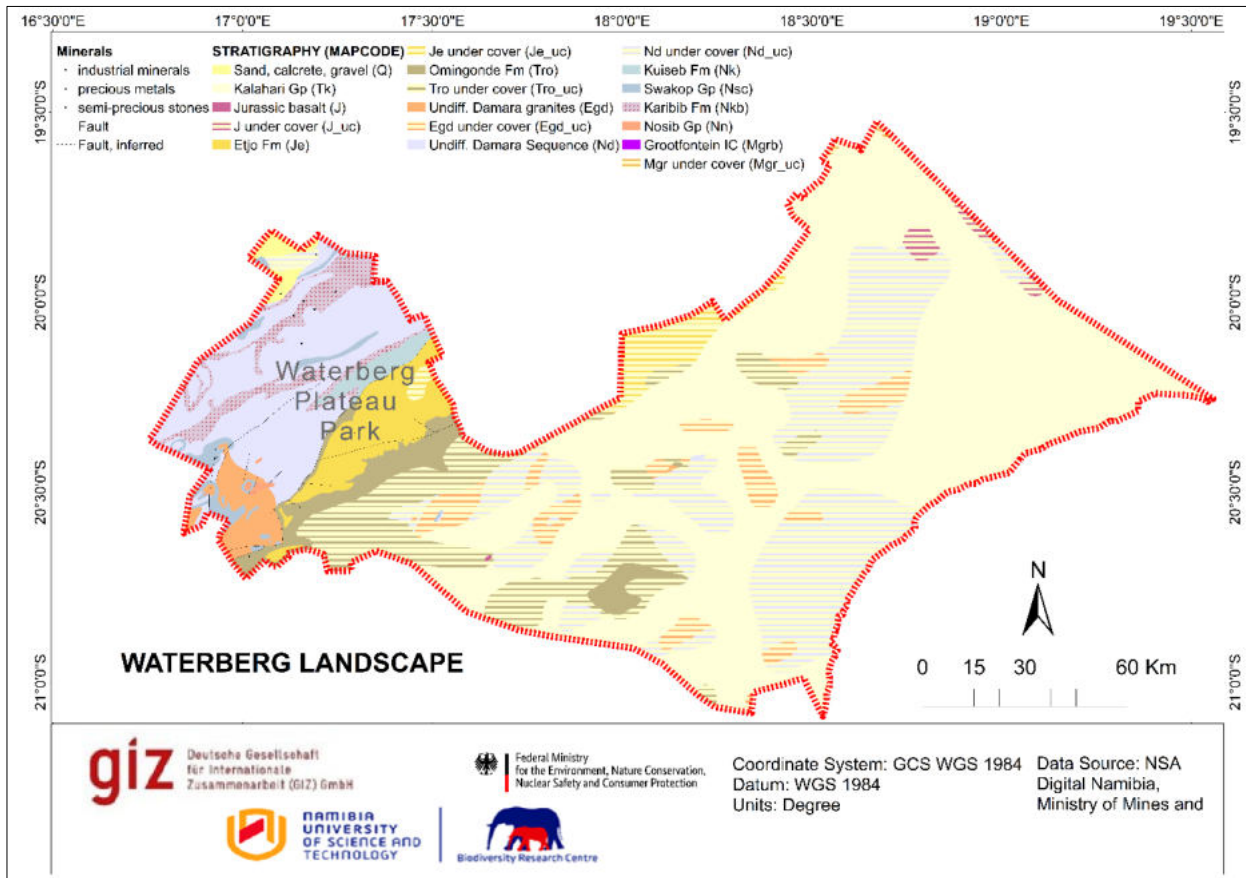


Figure 18: Geology map of the Waterberg Landscape.

3.3.4 Distribution of people

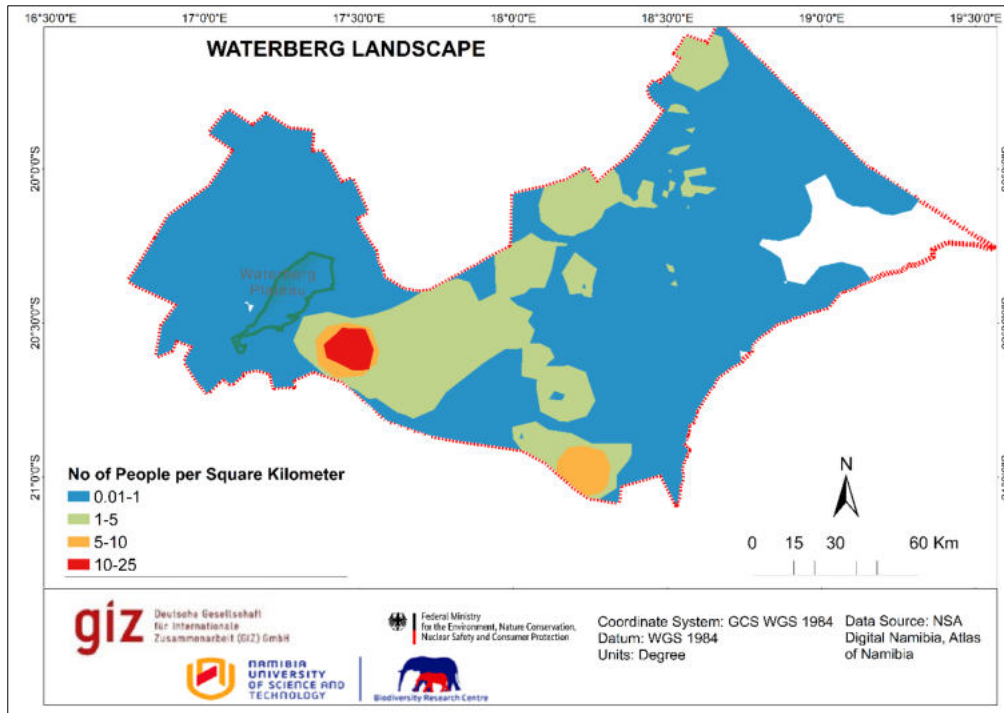


Figure 19: human population density in the Waterberg Landscape.

3.3.5 Distribution of livestock

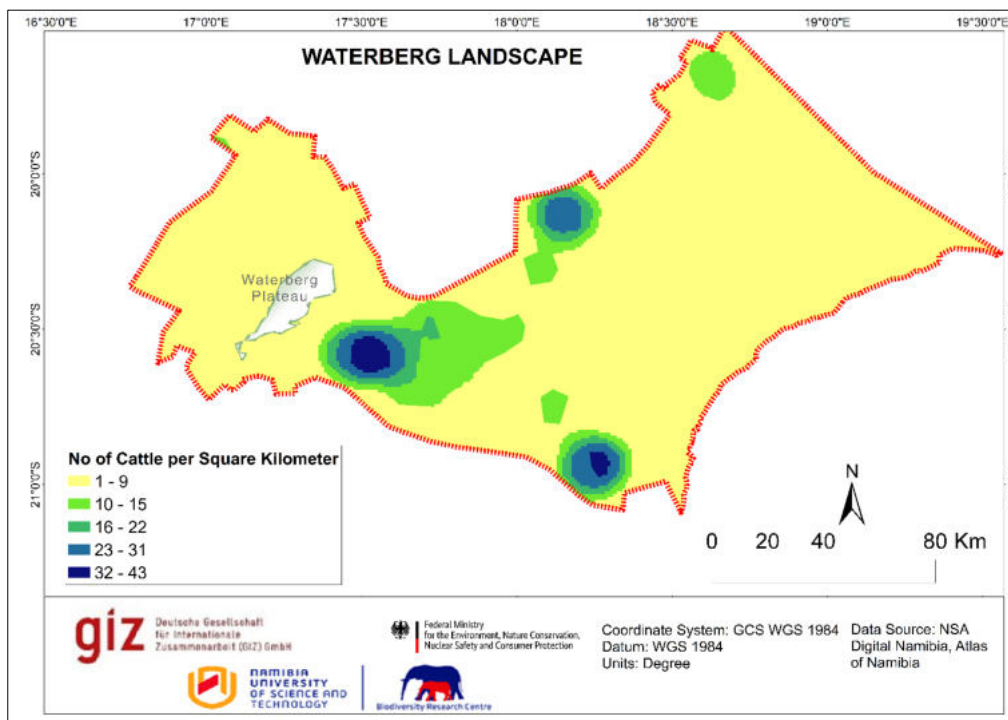


Figure 20: Density of cattle in the Waterberg Landscape.

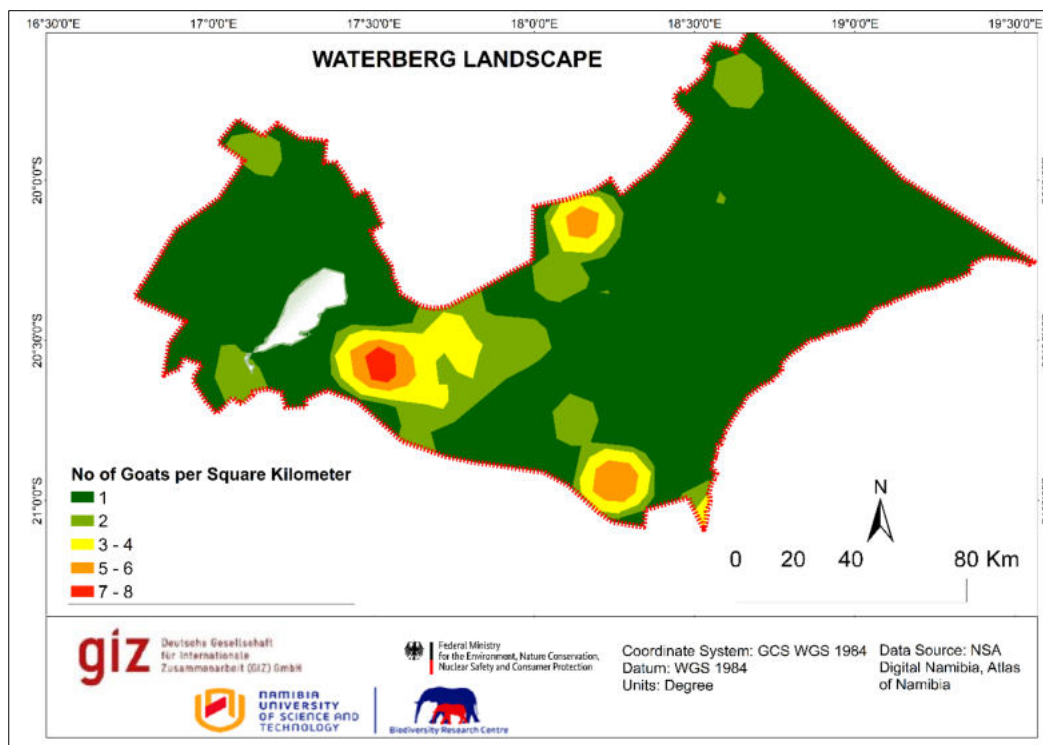


Figure 21: Density of goats in the Waterberg Landscape.

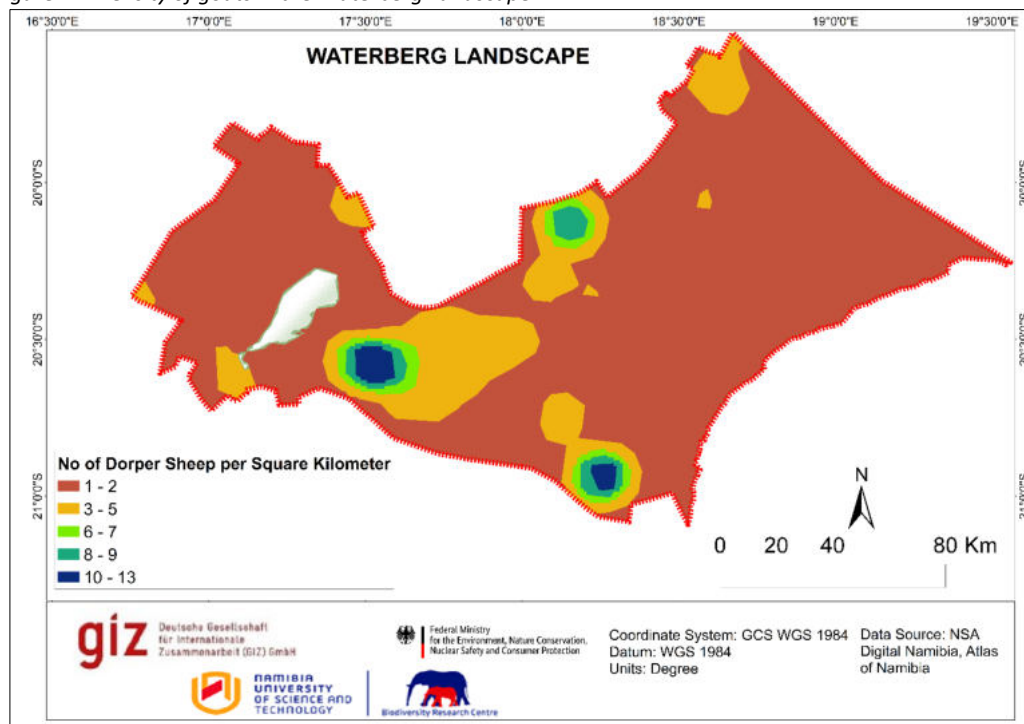


Figure 22: Density of sheep in the Waterberg Landscape.

3.4 Geopark/Brandberg Landscape

The Geopark/Brandberg Landscape is situated in the Kunene Region Northwest Namibian. The total coverage of the landscape will be defined during the project, but this baseline (Figure 23) covers approximately 4 200 km², which is made up of the conservancies such as Tseiseb, Ohungu, Otjimboyo and #Gaingu as well as the iconic Brandberg Mountain. Some of the most important sites included in this landscape includes the Brandberg, Spitzkoppe, Twylfelfontein and the petrified forest. These are sites of geological importance and thus needs to be preserved for their rich

heritage, rocks, minerals and fossils. The proposed Gondwanaland Geopark would incorporate much of the landscape if realised as a United Nations Educational, Scientific and Cultural Organization (UNESCO) Geopark. Currently the area carries little formal protection, except for the Twyfelfontein Cultural World Heritage site.

3.4.1 Topography

Geopark/Brandberg Landscape is a semi desert area characterized by a mixture of mountain ranges, hills and, sparse savannah plains intercepted by a number of the major ephemeral rivers.

