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Review / Update of the National Biodiversity Strategy and Action Plan (NBSAP)

Stocktaking and Gap Analysis Report

March 2014

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List of Acronyms and Abbreviations

BCA	Botswana College of Agriculture
BIDPA	Botswana Institute for Development Policy Analysis
BIOFIN	Biodiversity Finance Initiative
BLB	Birdlife Botswana
BWMA	Botswana Wildlife Management Association
BWP	Botswana Pula
BWPA	Botswana Wildlife Producers Association
CBD	Convention on Biological Diversity
CBNRM	Community-based Natural Resources Management
CESRIKI	Centre for Scientific Research Indigenous Knowledge and Innovation
CHA	Controlled Hunting Area
CHM	Clearing House Mechanism
CI	Conservation International
CMS	Convention on Migratory Species
COP	Conference of Parties
DCP	Department of Crop Production
DAP	Department of Animal Production
DAR	Department of Agricultural Research
DDC	District Development Committee
DEA	Department of Environmental Affairs
DFRR	Department of Forest Resources and Rangelands
DNMM	Department of National Museum and Monuments
DMLA	Department of Multilateral Agreements
DMS	Department of Meteorological Services
DWA	Department of Water Affairs
DoT	Department of Tourism
DWNP	Department of Wildlife and National Parks
GoB	Government of Botswana
Ha	Hectare
HWC	Human wildlife conflict
IBA	Important Bird Areas
IK	Indigenous Knowledge
KAZA	Kavango-Zambezi
KCS	Kalahari Conservation Society
LIMID	Livestock Management and Infrastructure Development
MEA	Multilateral Environmental Agreement
MEWT	Ministry of Environment, Wildlife and Tourism
MoA	Ministry of Agriculture
MODIS	