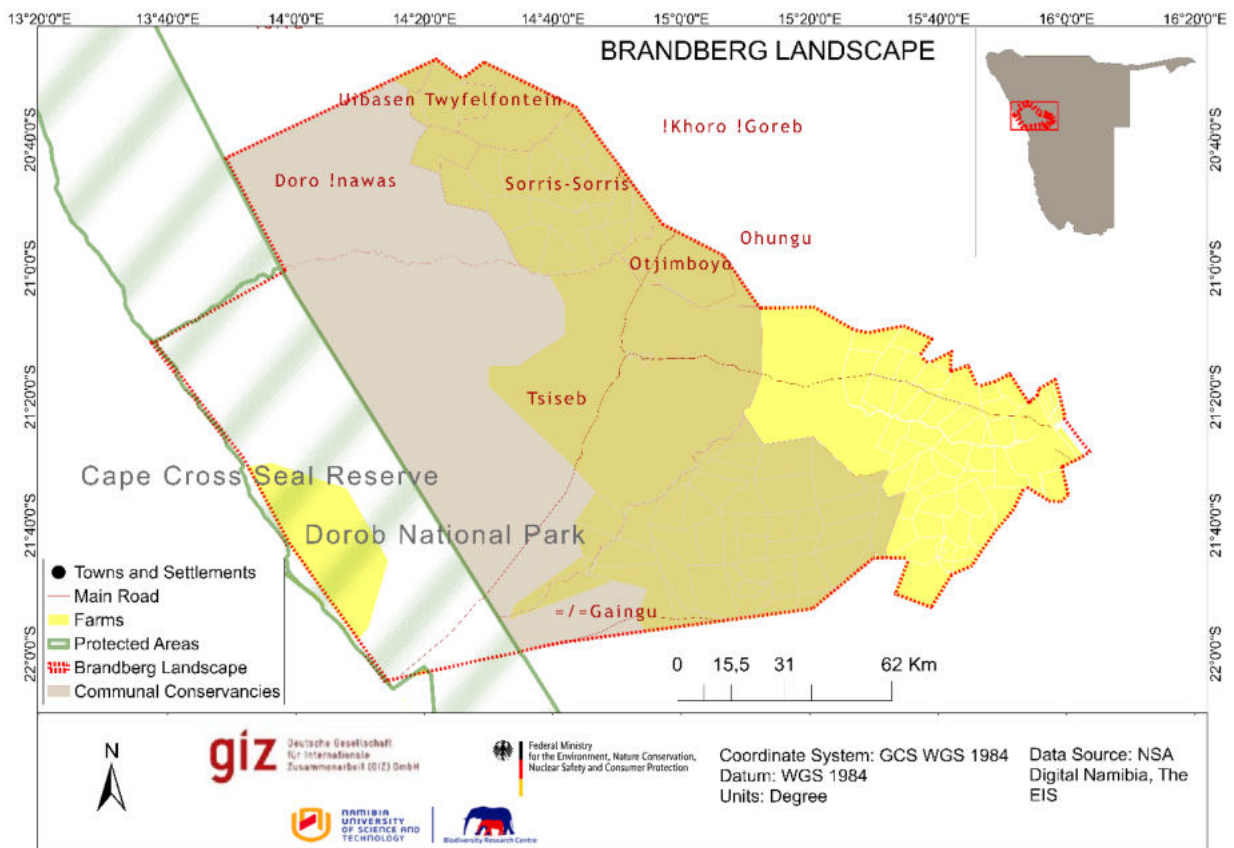


Figure 23: The Geopark/Brandberg Landscape.

3.4.2 Climate

The landscape is characterized by dry extreme temperatures and low rainfall which makes the area susceptible to climate change effects. Rainfall in the landscape is lowest on the west with an increasing gradient from less than 100mm on the southwest to over 250mm per annum to the northeast of the landscape.

3.4.3 Geology

The landscape shows the geological history of Namibia from the time it was part of Gondwana land and to its current status. The deposits found in this landscape ranges from calcrete, quartzite, mica schist, limestone, dolomite and granite. The whole landscape is rich in archaeological assets which include rock paintings and petroglyphs.

3.4.5 Distribution of livestock

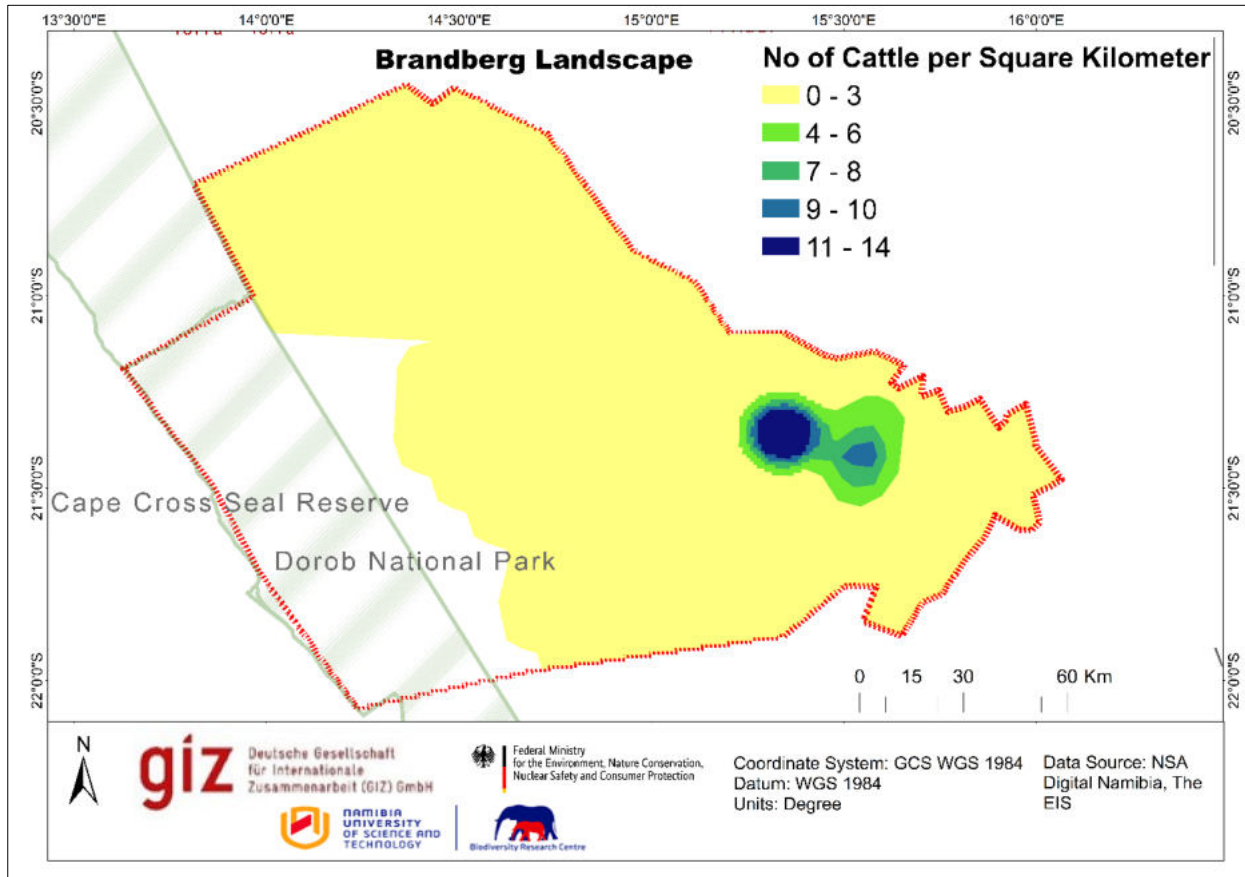


Figure 26: Cattle density in the Geopark/Brandberg Landscape.

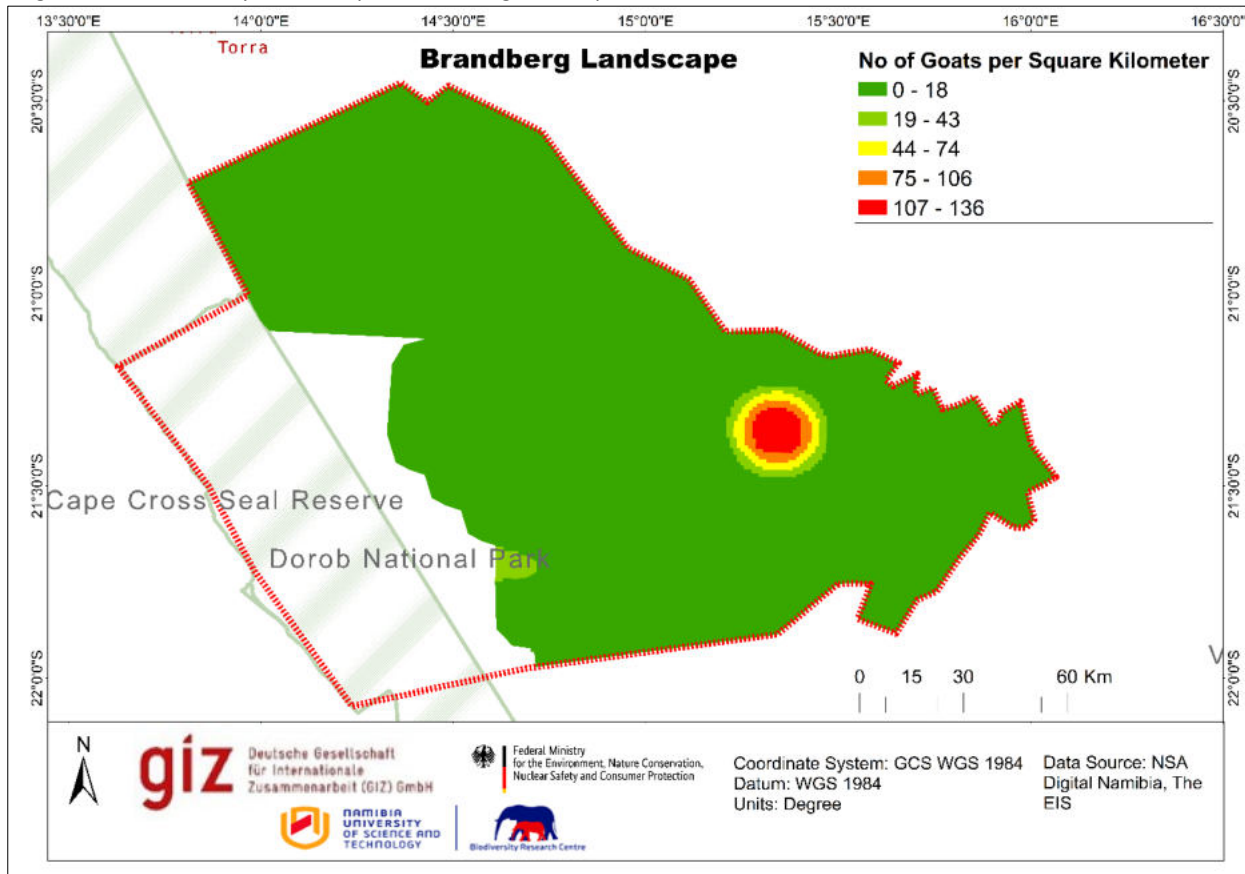


Figure 27: Density of goats in the Geopark/Brandberg Landscape.

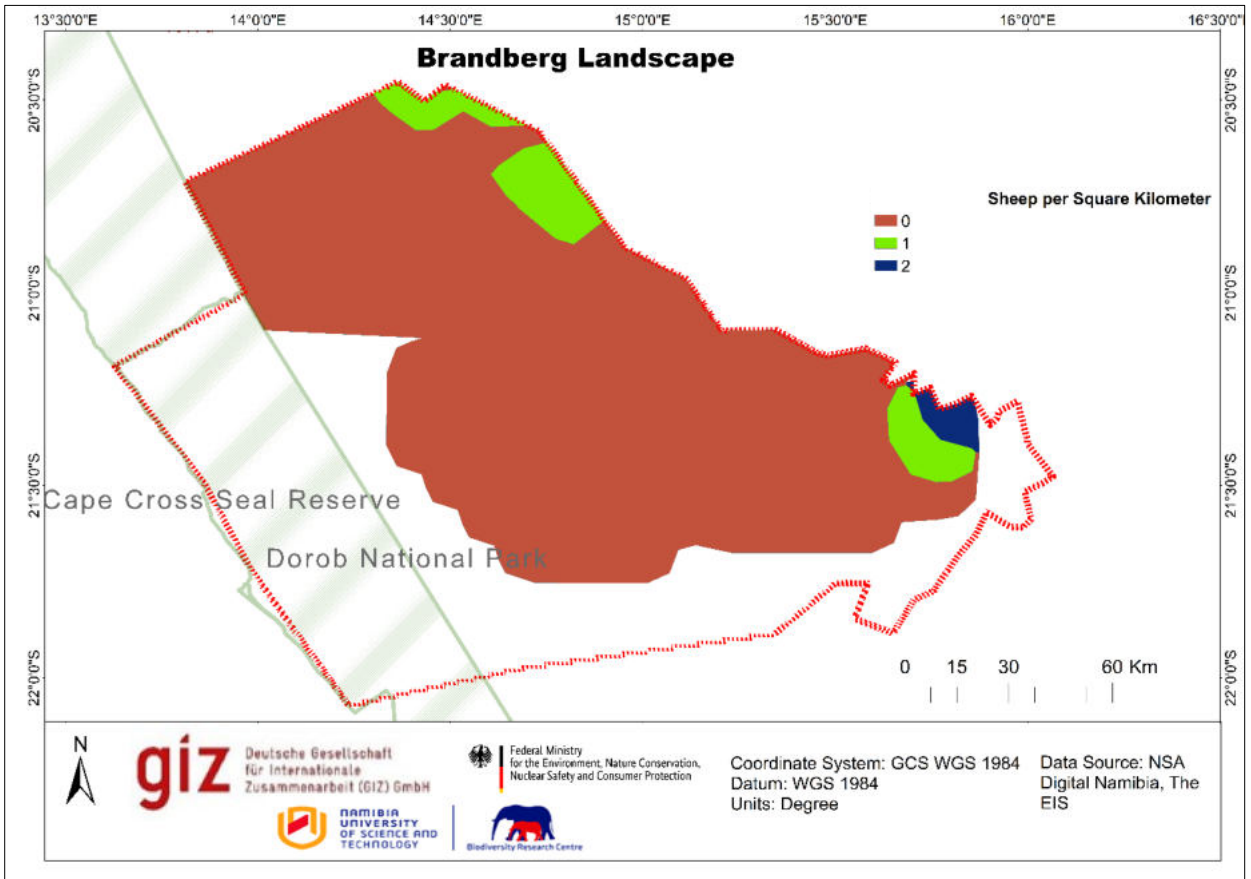


Figure 28: Sheep density in the Geopark/Brandberg Landscape.

4 ECOSYSTEM SERVICES AND TRENDS OF RELEVANCE TO THE PROJECT

The ecosystem services assessment below was produced by conducting a broad Toolkit for Ecosystem Service Site-Based Assessment (TESSA) based on stakeholder engagement, scientific studies and knowledge of the landscapes. Detailed ecosystem services assessments are required as an output of the project, which can use this assessment as a starting point.

Results of the TESSA are provided below, with the identification of key ecosystem services, their relative importance within each landscape and their trends (increasing-decreasing-stable etc.) It is not incumbent on the project to improve each ecosystem service, or improve livelihoods from each service, but is a guide to be used to select areas where benefits from services can be improved.

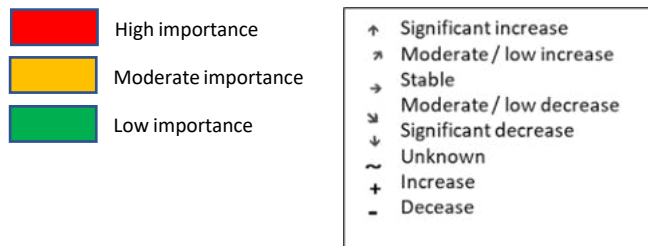


Table 1: Ecosystem Services Assessment of Landscapes based on stakeholder discussions and site visits to the landscape.

Service Group	Ecosystem Services	Specifics	EWSL	OPL	WL	BL	Main issues and / or opportunities
Provisioning	Livestock production from rangeland	Commercial and subsistence meat	→	↓	→	↓	Livestock production is practiced in all four landscapes. Commercial beef production is most profitable on freehold farms in the Waterberg Landscape, and less-so in the Etosha West and South Landscape’s freehold farming area. Rangeland / grass production is a critical ecosystem service in this regard.
	Plants for energy use	Charcoal production Firewood production	↗	→	↗	→	Charcoal production has been an important activity for the Waterberg Landscape for some time. This has also been implemented to counter bush encroachment. It has increased recently with the introduction of bush-to-energy initiatives. Following prolonged drought farmers in the eastern part of the Etosha South-West Landscape have increased their production of charcoal to supplement their lower beef income.
	Rangeland productivity (Linked to livestock production, but also wildlife and carbon sequestration)	Grazing and browsing resources	↓	↓	→	↓	One of the most critical services in all the landscapes. Prolonged drought (2014-2020) resulted in reduced vegetation productivity, severely so for the Etosha West and South Landscape, Ombonde People’s Landscape and Geopark/Brandberg. Commercial farmers introduced “boskos” (bush feed) activities to provide feed to livestock and wildlife during the drought. Sale of boskos was seen in the Waterberg Landscape.

Service Group	Ecosystem Services	Specifics	EWSL	OPL	WL	BL	Main issues and / or opportunities
	Plants for medicinal and cosmetic use	e.g. Commiphora, devils' claw	→	→	→	→	Medicinal plants are harvested mostly in communal conservancies. The eastern parts of the Waterberg Landscape are particularly important for devil's claw harvesting.
	Wildlife for conservation hunting	Trophy and sport	→	↓	→	↓	Trophy hunting is an important income generating activity, particularly in the Etosha West and South and the Waterberg Landscape. Commercial farmers have been intensively breeding popular trophy animals (e.g. roan, sable, lechwe, waterbuck) while buffalo hunting is practiced in Waterberg Plateau Park. Only a few elephant, lion and giraffe have been trophy hunted in communal areas. Private ownership of buffalo is prohibited due to disease concerns. Investigating the true risk of buffalo- cattle disease transmission compared to the potential income benefits of buffalo to commercial and conservancy revenues should be investigated
	Wildlife for own use	Meat and skins	→	↓	→	↓	Own use hunting was a major part of conservancy benefits in the western landscapes (Geopark/Brandberg, Etosha West and South and Ombonde People-s Landscape). With the drought and resultant decreases in wildlife populations, this has reduced drastically. Meat hunting is still popular in commercial farmland of Etosha West and South and Waterberg Landscapes.
	Ground water	Water for people, wildlife and livestock	→	→	→	↓	Indiscriminate abstraction of water for tourism and agriculture is a concern. New tourism developments need to consider the cumulative volumes of water abstraction.

Service Group	Ecosystem Services	Specifics	EWSL	OPL	WL	BL	Main issues and / or opportunities
							replenishment rate of aquifers more carefully. Water provision often does not consider effects on human-wildlife conflict, especially conflict with elephants. Prolonged drought has resulted in worrying drops in groundwater levels, some boreholes are dry and were abandoned
	Surface Water	Ephemeral river flows, springs, dams	→	→	→	→	Although surface water is not dominant, and there are no perennial rivers, any artificial surface water provided through pumping from underground or in constructed dams affect wildlife and livestock movements drastically. This is suspected to be a major cause of human-wildlife conflict.
Regulation & Maintenance	Soil formation and composition	Erosion because of drought followed by flood events	~	~	~	~	Soils are generally infertile and shallow, except in parts of the Waterberg Landscape. Erosion is however prevalent where poor rangeland management is practiced.
	Mediation of waste and pollution	Increased tourism and populations have resulted in increased solid waste accumulation and incorrect disposal	→	→	→	→	Waste management is practiced and varied levels. Some tourist operators see it as a priority, overall it is poorly management, or not at all. Potential for repurposing and recycling of waste exists.
	Global and regional climate regulation	Vegetation productivity, carbon sequestration	→	→	→	→	Trade-off between bush thickening and bush thinning/charcoal production
	Ventilation and transpiration	As above					As above
	Maintaining nursery population and habitats	Habitat for endangered and endemic species Source populations of wildlife	→	→	→	→	Etosha WS Landscape – critical habitat for black rhino, large predators and elephants Geopark/Brandberg Landscape important for reptile endemic protection, plant endemics, desert elephants WL – Important habitat for black and white rhino, roan and sable antelope, disease free buffalo

Service Group	Ecosystem Services	Specifics	EWSL	OPL	WL	BL	Main issues and / or opportunities
							Ombonde People's Landscape important for desert lion, black rhino
Cultural	Physical Interactions		→	→	→	→	
	Spiritual, symbolic and intellectual interactions	Livestock ownership	→	→	~	→	Livestock ownership is specifically of cultural and spiritual value to local groups, in commercial and communal areas.
	Landscapes, sense of place, natural beauty	Tourist attractions in many of the landscapes are primarily landscape based. Large open expanses of undisturbed nature, quiet and undeveloped	→	→	↓	→	A major threat is bush encroachment and charcoal burning. Charcoal fires are evident at most scenic spots in the Etosha West and South Landscape and the Waterberg Landscape. Bush encroachment is of particular concern in the Waterberg Landscape, and particularly in the communal areas of this landscape
	Populations of charismatic species to attract tourists		→	→	→	→	The parks within the selected landscapes (Etosha and Waterberg) are both known for large endangered and rare mammals. The goals of both parks centre primarily around the protection of these species. A unique species for Waterberg is buffalo, while Etosha has the largest populations of black-rhino and large predators (lion, spotted hyena, leopard and cheetah). The Geopark/Brandberg Landscape hosts desert-adapted elephants, the focus of many of its tourism activities, while the Ombonde People's Landscape provides rhino-specific tourism activities.

Service Group	Ecosystem Services	Specifics	EWSL	OPPL	WL	BL	Main issues and / or opportunities
	Opportunities for biodiversity research		→	→	→	→	Conservation or species-specific wildlife research is commonplace across all landscapes. Much of the focus is on human-wildlife conflict. There is no coordination of research on any of the landscapes. The research agenda is driven by researchers, and not by the conservation or livelihood needs of residents. There is little economic-specific research, with the only study being by Save the Rhino Trust.

5 SELECTED BIO-ECONOMIC THREATS IDENTIFIED DURING THE BASELINE STUDY

5.1 Fire

One of the main concerns raised during stakeholder meetings was the increase of bush fires that resulted from charcoal burning processes when they are not managed properly. In the last year 2021, Namibia recorded an increase in bush fires which was found to be destroying the biodiversity and some of these fires were a result of negligence in charcoal production.

The maps below illustrate the fire incidents recorded in the landscapes for the past 5 years (2017 – 2022). In landscapes where rainfall is on average above 350mm (Etosha West and South Landscape and Waterberg Landscape: Figures 29 and 30) fires are both a necessary ecological process and a risk to livelihoods through removing grazing for livestock and threatening life and infrastructure. Fire management and control strategies are complex and often conflicting within landscapes. For example Waterberg Plateau Park has a fire management plan which includes setting fires to control bush and stimulate grazing while many neighbouring farms prevent fire and fire risk at all cost. Landscape-wide fire management strategies would be an advantage, and collaborative fire-fighting teams and pooled equipment could be effective in controlling fires within the landscape.

In the drier landscapes of Ombonde People’s Landscape and Geopark/Brandberg (Figures 31 and 32) fires are less of a problem as low rainfall prevents there being sufficient dry grass biomass to fuel fires.

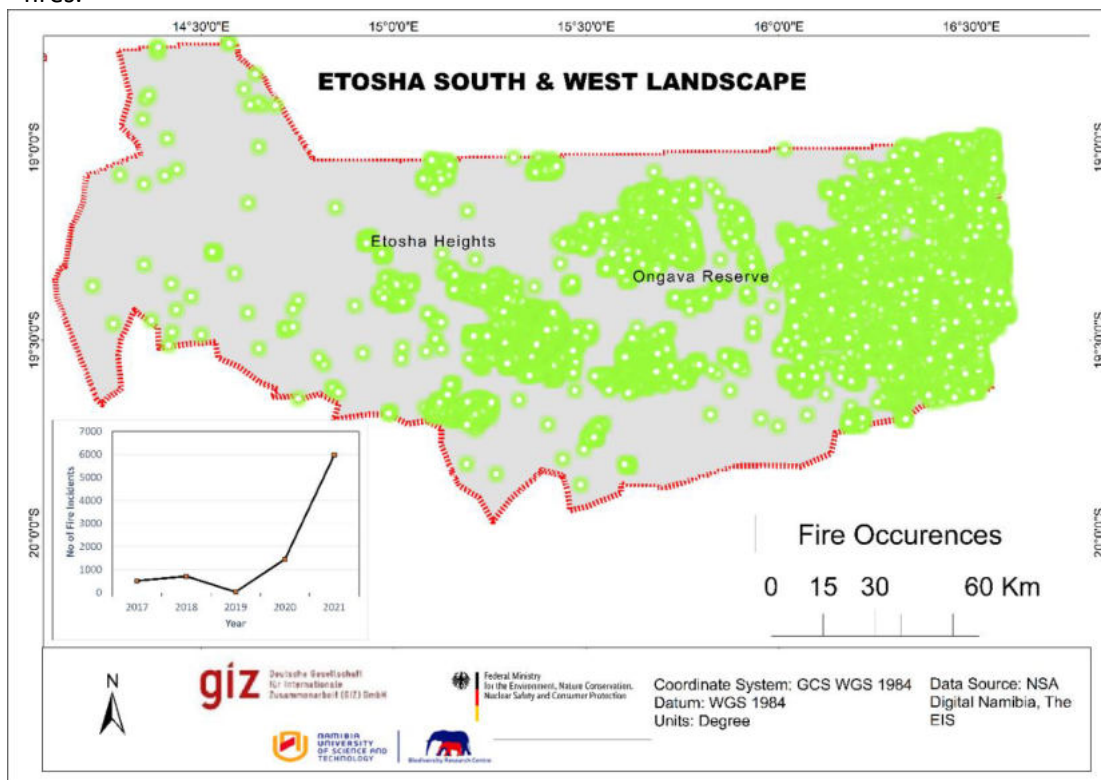


Figure 29: Fire incidents recorded in Etosha West and South Landscape for the past 5 years.

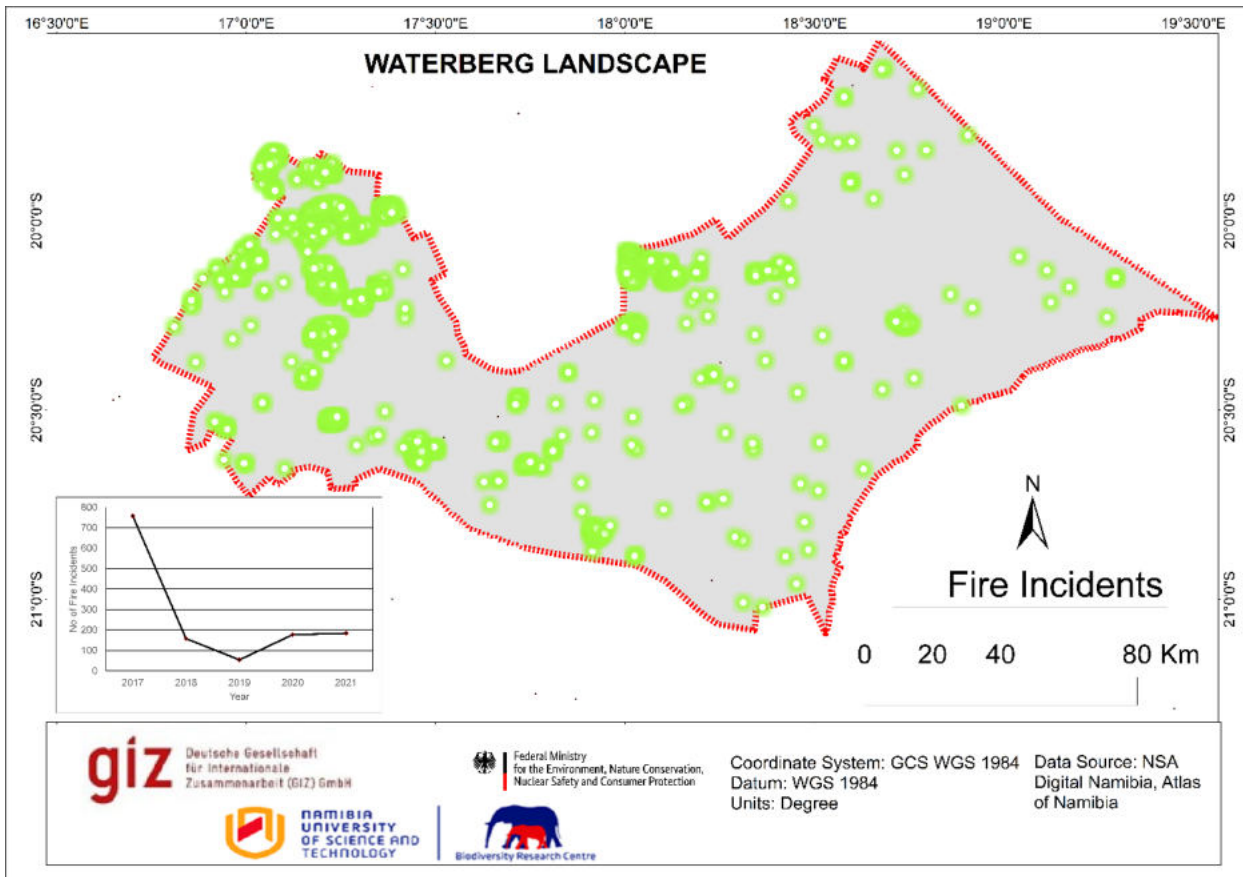


Figure 30: Fire incidents recorded in Waterberg Landscape for the past 5 years.

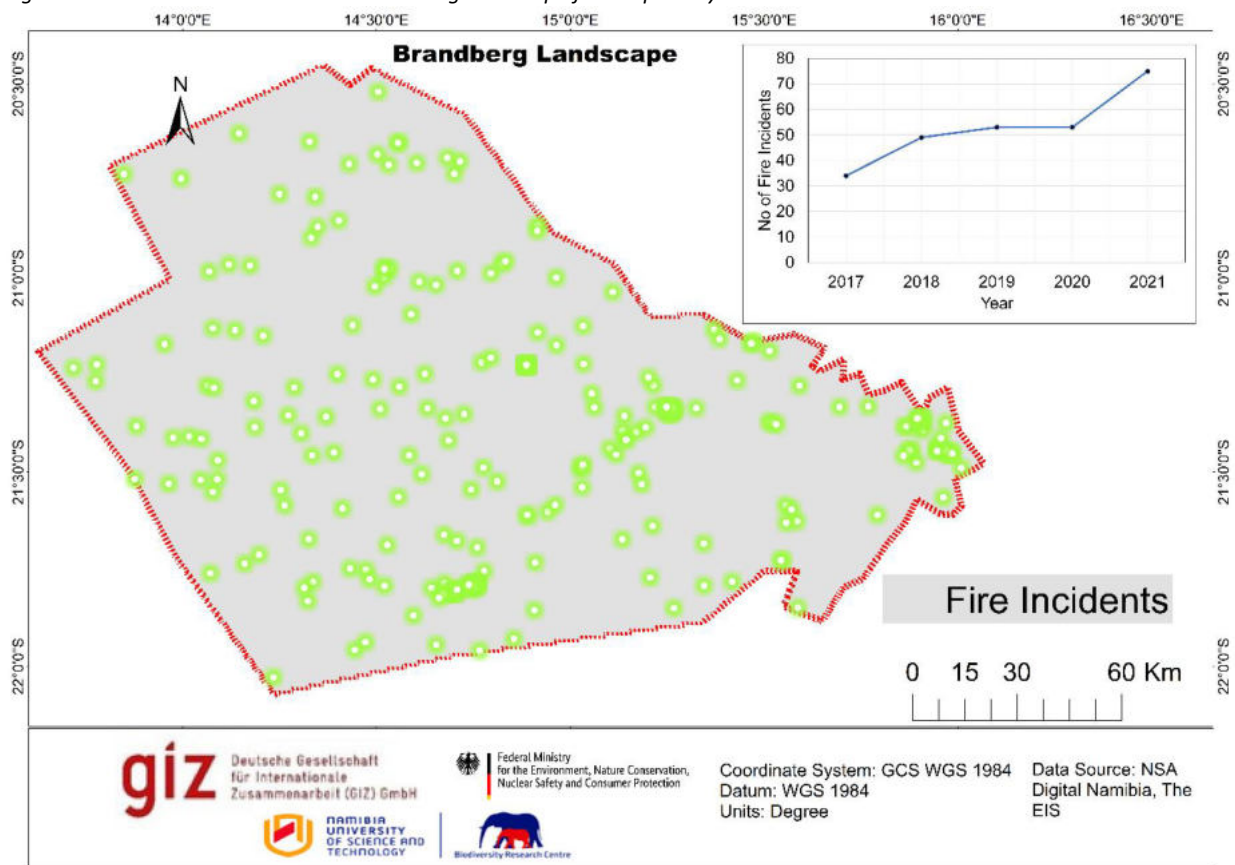


Figure 31: Fire incidents recorded in Geopark/Brandberg Landscape for the past 5 years.

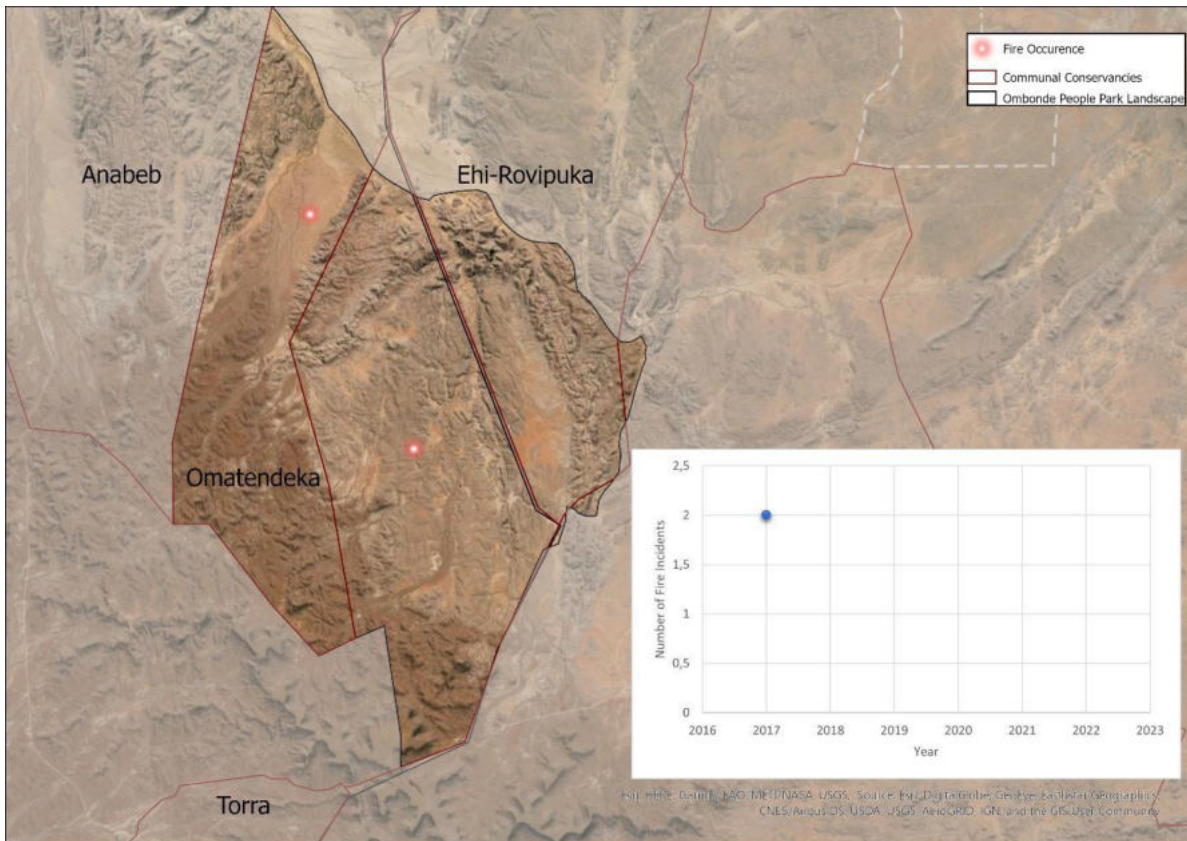


Figure 32: Fire incidents recorded in Ombonde People's Landscape for the past 5 years. Possibly burning of waste or small crop-sites post-harvest.

5.2 Bush thickening and encroachment

Two of the four selected landscapes experience heavy levels of bush encroachment. A survey by the GIZ Ministry of Agriculture Water and Forestry (MAWF) De-Bushing Project in 2015 (Figure 33 below) shows that bush encroachment is visible in all the identified landscapes with parts of the Etosha South-West Landscape and Waterberg Landscape being relatively severe. This has provided an opportunity for charcoal, energy production and other enterprises to be initiated. Current levels and potential for bush-related enterprises and discussed further in Section 7, which focuses on biodiversity related enterprises.

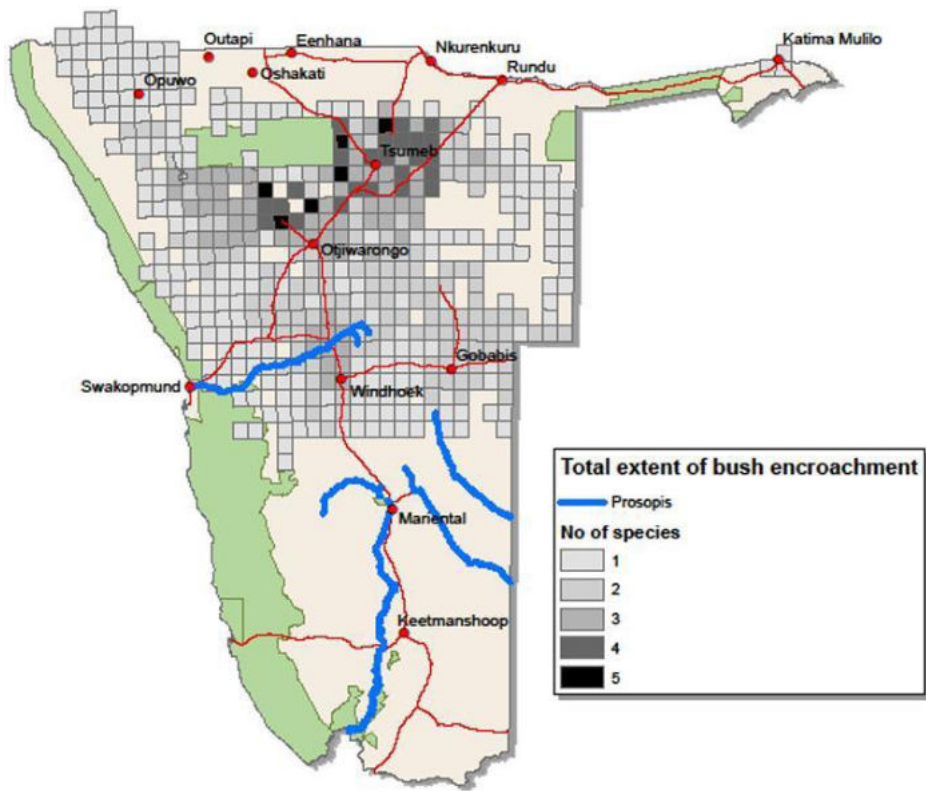


Figure 33: Extent of bush encroachment in Namibia (GIZ MAWF De-Bushing Project 2015).
NCA members among the farms surveyed in 2020

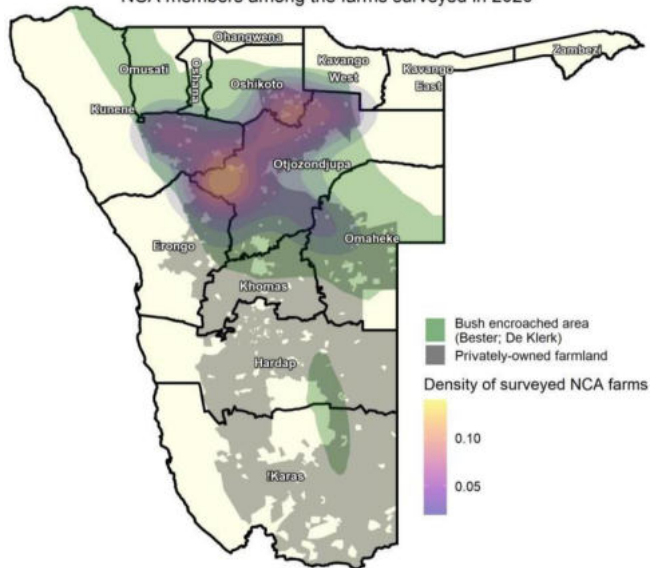


Figure 34: Density of farms engaged in debushing-biomass-charcoal advisory (Beck 2019).

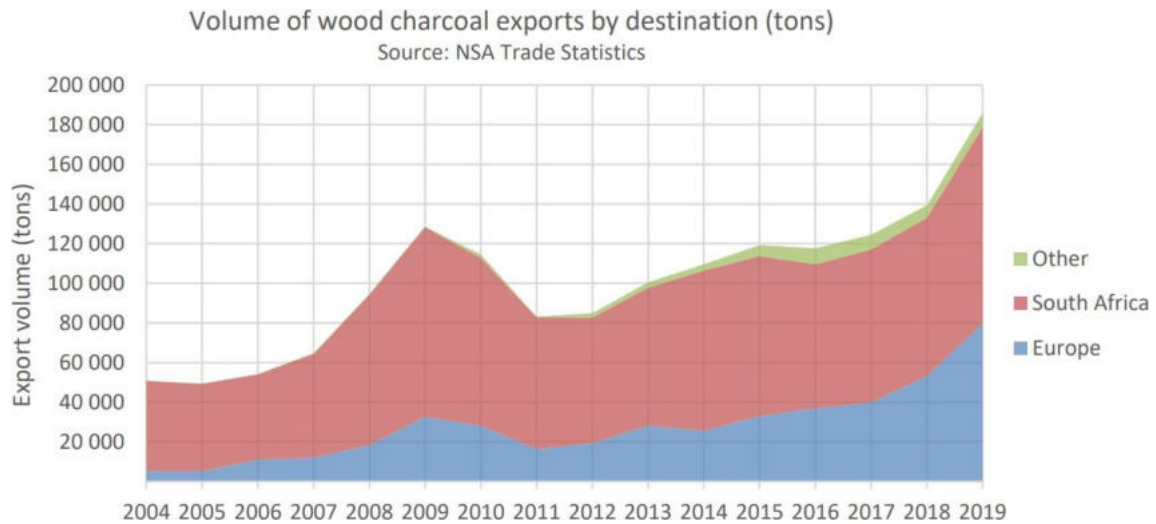


Figure 35: Charcoal production in Namibia over time (Beck 2019).

5.3 Human-wildlife conflict

As illustrated in Figure 36 below human-wildlife conflict is currently particularly prevalent in terms of livestock depredation and damage to infrastructure within and in the vicinity of the Ombonde Peoples Landscape, the Etosha West and South Landscape and the Geopark/Brandberg Landscape. Species most responsible for the conflict are lion, hyena and elephant. Tavolaro et al. (2022) only considered communal areas and did not quantify damage or depredation loss in economic terms. There is a need to quantify the losses and to investigate levels of human wildlife conflict in commercial farms within the landscapes. Additionally, mitigation of the conflict could be enhanced through a landscapes cooperative approach.

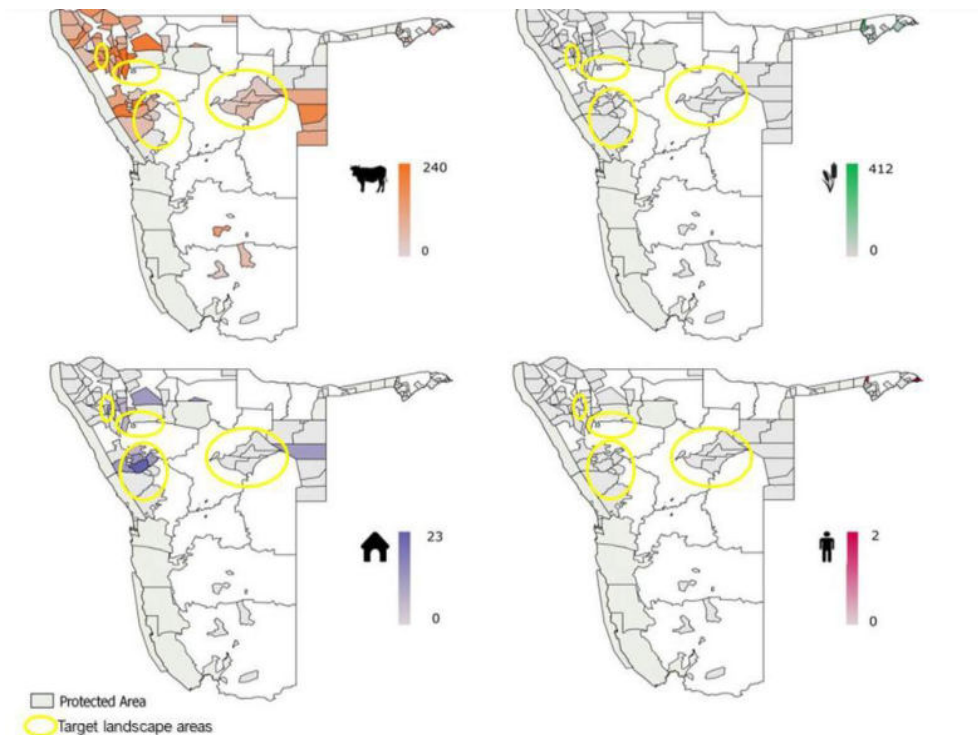


Figure 36: Human-wildlife conflict damage reports 2001-2019 (Tavolaro et al. 2022). Damage to livestock, crops, infrastructure and humans as per symbols).

5.4 Wildlife Poaching

Illegal trade and consumption of wildlife is a global threat which has contributed to the steep decline in most wildlife across the world. Although Namibia is not immune to this decline, the country has been one of the success stories in curbing the steep decline, and in fact, since the 1960s seen the recovery of populations of most species of wildlife. Currently Namibia's conservation efforts are lauded as world renown success story with wildlife in parks, private farms and communal areas being at healthy levels. Poaching is however an ever-present factor affecting wildlife populations and their associated economic benefits. Wildlife poaching takes a number of forms, and each requires specialized methods to tackle the challenge. These are:

- i) Opportunistic meat poaching;
- ii) Commercial meat poaching and trade;
- iii) Organised poaching of and trade in high value species.

Countering and preventing wildlife poaching is extremely costly and labour intensive, in addition to personal safety risk. This has been identified as a major concern particularly to private landowners who have becoming increasingly negative about the risk of owning or providing sanctuary for high value and high-risk species.

Table 2 below provides an estimate of levels of poaching within each of the landscapes, based on stakeholder consultation within the landscapes and with authorities and supporting institutions in Windhoek. It also considers a recent survey by the Namibia Agricultural Union (NAU) of stock theft and wildlife poaching on farmland.

Table 2: Estimate / suspicion of current poaching levels within the project landscapes.

Landscape	Opportunistic meat	Commercial meat	High value organized crime	
Etosha West and South	Moderate	High	High	The landscape includes critically important populations of black and white rhino, both in the national park and in several custodian properties. There have been and continues to be concerning levels of rhino poaching. Commercial game and livestock farmers have noted that organized meat hunting and trade is a problem in the landscape. Several arrests have been made in this regard, but the problem remains a concern.
Ombonde People's	Low	Low	Moderate	An important desert black rhino population exists in the landscape, it is however well protected through community and NGO supported programmes. Despite this there have been some poaching incidents.
Geopark/Brandberg	Moderate	Moderate	Low	Tourism concessionaires commented on frequent illegal hunting taking place in remote areas of the landscape, both in communal land and adjoining commercial farmland to the east. Desert elephants are a feature of the landscape, but there have not to date been poaching threats to the population. Close monitoring through field observations and collaring is a deterrent.
Waterberg	High	Moderate	Moderate	Being in the central savanna this landscape lies within the most productive in terms of wildlife productivity and growth. Similar to Etosha West and South, important populations of black and white rhino exists within the public and private protected areas. Concerns are similar to Etosha

				West and South. This landscape is also suspected (based on NUST research directly to the east of the landscape) to host a very high density of pangolins. Pangolin poaching is increasing at a fast rate , and it is suspected that much pangolin poaching is going undetected in commercial and communal areas within the central savanna.
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5.5 Habitat and landscape fragmentation (physical, ecological and management)

Although nearly half of Namibia is classified as having conservation or wildlife use as a major land-use, much of the area is still fragmented. This fragmentation is not only geographical, but also in management strategy and activity.

Through a Geographic analysis and stakeholder consultation the level of fragmentation within the landscapes is assessed in Table 3 below. This analysis was mostly subjective, and true landscape fragmentation and/or connectivity could be assessed as part of the research aspect of this project. Since wildlife movements are often indicators of fragmentation or connectivity, movement ecology and telemetry research could form an important part of this project's intervention. More detail relating to the management framework and opportunities is provided in Section 9 of this report.

Table 3: Landscape fragmentation estimate for identified landscapes.

	EWSL	OPP	WL	BL
Total area (km²) of landscape	26 088,9	1068,35	26 365,00	23 857,00
Area under conservation (km²)	12 526.8	1068,35 (Communal conservancies)	16 552.9	23 857,00 (Communal conservancies)
National Park (km²)	9 907.8 (portion of Etosha National Park)		395.7 (Waterberg Plateau Park)	
Communal Conservancy (km²)	5 596.6		16 157.2	23,857,00
Private Nature Reserve(km²)	757.0 (Ongava and Etosha Heights)		668.8 (B2Gold Otjikoto and CCF)	
Cooperative management	Communal conservancies cooperate informally under the North-West communal conservancy group. An informal	Communal conservancies cooperate informally under the North-West communal conservancy group	Landscape association constituted in 2008, has become inactive	No collaborative management or association. Erongo Small Miners Association (ERSMA) initiated by Ministry of

	<p>elephant management association has been initiated between commercial farmers in the Kamanjab district.</p> <p>Neighbours of Etosha National Park cite ad-hoc engagement of the park, mostly related to human-wildlife conflict and anti-poaching.</p>			<p>Mines and Energy in 2010 has become inactive</p>
<p>Major physical obstacles to continuous landscape area</p>	<p>Veterinary cordon fence, communal-commercial land boundary, individual farm boundaries, Etosha National Park boundary.</p>	<p>Uncoordinated and uneven waterpoint distribution</p>	<p>Communal-commercial boundary, individual farm boundaries, Waterberg Plateau Park boundary, Uncoordinated and uneven waterpoint distribution, illegal fencing in communal conservancies</p>	<p>Communal-commercial boundary, Uncoordinated and uneven waterpoint distribution</p>
<p>Major social / management obstacles to continuous landscape</p>	<p>Uncoordinated and uneven waterpoint distribution and management. Increasing conflict for grazing resources and increased human-wildlife conflict, fragmented human-wildlife conflict management, no legislative framework for commercial</p>	<p>Conflicting views of livestock vs wildlife livelihoods.</p>	<p>Uncoordinated and uneven waterpoint distribution, fragmented human-wildlife conflict management</p>	<p>Uncoordinated and uneven waterpoint distribution and management. Increasing conflict for grazing resources and increased human-wildlife conflict, fragmented human-wildlife conflict management, no legislative framework for commercial</p>

	conservancies, uncoordinated research not focusing on the biodiversity economy			conservancies, uncoordinated research not focusing on the biodiversity economy
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Modified from the measures for habitat fragmentation in Wang *et al.* (2014).

6 COMMERCIAL ACTIVITIES AND ENTERPRISES RELATED TO THE BIODIVERSITY ECONOMY WITHIN THE LANDSCAPES

6.1 Wildlife consumptive use and ecotourism

Wildlife-based land uses are common across all landscapes. Figure 37 below shows consumptive and non-consumptive wildlife activities on freehold land, with the approximate landscapes overlaid in yellow circles, while Table 3 based on a study of Peter Lindesay in 2011 puts these activities in perspective compared to livestock-based livelihoods. Current states and trends of wildlife and livestock-based activities and other biodiversity related economic enterprises from the baseline assessment are summarised in Table 3 below. In terms of biodiversity related economic and ecosystem services benefits to livelihoods, there is a strong bias towards livestock production and eco-tourism. This “all eggs in one basket” strategy carries risks in the event of changes in environmental or global market related crashes. Diversifying livelihoods should be a focus of the GIZ funded project. Table 4 details the number of activities within each potential bio-economic sector within the freehold and communal parts of each landscape. The diversity of activities identified during this baseline (in different types and not quantified amounts) within each landscape are graphed in Figure 21.

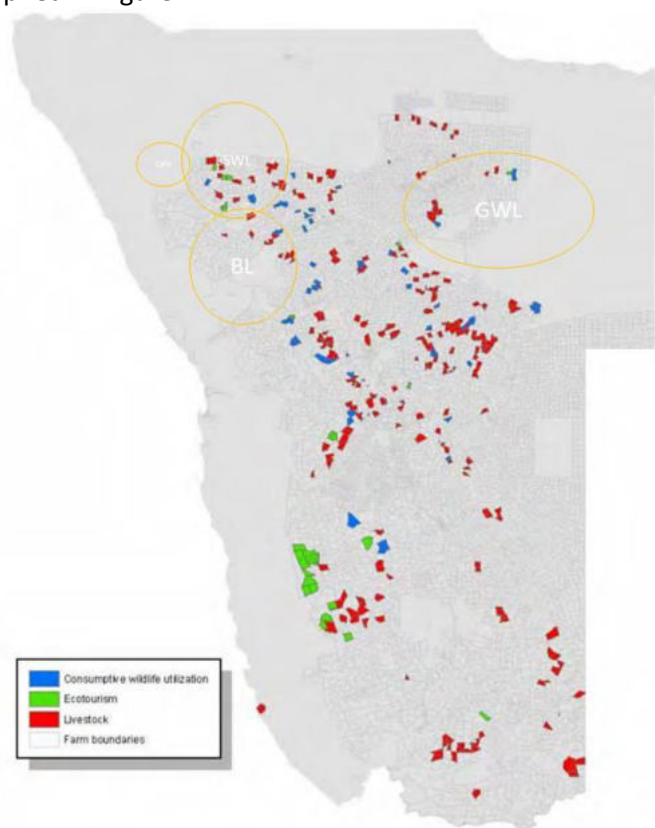


Figure 37: A sample of commercial activities on freehold farms using wildlife and livestock (Lindesay 2011).

Wildlife is utilized in various ways in the landscapes, and these are detailed per landscape in Table 4. Consumptive use through trophy hunting and meat hunting is an important economic activity in communal conservancies and privately owned game farms. It further brings income through permits and fees to the Ministry of Environment Forestry and Tourism for conservation activities. During the period 2019 – 2020 this amounted to N\$ 2 277 650.

Of concern however is that the western landscapes have not yet recovered from the most severe drought in living memory. Particularly huntable and meat production species wildlife species have declined steeply (2018-2020) and their potential consumptive valuable to these landscapes is currently very low.

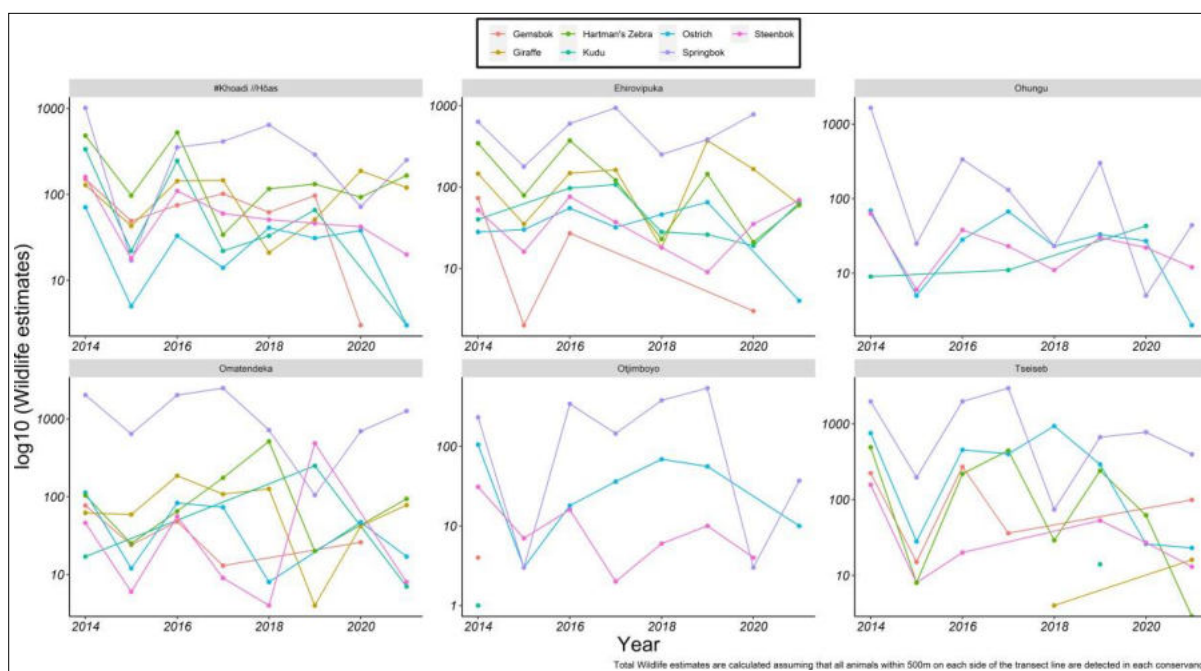


Figure 38: Wildlife trends in communal conservancies of the Etosha West and South Landscape, Ombonde People's Landscape and Geopark/Brandberg Landscape between 2014 and 2021. Wildlife numbers in the communal conservancies of the Waterberg Landscape are very low and not monitored according to our findings.

Table 4: Percentage of commercial farms using wildlife commercially (Lindesay 2011).

Region *	Total area	Safari hunting		Ecotourism		Wildlife based land uses		Pure wildlife (livestock absent)	
		% of farms	km ²	% of farms	km ²	% of farms	km ²	% of farms	km ²
Erongo	21 729	50.0	10 865	20.0	4346	80	17 383	10.0	2173
Hardap	78 156	30.0	23 447	20.0	15 631	95	74 248	10.0	7816
Karas	86 764	50.0	43 382	40.7	35 313	100	86 764	10.7	9284
Khomas	32 349	29.2	9446	29.2	9446	83.3	26 947	16.7	5402
Kunene	26 199	14.8	3877	40.7	10 663	44.4	11 632	0	0
Omaheke	36 690	8.3	3045	8.3	3045	50	18 345	16.7	6127
Omusati	802	14.8	119	40.7	326	44.4	356	0	0
Oshana	550	14.8	81	40.7	224	44.4	244	0	0
Oshikoto	7054	14.8	1044	40.7	2871	44.4	3132	0	0
Otjozondjupa	66 239	48.9	32 391	9.8	6491	73.2	48 487	2.4	1590
Total/average	356 532	35.8	127 697	29.1	88 357	80.7	287 539	9.1	32 392

6.2 Indigenous plants of economic importance

The landscapes are rich in various indigenous plants that have some economic value and most communities at to some extent involved in their exploitation, although at a small scale. The distribution of these within each landscape are mapped in Figure 39 below. More details are provided about enterprises surrounding their use in Table 5 below.

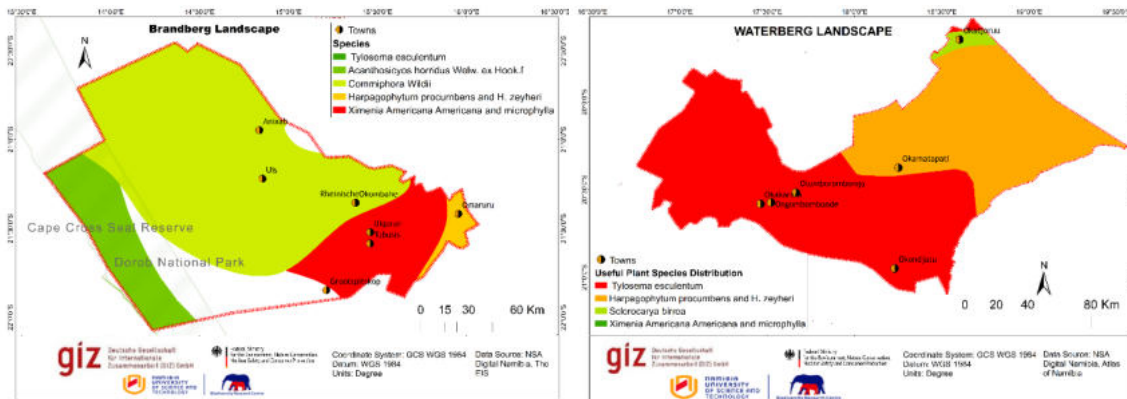


Figure 39: The distribution of indigenous plants of economic importance in the two landscapes where they are most important.

6.3 Range of Biodiversity economic enterprises

The field and desktop assessment identified enterprises which rely on the biodiversity economy, and details of these are provided in Table 5 below. Figures 40 and 41 illustrate the current diversity of enterprises within each landscape as well as the percentage of all possible enterprises identified during this study which the landscapes are currently pursuing.



Figure 40: Number of different types of enterprises currently practiced in each landscape.

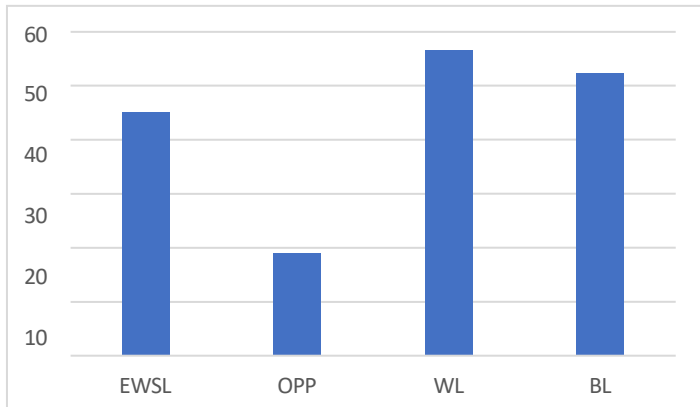


Figure 41: Percentage (y axis) of all possible biodiversity economic enterprises engaged in within the landscapes.⁵

⁵ This only includes enterprises considered viable in each landscape – e.g. grass cutting, and sale is not possible in the low rainfall Ombonde People’s Landscape and Geopark/Brandberg Landscape.

Table 5: Eco-entrepreneurial enterprises currently benefiting from services within the landscape, and potential enterprises from landscape level cooperative management.

Area/sector/specific ecosystem service	Biodiversity enterprises related	EWS	OPPL	WBL	BLL	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
Hunting	Taxidermy	0	0	0	0					Although trophy hunting is prevalent in all the landscapes, processing and taxidermy of trophies is all practiced outside of the landscape
	Trophy hunting	5	2	4	3	≠Khoadi-//Hôas,Ehi-Rovipuka Conservancy, Etosha-view Hunts (Voluiga Farm), Rex's Hunt Estreux Safaris, based near Kamanjab, Wildveld Safaris, Windpoort Hunts, KBS Hunting	Ehrovipuka Conservancy, Omatendeka Conservancy Estreux Safaris,	Waterberg Plateau, Jamy Traut Safaris, Ozonjahe Safaris,	Tseiseb Conservancy, Otjimboyo Conservancy,Oh ungu Conservancy, Nick Nolte Safaris, Omuwiwe Hunting Safaris, African Hunting Safaris, Gert vd Walt Hunting Safaris,	Hunting permits are linked to farms. Many animals move across multiple farms. This limits hunting success of these species. Landscapes should lobby for changes in regulations that hunting permits or "tags" be permitted at landscape level with multiple beneficiaries
	Commercial venison and venison product processing	1	0	0	0	Kamanjab butchery is the only known commercial				There is an opportunity for small venison

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
							venison and venison product production.				beneficiation enterprises (salamis, biltong, droewors, smoked meat etc.) instead of exporting raw product
Wildlife live sales and translocation	Wildlife Auction facilities (pens, bomas)			1					Waterberg Park has a high-quality facility but it is not available or accessible to other members of the landscape as a result of strict disease regulations as a result of buffalo presence Du Preez Wild has an auction facility within 50km of the landscape		With high numbers of wildlife in the Waterberg, an auction facility is possibly feasible for live sales and translocations. The feasibility of this in the Etosha South-West landscape should be investigated. This landscape is the gateway between Namibia's central farms and the communal conservancies and concessions of the north-west.

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
	Live sales of wildlife		5		5		All trophy hunting farms listed above also sell animals live occasionally, but not as a main activity	No live sales of wildlife	All trophy hunting farms, and Otjikoto (B2Gold), where trophy hunting is not conducted	No live sales of wildlife	Conservancies are conspicuously absent from the wildlife auction enterprise in Namibia. Targeted sales of animals focusing on the competitive advantage of conservancies (strong genetic diversity, extensive unmodified populations) should be supported.
	Breeding of high value wildlife species		4		5		Etosha Heights, Ermo, Kaross, Kaoko Bush Lodge,		Waterberg Plateau Park, Klawerberg, Wabi, Frans Indongo Lodge, Mundulea		Allowing private ownership and breeding of disease-free buffalo is possibly the largest economic opportunity for private game farms. It does

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E S W L	O P P L	W L L	B L L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
											hold risk to cattle farming. A risk assessment and feasibility study could be considered
Woody biomass	Boskos (livestock feed from chipping wood and adding supplements)			1			Individual farmers produce boskos for own use		Individual farmers produce boskos for own use.		
	Woodchip to barbecue brickets			1					Cheetah Conservation Fund		
	Charcoal production	E s t i m a t e d 4 0 % of freeholders farms		E s t i m a t e d 2 5 % of freeholders farms			Following the prolonged drought and availability of Mopani wood, many farmers turned to charcoal production in the later part of the 2010s		Charcoal production has been a long-term activity across the landscape as a debushing activity to supplement livelihoods.		Communal conservancies in the Waterberg Landscape could take more initiative and a lead in involving large charcoal producers and exporters. Possible conservation levy on such charcoal, including an endorsement from the conservancy for marketing of charcoal from conservancies

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
				r m s							
	Charcoal transport, packaging and bricket production	2		4			Charcoal producers sell to: Unifoods, Etosha Charcoal,		Charcoal producers sell to: Makarra, Jumbo, Carbology, Invader Bush Charcoal, NRC, JJ Lepen		All packaging, beneficiation and export conducted from major towns, none within the landscapes. Landscape conservation friendly branding
	Wood building material production										
	Debushing Services			1					Ombengu Bushroller		
	Lease of harvesting equipment										Farmers in commercial areas lease equipment to each other
	Energy production								Ombengu Energy		Kholbach manufactures small energy production units, could be a business opportunity
	Firewood			1			Various – mostly Mopani wood on commercial farms only		Various, mostly blackthorn, redthorn and		The cost of transportation of wood to major markets

Area/sector/specific ecosystem service	Biodiversity enterprises related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
								sickle bush – on commercial farms		(Oshakati, Windhoek, Walvis-Bay) mostly preclude communal farms to participate
	Biochar	1	0	0	0	As a by-product of charcoal processing and packaging Uni-Foods uses biochar on vegetable gardens, and although this is in Outjo outside the landscape, most of the charcoal in produced in the landscape				Only Namchar, situated outside the landscapes in Omaheke but marketed by a South African company
Medicinal and cosmetic plant products (Phytotrade)	Indigenous plant species occurring within the landscapes which are harvested	5	3	4	2	<i>H procumbens</i> , <i>Scletocarya birrea</i> , <i>Ximania</i> , <i>Commiphora wildii</i> , <i>C.Mopane</i>	<i>Ximania Americana</i> , <i>Commiphora wildii</i> , <i>C. Mopane</i>	<i>H procumbens</i> , <i>Ximania Americana</i> , <i>Scierocarya birrea</i> , <i>Ximania crd</i>	<i>Ximania</i> , <i>Commiphora wildii</i> ,	Self harvesting tours – or guided non-consumptive botanical tours
	Manufacture of plant-based medicines	0	0	0	0					Beneficiation, export and marketing of raw product. Currently there are companies in Namibia, but outside of the landscapes: Green Oryx Wellness, M&M Oils, Zambezi

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E W SL	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
											Phyotrading, Spruce Cosmetics, Pure Delight, Procumbens exporters Namibia, Fabupharm. Research to understand the economics of such companies and the feasibility for similar within the landscapes should be pursued
	Conservation farming				1	1			Cheetah Conservation Fund	Krenzon Farm	
Tourism	Accommodation		6 7		1 4	9	Anderson Camp, Bambatsi Guestfarm, Dolomite Camp, Eagle Tented Lodge & Spa, Eldorado, Emanya Etosha Lodge, Epacha Game Lodge & Spa, Etosha Oberland Lodge, Etosha Heights Game Safaris (PTY) LTD, Etosha Safari Lodge, Gastefarm Otjitambi, Grootberg Lodge, Gelbingen Lodge	None specifically within the pre-conceived boundaries of the park, but in the vicinity are: Okamutati Campsite, Khowarib Lodge, Grootberg	Aloegrove Safari Lodge, Babson House, Cheetah Conservation Fund -lightfoot camp, Cheetah Conservation Fund guesthouse, Frans Indongo Lodge, Kambaku Safari lodge, Kamrav Guest Farm, Omega Rest Camp,	Brandberg Rest Camp, Brandberg Elephant Rock Campsite, Brandberg White Lady Lodge, Ugab River Rhino Camp, Ozohere Campsite, Konigstein Guesthouse,	

Area/sector/specific ecosystem service	Biodiversity enterprises related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
						& Safaris, Harnas Wildlife Foundation Lodge, Health & Aroma Wellness Centre CC T/A Farm Robyn, Hoada Community Campsite, Hobatere Lodge, Holstein Hunting and Guest Farm, Huab Lodge, Kamanjab Restcamp, Kamanjab Trophy Hunting, Kaross Hunting, Kavita Lion Lodge, Kifaru Bush Camp, Kifaru Luxury Lodge, King Nehale Lodge, Klein Liechtenstein Guest Farm, Leopard Legend Hunting Safaris, Little Ongava, Maria Bed & Breakfast, Mushara Villa, Maria Bed & Breakfast, Oase Garni Guest House, Ohorongo Hunting Safaris Cc, Naua Naua Game Lodge & Safaris, Okatara Hunting Safaris, Okaukuejo Restcamp, Okutala Etosha Farmhouse, Okutala Lodge, Ongango Safaris of Namibia, Ongava Lodge, Ongava Tented Camp, Olifantsrus Campsite, Onjowewe Lodge, Oppi Koppi Restcamp, Porcupine	Lodge, Hoada Campsite.	Wabi Game Lodge, Waterberg Plateau Campsite, Waterberg Rest Camp, Waterberg Wilderness lodge, African Wilderness Trails CC	Khaus Lizenstein, Vickys Coffee Shop, Daureb Craft and Brandberg Mountain Guides, The White Lady B&B, Ehra Eco Camp & Tsaurob Valley	

Area/sector/specific ecosystem service	Biodiversity enterprises	related	E S W L	O P P L	W L	B L	Detail: EWSL	Detail: OPPL	Detail: WL	Detail: BL	Opportunities for project
							Camp, Rexes Hunting, Rustig Toko Lodge, Safari Hoek Trophy Hunting, Sakaite Selfcatering, Seringhetti Tourism Etosha Mountain Lodge, Sebra Hunting Safaris, Stillerus Hunting Farm,Tandala Ridge Lodge, Toshari Lodge, Tauluka Safari Lodge, Tarentaal Guestfarm, Terra Africana Safaris CC, Untamed Hunting Safaris CC, Vieranas Safaris, Viglietti Safaris, Volouiga Farming, Vreugde Guestfarm, Westfalen Hunting, Zebra Pen Safaris				
	Volunteer tourism				1	1			Cheetah Conservation Fund (CCF),	Elephant-Human Relations Aid (EHRA)	An activity driven by NGOs, involvement with conservancies in the landscapes are already established but could be expanded.

7 EXISTING SUPPORT-PROJECTS AND RESEARCH RELATING TO THE BIODIVERSITY ECONOMY

The table below gives an inventory of research and Non-Governmental Organisation (NGO) conservation and livelihood support within and in the vicinity of the landscapes. The last column provides an indication of whether activities support the biodiversity economy of areas where they have a presence. Of the 20 organisations or projects listed, only 30% seem to support or research aspects of the biodiversity economy.

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Integrated Rural Development and Nature Conservation (IRDNC)	x	x			Medicinal plants, wildlife counts, crafts, trophy hunting, concessions, fisheries, human-wildlife conflict management support	Medicinal plants, wildlife counts, trophy hunting, human-wildlife conflict management support			Yes
Conservancies Association of Namibia (CANAM)	x	x	x	x	Wildlife utilisation such as live game capture, trophy hunting, hunting for own use, game counts. Rehabilitation of ecosystem, protecting certain species (fauna and flora), anti-poaching		Wildlife utilisation such as live game capture, trophy hunting, hunting for own use, game counts. Rehabilitation of ecosystem, protecting certain species (fauna and flora), anti-poaching		Yes, but not formally, many opportunities exist if CANAM is approached and guided

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Cheetah Conservation Fund (CCF)			x				<p>Research: cheetah's life cycle, biology and genetics, behaviour demographics, home ranges, reintroduction, human-wildlife conflict, agriculture, and biomass energy. Trained scat detection dogs help CCF geneticists find cheetah scat in the field. Monitors cheetah's population: through radio-telemetry, spoor track counts and camera traps. Biomass: briquette logs, charcoal hex logs, lump charcoal, wood pellet production. Education of HWC-Livestock guarding dogs. Removal and relocation of cheetah</p>		Yes

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
							from areas where they cause HWC.		
Desert Lion Conservation Trust	x	x		x	Manage human-lion conflict: Developed "early-warning" systems and the erecting of suitable lion-proof corrals. Implementation of "Satellite Logger Unit" which monitors lion movements, download GPS data stored on lion collars, and relay the information via satellite to the Central Server. Community is alerted when the animal is moving in close proximity to their residences.	Manage human-lion conflict: Developed "early-warning" systems and the erecting of suitable lion-proof corrals. Implementation of "Satellite Logger Unit" which monitors lion movements, download GPS data stored on lion collars, and relay the information via satellite to the Central Server. Community is alerted when the animal is moving in close proximity to their residences.		Manage human-lion conflict: Developed "early-warning" systems and the erecting of suitable lion-proof corrals. Implementation of "Satellite Logger Unit" which monitors lion movements, download GPS data stored on lion collars, and relay the information via satellite to the Central Server. Community is alerted when the animal is moving in close proximity to their residences.	No
Eco Awards Namibia	x	x	x	x	Incentivises environmentally sustainable tourism in Namibia	Incentivises environmentally sustainable tourism in Namibia	Incentivises environmentally sustainable tourism in Namibia	Incentivises environmentally sustainable tourism in Namibia	Not presently, but opportunities exist to

									incentivize low-impact tourism more
Elephant-human Relations Aid (EHRA)	x			x	Provide practical solutions to elephant-human conflict and affected areas			Provide practical solutions to elephant-human conflict and affected areas	No
Giraffe Conservation Foundation (GCF)	x	x		x	Giraffe monitoring - movements, population evaluation	Giraffe monitoring - movements, population evaluation		Giraffe monitoring - movements, population evaluation	No
Namibian Association for CBRNM Support Organisations (NACSO)	x	x	x	x	Provide quality services to rural communities seeking to manage and utilise their natural resources in a sustainable manner, advice on governance and institutional issues, on natural resources management and assistance with financial and business planning.	Provide quality services to rural communities seeking to manage and utilise their natural resources in a sustainable manner, advice on governance and institutional issues, on natural resources management and assistance with financial and business planning.	Provide quality services to rural communities seeking to manage and utilise their natural resources in a sustainable manner, advice on governance and institutional issues, on natural resources management and assistance with financial and business planning.	Provide quality services to rural communities seeking to manage and utilise their natural resources in a sustainable manner, advice on governance and institutional issues, on natural resources management and assistance with financial and business planning.	Yes

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Namibia Biomass Industry Group (N-BiG)	X		x		Charcoal, de-bushing services, biomass/boskos		Charcoal, de-bushing services, biomass/boskos		Yes

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy	
Namibia Nature Foundation	x	x		x	Involved in developing management and utilization plans for communal conservancies	Supported projects: Extend Rhino Ranger patrols with Save The Rhino Trust. Awareness creation on HWC and supporting compensation schemes. Population and evolutionary ecology of mountain zebra throughout Namibia. Natural Ecosystems and Biodiversity: Awareness of carnivore conflicts.			Supported projects: Extend Rhino Ranger patrols with Save The Rhino Trust. Awareness creation on HWC and compensate affected persons. Population and evolutionary ecology of mountain zebra throughout Namibia. Natural Ecosystems and Biodiversity: Awareness of carnivore conflicts. Monitoring and ringing Lappet-faced vultures, to ID, track and determine population trends in Namib-Nauklufit Park. Mountain zebra conservation.	Yes

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Namibia Professional Hunting Association	x	x	x	x	Promoting ethical hunting and certification of professional hunters and hunting guides	Promoting ethical hunting and certification of professional hunters and hunting guides	Promoting ethical hunting and certification of professional hunters and hunting guides	Promoting ethical hunting and certification of professional hunters and hunting guides	Yes
NUST	x	x	x	x	Wildlife movements, bush encroachment, rangeland management, biodiversity assessment, wildlife collaring and monitoring, Camera trapping.	Wildlife movements, biodiversity assessment, wildlife monitoring.	Wildlife movements, biodiversity assessment, wildlife monitoring.	Wildlife movements, biodiversity assessment.	No
Ongava Research centre	x				Monitoring rare and endangered species - Rhino, camera trapping, wildlife tagging -movements and home range.				No

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Otjikoto Environmental Education Centre at B2Gold			x				Wildlife studies and environmental education		No
Kalahari African Wild-dog Trust			X				Supporting communities in communal area with management of human-wild-dog conflict		No
MEFT Etosha Ecological Institute	x				Management and scientific research for the past 50 years. Less research has been conducted in the west (Etosha South-West Landscape).				No
Etosha Carnivore Programme	x				Not yet started at the baseline assessment stage. The project will look at various aspects of large carnivore ecology in Etosha National Park				No

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy	
Save The Rhino Trust (SRT)	x	x		x	SRT provides consistent patrolling and monitoring of black rhino in the Kunene. This ensures the long-term security of the desert-adapted black rhino and prevents poaching or other illegal activities. Monitor and report on black rhino numbers, distribution, human and wildlife conflict, and Human-induced Disturbances. Compile and update data using photos, wildlife sightings and field operations.	SRT provides consistent patrolling and monitoring of black rhino in the Kunene. This ensures the long-term security of the desert-adapted black rhino and prevents poaching or other illegal activities. Monitor and report on black rhino numbers, distribution, human and wildlife conflict, and Human-induced Disturbances. Compile and update data using photos, wildlife sightings and field operations.			SRT provides consistent patrolling and monitoring of black rhino in the Kunene. This ensures the long-term security of the desert-adapted black rhino and prevents poaching or other illegal activities. Monitor and report on black rhino numbers, distribution, human and wildlife conflict, and Human-induced Disturbances. Compile and update data using photos, wildlife sightings and field operations.	Yes

Support, research, and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Tourism Supporting Conservation (TOSCO) Trust	x	x	x	x	<p>Research supported: Lion conservation-study lion's ecology, population, behaviour, biology and adaptation.</p> <p>Information used to find a solution to human-lion conflict, to elevate the tourism value of lions, and to contribute to the conservation of the species. Desert elephant population and genetics. Behavioral ecology and population dynamics of brown hyaenas in the Namib Desert. Mitigate or reduce the conflicts between humans and snakes through snake by translocation of snakes.</p>	<p>Research supported: Lion conservation-study lion's ecology, population, behavior, biology and adaptation.</p> <p>Information used to find a solution to human-lion conflict, to elevate the tourism value of lions, and to contribute to the conservation of the species. Desert elephant population and genetics. Behavioral ecology and population dynamics of brown hyaenas in the Namib Desert. Mitigate or reduce the conflicts between humans and snakes through snake by translocation of snakes.</p>		<p>Research supported: Lion conservation-study lion's ecology, population, behavior, biology and adaptation.</p> <p>Information used to find a solution to human-lion conflict, to elevate the tourism value of lions, and to contribute to the conservation of the species. Desert elephant population and genetics. Behavioral ecology and population dynamics of brown hyaenas in the Namib Desert. Mitigate or reduce the conflicts between humans and snakes through snake by translocation of snakes.</p>	Indirectly , but opportunities exist for its inclusion

Support, research and NGOs	EWSL	OPPL	WL	BL	EWSL	OPPL	WL	BL	Supports bio-economy
Venture Media	x	X	x	x	To publish awareness and promotional material on conservation activities and research and tourism	To publish awareness and promotional material on conservation activities and research and tourism	To publish awareness and promotional material on conservation activities and research and tourism	To publish awareness and promotional material on conservation activities and research and tourism	No

8. SUMMARY BASELINE BIODIVERSITY MANAGEMENT WITHIN THE LANDSCAPES

Name	Type	Size: km ²	Management Plan in place	Effective management and governance ⁶	Compliant with MEFT SOP (for communal conservancies)	Main threats
Etosha West and South Landscape						
Etosha National Park	National Park	9908 (portion within landscape)	Yes	Reasonable	NA	Poaching, localised over-tourism, weak neighbour relations
#Khoadi-//Hoas	Communal conservancy	3364 (only a portion is within the landscape)	Yes	Strong	Yes	Human-wildlife conflict, increase in large predator numbers and consequently human-wildlife conflict, commercial poaching
Ehi-Rovipuka	Communal conservancy and community forest	1980	Yes	Strong	Yes	Human-wildlife conflict, increase in large predator numbers and consequently human-wildlife conflict, commercial poaching

⁶ Communal Conservancy 2019 audit results were used

Name	Type	Size: km ²	Management Plan in place	Effective management and governance ⁶	Compliant with MEFT SOP (for communal conservancies)	Main threats
Ombonde People's Landscape						
Ehi-Rovipuka	Communal conservancy and community forest	1980	Yes	Strong	Yes	Human-wildlife conflict, increase in large predator numbers and consequently human-wildlife conflict, commercial poaching
Omatendeka	Communal conservancy	1619	Yes	Strong	Yes	Increase in human-wildlife conflict, springbok and oryx numbers falling
Geopark/Brandberg						
#Gaingu	Communal conservancy	7731	Spitzkoppe area management plan only	Poor	No	Falling wildlife numbers, unregulated and illegal small-scale mining
Tsiseb	Communal conservancy	7913	Game management and Utilization Plan	Reasonable- strong	No	Subsistence and commercial poaching, decrease in springbok, oryx

Name	Type	Size: km ²	Management Plan in place	Effective management and governance ⁶	Compliant with MEFT SOP (for communal conservancies)	Main threats
Doro !Nawas	Communal conservancy	3978	Yes	Reasonable	No	Human-wildlife conflict, decrease in springbok, oryx
/Uibasen Twyfelfontein	Communal conservancy	286	Yes, includes World Heritage Site	Strong	Yes	Tourism impacts, decrease in overall wildlife numbers
						and ostrich numbers, increase in large carnivores (leopard and lion)
Sorris-Sorris	Communal conservancy	2290	Yes	Strong	No	Increase in predator human-wildlife conflict
Ohungu	Communal conservancy	1211	No	Reasonable-strong	No	Low wildlife numbers
Otjimboyo	Communal conservancy	448	Yes	Strong	No	Jackal numbers and therefore livestock Depredation

Name	Type	Size: km ²	Management Plan in place	Effective management and governance ⁶	Compliant with MEFT SOP (for communal conservancies)	Main threats
Waterberg Landscape						
Waterberg Plateau Park	Game Park	398	Yes, but outdated	Reasonable to strong	NA	Not a declared national park, poaching, neighbour relations – especially relating to perceived buffalo disease threats
Ozonahi	Communal conservancy	3204	Yes	Poor to reasonable	No	Increase in predators and consequently human-wildlife conflict, very low wild herbivore
						numbers, illegal fencing, bush encroachment, wildfires
Otjituou	Communal conservancy and community forest	6133	Yes	Very poor	No	Wild dog conflict and consequently human-wildlife conflict, very low wild herbivore numbers, illegal fencing, bush encroachment, wildfires

Name	Type	Size: km ²	Management Plan in place	Effective management and governance ⁶	Compliant with MEFT SOP (for communal conservancies)	Main threats
Okamatapati	Communal conservancy	3096	No	Very poor	No	Wild dog conflict, very low wild herbivore numbers, illegal fencing, bush encroachment, wildfires
African Wild Dog	Communal conservancy and community forest	3824	Yes	Reasonable-good	No	Increase in jackal conflict, very low wildlife numbers

9. INDICATORS AND MONITORING FRAMEWORK

In relation to the targets, timing and impact of the project, these were largely set before the baseline report, due to the restricting impact of Covid-19 on the development of the project proposals, negotiation of contracts, funding acquisition and field work. It is our recommendation (although possibly not practicable) that implementation extends beyond even the 2024 period. Relationships with stakeholders and adoption of new concepts and enterprises tends to take time and grow organically.

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
1. Project administration <i>Impact logic</i> <i>Output:</i> Coordination of research project <i>Target:</i> NUST, UNU <i>Timing:</i> 2020 – 2023 (- 2024 in case of cost-neutral extension) <i>Impact:</i> Knowledge sharing, strengthening capacity of NUST						
1.1. Coordinating and academically supervising the research partnership jointly with the other project partners	<ul style="list-style-type: none"> Number of institutions collaborating Number of collaborative research projects Number of academic or technical manuscripts produced 	Quantitative Quantitative Quantitative	No collaborative research on biodiversity economy and landscapes	<ul style="list-style-type: none"> NUST capacity strengthened 	Qualitative	No multidisciplinary biodiversity related economic courses or research
1.2. Strengthening NUST's institutional capacity as an interdisciplinary research center jointly with the other project partners	<ul style="list-style-type: none"> Number of masters and PhD students Number of collaborations with institutions specializing in 	Quantitative Quantitative	No masters and PhDs funded in aspects of biodiversity economics or landscape conservation	<ul style="list-style-type: none"> NUST's institutional capacity in biodiversity economics improved 		A name established in resource/bio economic-ecological integration

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
	biodiversity economics					
2. Stakeholder engagement <u>Impact logic</u> <i>Output:</i> Overview of relevant stakeholders, joint meetings, information calls & materials <i>Target:</i> Relevant stakeholders in biodiversity economy <i>Timing:</i> Initiate early, maintain throughout project <i>Impact:</i> Raising awareness for biodiversity economy in Namibia for relevant stakeholders						
2.1. Identifying and engaging stakeholders for research on biodiversity economy in Namibia	<ul style="list-style-type: none"> • Research stakeholders in the biodiversity economy at landscape and national level identified • Number of research stakeholders in the biodiversity economy at landscape and national level engaged 	<p>Qualitative</p> <p>Quantitative</p>	<ul style="list-style-type: none"> • No stakeholders identified and engaged by the project • No research stakeholders supporting biodiversity related economic research at landscape level 	<ul style="list-style-type: none"> • Biodiversity economy research mainstreamed in research programmes 	Qualitative	<ul style="list-style-type: none"> • Knowledge of the value of the biodiversity economy at landscape level improved. • Increased • Biodiversity economy research stakeholders engaged at landscape level • No research outputs

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
2.2. Engage stakeholders through workshops, attending farmers' union conservancy and park meetings, online updates, involvement in developing research questions, developing the baseline ecosystem services assessments for landscapes	<ul style="list-style-type: none"> Stakeholders in the biodiversity economy at landscape and national level identified Number of stakeholders reached in the 	Quantitative	No stakeholders engaged and awareness raised No ecosystem services assessments for landscapes, only a national inventory exists	<ul style="list-style-type: none"> Improved coordination and cooperation strengthened 	Qualitative	No involvement of the project. WL: Low level of cooperation EWSL: No landscape level cooperation. Kamanjab Farmers
	<ul style="list-style-type: none"> biodiversity economy at landscape and national level engaged Number of Ecosystem Services Assessments conducted 	Quantitative	0	<ul style="list-style-type: none"> Stakeholders more accepting of the landscape approach Stakeholders positive about engaging at landscape level as a result of biodiversity related economic benefits 		have an Elephant Management forum OPP: No formal park agreed to, informal interaction and idea building done

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
.3. Develop audiovisual, print and social media material for awareness raising and feedback	<ul style="list-style-type: none"> Regular awareness material produced Number of audiovisual outputs Number of print outputs 	<p>Qualitative</p> <p>Quantitative</p> <p>Quantitative</p>	<p>No materials</p> <p>The Environmental Economics Network of Namibia (EENN) is inactive since late 2020</p> <p>No awareness or educational materials on landscape cooperation or biodiversity economics or ecosystem services at landscape level</p>	<ul style="list-style-type: none"> Public awareness on the value of biodiversity improved Awareness of biodiversity value at landscape level improved Awareness of importance of landscape conservation in MEFT improved 	<p>Qualitative</p> <p>Qualitative</p> <p>Qualitative</p>	<p>Public generally not aware of landscape cooperation and conservation, or the role of biodiversity economics in improving livelihoods</p>
<p>3. Collection of baseline data for Biodiversity Economy project</p> <p><u>Impact logic</u></p> <p><i>Output:</i> Baseline data for specific Biodiversity Economy project indicators (see below)</p> <p><i>Target:</i> Eco-entrepreneurs, landscape associations,</p>						
<p>MEFT & NBEC, biodiversity economy companies</p> <p><i>Timing:</i> To be completed by 2023 (2024)</p> <p><i>Impact:</i> Provide foundation for informed decision-making in steering the biodiversity economy</p>						
3.1. Conducting scientific research for providing baseline data and analysis to support the evaluation of the following indicators:						

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
3.1.1. Outcome indicator 0.2: More than half of the eco-entrepreneurs involved in the eco-entrepreneur support measures (WP 1.4) confirm an improved value addition of their enterprises	<ul style="list-style-type: none"> Percentage of eco-entrepreneurs note value addition within each target landscape 	Quantitative	No value addition to eco-entrepreneurs in landscapes Baseline number and type of eco entrepreneurs (as in Table 2) of baseline report	<ul style="list-style-type: none"> Value added to eco-entrepreneurs at landscape level 	Qualitative	Eco-entrepreneurs unsupported, only standard tourism, hunting, livestock farming and charcoal exists. Benefits of tourism are mostly within Etosha National Park and Waterberg Park
3.1.1.1. Develop and implement student research projects which determine the baseline condition, dynamics and potentials for ecosystem value	<ul style="list-style-type: none"> Number of bursaries provided Number of research projects active Number of research projects completed Number of research articles, conference presentations or theses 	Quantitative Quantitative Quantitative	No baseline research by students No research projects by students No research articles No conference presentations No student theses	<ul style="list-style-type: none"> Student understanding of biodiversity economics improved Students capacitated to become bio-economists or economic ecologists Published information on biodiversity economics in Namibia 	Qualitative Quantitative Quantitative	

<p>3.1.1.2. Design questionnaires and analyze responses at selected time intervals (before the implementation of measure and two additional selected time points after the measure).</p>	<ul style="list-style-type: none"> • Questionnaires designed 	<p>Quantitative</p>	<p>No questionnaire</p>			
<p>Project outputs and outcomes</p>	<p>Process indicators</p>	<p>Measurement type</p>	<p>Baseline</p>	<p>Outcome indicators</p>	<p>Measurement type</p>	<p>Baseline</p>
<p>3.1.1.3. Identify potential value addition eco-enterprises and link to PhD research to consider their feasibility</p>	<ul style="list-style-type: none"> • Number of potential eco-enterprises linked to research 	<p>Quantitative</p>	<p>No eco-entrepreneurs supported by students</p>	<ul style="list-style-type: none"> • Eco-entrepreneurs feel supported by research to consider feasibility 	<p>Qualitative</p>	<p>Eco-entrepreneurs not supported and are unaware such support is available</p>

<p>3.1.2. Outcome indicator 0.3: More than 50% of the landscape associations which cooperate with the project have implemented effective conservation measures outlined in their new or revised management plans (effectiveness = positive impact on biodiversity)</p>	<ul style="list-style-type: none"> Percentage of landscape associations implemented new conservation measures 	<p>Quantitative</p>	<p>EWSL: No cooperative conservation measures Elephant management group exist only for early warning and government lobby, and only on commercial farms. No landscape level engagement No management plan for the landscape Management Plan for Etosha National Park, does not acknowledge the EWSL No baseline profiles No map depicting the area</p>	<ul style="list-style-type: none"> Improved conservation at landscape level 	<p>Qualitative</p>	<p>Landscapes are active and collaboration exists at multiple land-use or multiple conservancy level, eco-entrepreneurial and tourism potential gaps identified</p>
			<p>No agreement on landscape boundaries and stakeholders OPP: Management plans for individual conservancies developed Tourism potential not investigated beyond baseline Wildlife numbers are low</p>			

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
3.1.2.1. Coordinate with and support landscape strategy development and landscape operational programming in engaging landscape stakeholders and contribute to management planning and monitoring	<ul style="list-style-type: none"> • Number of meetings with landscapes • Number of additional management plans • Number of monitoring plans 	Quantitative		<ul style="list-style-type: none"> • Improved planning and monitoring at landscape level 	Qualitative	Minimal monitoring currently: EWSL – Annual game counts for conservancies OPP – Annual game counts for conservancies Geopark/Brandberg – Annual game counts for conservancies Register of small mining claims at MME WPP - None
3.1.2.2. Include conservation aspects in student research projects	<ul style="list-style-type: none"> • Number of student projects considering conservation aspects 	Quantitative	As 3.1.1.1	<ul style="list-style-type: none"> • Capacity of young researchers improved in conservation 	Qualitative	As 3.1.1.1
3.1.3. Two existing landscape associations have (effectively)	Two landscapes implemented 50% + of	Quantitative	Only WL has a management strategy	<ul style="list-style-type: none"> • Improved conservation 	Qualitative	Low level of cooperative

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
implemented 50% of the joint conservation and development measures outlined in their revised management plans towards a biodiversity economy	measures in their management plans		and plan, but not actively implementing it.	at landscape level		conservation at landscape level
3.1.3.1. <u>Monitoring of progress relating to joint conservation initiatives and cooperation between stakeholders</u>				<ul style="list-style-type: none"> Joint conservation improved 		
3.1.3.2. <u>Provision of technical assistance to developing joint conservation measures</u>	<ul style="list-style-type: none"> Number of technical reports 			<ul style="list-style-type: none"> Landscapes feel assisted technically in conservation 		
3.1.4. <u>Output indicator I.3: At least 75% of the supported eco-entrepreneurs confirm the application of knowledge attained in the biodiversity-economy business school</u>	<ul style="list-style-type: none"> Business school held Percentage of eco-entrepreneurs applying knowledge from the business school 	Quantitative	0			
3.1.4.1. <u>Research results shared with eco-entrepreneurs</u>	<ul style="list-style-type: none"> Number of research presentations or posters shared 	Quantitative	0			

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
3.1.5. Output indicator II.1: Measures that support biodiversity-friendly business practices are introduced into	<ul style="list-style-type: none"> Number of biodiversity-friendly businesses 	Quantitative	See Table 2	<ul style="list-style-type: none"> Knowledge support provided to eco-entrepreneurs 	Qualitative	No knowledge support
relevant sectors or value chains						
3.1.5.1. Training in using the natural capital protocol	<ul style="list-style-type: none"> Training course delivered Number of attendees 	Quantitative	0			
3.1.5.2. Production and dissemination of audio-visual and print material for practical use by industry	<ul style="list-style-type: none"> Number of support materials produced 	Quantitative	0			
3.1.6. Output indicator III.3: Key elements for further developing the biodiversity economy have been submitted by MET / the NBEC for integration into Namibia's next National Development Plan (NDP6)				<ul style="list-style-type: none"> Integration of biodiversity economy and ecosystem services into NDP6 	Quantitative	No integration of biodiversity economy in NDP
3.1.6.1. Formulating of policy briefs	<ul style="list-style-type: none"> Number of policy briefs 	Quantitative	0			
3.1.6.2. Engagement with NDP6 development plan or partners conducting the Strategic Environmental Assessment for the Plan.	Number of engagements with NDP6 and SEA developers	Quantitative	0			

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
3.1.7. Action indicator AE (Action Ecosystems): Area of ecosystems improved or protected by program measures				<ul style="list-style-type: none"> Land area protected 	Quantitative	
3.1.7.1. Developing monitoring approach				<ul style="list-style-type: none"> Monitoring and adaptive management approach applied in conservation 		
3.1.7.2. Collecting baseline data	<ul style="list-style-type: none"> Baseline data collected 	Quantitative	No baseline data			
3.1.7.3. Collecting monitoring data and evaluate them	<ul style="list-style-type: none"> Ongoing monitoring and evaluation of data 	Qualitative	A system to monitor is in place, and analysis and evaluation reports produced			
4. Assessment of ecosystem services for Biodiversity Economy Project <u>Impact logic</u> <i>Output:</i> Baseline data on ecosystem services in landscapes <i>Target:</i> Landscapes, NCBE secretariat <i>Timing:</i> To be completed by 2023 (2024) <i>Impact:</i> Provide foundation for informed decision-making at landscape level	<ul style="list-style-type: none"> 					
4.1. Activity III.3.2: Assessing the status of ecosystem services at landscape level with the intention of establishing sustainable service yields, identifying underutilized services, and areas requiring investment for enhanced conservation	<ul style="list-style-type: none"> Identifying state of ecosystem services in landscapes Underutilized ecosystem services identified 	Qualitative		<ul style="list-style-type: none"> Ecosystem services at landscape level better and sustainably utilized 		

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
4.1.1. Student Masters projects to conduct baseline assessments as a major part of their studies	<ul style="list-style-type: none"> Baseline ecosystem services assessed in student studies 	Quantitative	0			
4.1.2. E.g. assessing the status of charismatic	Number of studies assessing	Quantitative	0	Key species conserved and	Qualitative	Flagship species considered and used
	<ul style="list-style-type: none"> 			<ul style="list-style-type: none"> 		
keystone / flagship species to support their sustainable utilization based on their biodiversity value	flagship, keystone or charismatic species			applied economically at landscape level		economically in landscapes for conservation and livelihoods
4.2. <u>Activity III.3.4:</u> Supporting the secretariat of the Biodiversity Economy Committee in the monitoring of progress based on the baseline data for biodiversity economy in the landscapes developed in Activities III.3.2 and 3.3	<ul style="list-style-type: none"> Biodiversity economy committee meets quarterly? 	Quantitative	No committee	<ul style="list-style-type: none"> Biodiversity Economy Committee effectively monitors biodiversity economic and conservation benefits of landscapes 	Qualitative	

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
<p>5. Supervision of researchers</p> <p><u>Impact logic</u></p> <p><i>Output:</i> Scholarships, supervision, five theses on topics related to biodiversity economy</p> <p><i>Target:</i> Researchers of NUST, UNU-FLORES, TU Dresden</p> <p><i>Timing:</i> To be completed by 2023 (2024)</p> <p><i>Impact:</i> Strengthen knowledge base about biodiversity economy and generate capacity of future generations, strengthening the interdisciplinary research landscape of Namibia in biodiversity economy</p>						
<p>5.1. Awarding scholarships for bachelor, master, and PhD students through NUST BRC in the field of biodiversity economy, including the accompanying scientific research</p>	<ul style="list-style-type: none"> • Number of scholarships awarded 	Quantitative	No student bursaries for biodiversity economics and landscape conservation			
<p>5.2. Supervision of the above students, provision of logistical and field support</p>	<ul style="list-style-type: none"> • Masters and PhD student research on track • Number of theses • Number of conference or peer-reviewed posters and articles 	Quantitative	None	<ul style="list-style-type: none"> • Improved capacity and research outputs including biodiversity economy, landscapes and ecosystem services 	Qualitative	Student and graduate capacity not considering biodiversity economy and landscape conservation

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
5.3. Receiving doctoral or master students from UNU-FLORES / TU Dresden at NUST for providing scientific support relevant to the Biodiversity Economy project.	<ul style="list-style-type: none"> UNU Flores students hosted in Namibia 		No collaboration	<ul style="list-style-type: none"> Close cooperation between NUST and UNU-FLORES / TU Dresden 	Qualitative	No collaboration
6. Outreach and communication <u>Impact logic</u> <i>Output:</i> Workshops, information material, 3 scientific publications on biodiversity economy submitted <i>Target:</i> Future biodiversity economy experts, stakeholders in the wider region, academia <i>Timing:</i> To be completed by 2023 (2024) <i>Impact:</i> Mainstreaming findings and insights of the research project						
6.1. Implementing 2 summer schools on biodiversity economy with conceptual input by UNU FLORES (3 days practical, 4 days in the field, 20 participants). Conduct two “Ecosystem Services Assessment and Valuation” course for senior	<ul style="list-style-type: none"> Two blended summer schools on biodiversity economy and ecosystem services 	Quantitative Qualitative	No course	<ul style="list-style-type: none"> Enhanced capacity in biodiversity economics and ecosystem services 	Qualitative	Capacity in ecosystem services assessment and biodiversity economy low
students and young professionals in the fields of ecology, social science and economics. The project will include theoretical as well as practical sessions and be available as a “Live online” course for cyberlearners.	<ul style="list-style-type: none"> Multidisciplinary course participants 		No multidisciplinary in participants	assessment and valuation		

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
<p>6.2. Sharing experiences at regional and international level through study tours, regional exchanges, conferences etc. As much as possible such exchange is provided virtually through online means (e.g. video conferences, student lectures, active social media engagement, audio-visual material) or is combined with other knowledge exchange (other than from the Research Project) and conducted back-to-back with other measures from the Research Project to reduce CO2-emissions and cost related to travel</p>	<ul style="list-style-type: none"> Number of study tours, regional exchanges and conferences attended virtually Audio-visual materials produced <p>Active social-media exchange on landscapes, biodiversity economics and ecosystem services</p>	<p>Quantitative</p> <p>Quantitative</p> <p>Qualitative</p>	<p>0</p> <p>No materials</p> <p>The EENN social media page has been inactive since 2020</p> <p>No landscape based biodiversity economic media articles or materials</p>	<p>Enhanced capacity in biodiversity economics and ecosystem services assessment and valuation</p>	<p>Qualitative</p>	<p>Capacity in ecosystem services assessment and biodiversity economy low</p>
<p>6.3. Contributing to the development of the capacity building strategy for biodiversity economy in Namibia with respect to research needs (incl. integration of biodiversity economics into curricula at NUST and UNAM)</p>	<ul style="list-style-type: none"> Capacity building strategy for biodiversity economy completed 	<p>Quantitative</p>	<p>No strategy</p>	<ul style="list-style-type: none"> Biodiversity economy capacity enhanced in tertiary education in Namibia 	<p>Qualitative</p>	<p>Capacity in ecosystem services assessment and biodiversity economy low</p>

Project outputs and outcomes	Process indicators	Measurement type	Baseline	Outcome indicators	Measurement type	Baseline
6.4. Conducting 8 training and awareness seminars (web + physical) using the NUST, UNAM, Scientific Society, Wildlife and Environment Society platforms	<ul style="list-style-type: none"> Number of training and awareness seminars 	Quantitative	No seminars			Capacity in ecosystem services assessment and biodiversity economy low
7. Post COVID-19 recovery in biodiversity economy research <u>Impact logic</u>						
<p><i>Output:</i> Contributions to post COVID-19 recovery of biodiversity economy</p> <p><i>Target:</i> Landscapes, private sector, policy makers</p> <p><i>Timing:</i> Throughout the research project</p> <p><i>Impact:</i> Support a rapid and sustainable post COVID-19 recovery of the biodiversity economy of Namibia</p>						
<p>In the components outlined above</p> <p>7.1. treating post COVID-19 recovery of the biodiversity economy as a cross-cutting issue</p> <p>7.2. identifying potential pathways for diversifying the biodiversity economy to increase resilience post COVID-19</p> <p>7.3. mainstreaming findings on the post COVID-19 recovery into biodiversity economy research and practice</p>	<ul style="list-style-type: none"> Pathways for diversifying the biodiversity economy identified Post-covid recovery considers biodiversity economy 	<p>Qualitative</p> <p>Qualitative</p>	No inclusion of post COVID-19 recovery of biodiversity economy in landscapes	<ul style="list-style-type: none"> Biodiversity economy considered in post-covid recovery 	Qualitative	Not considered

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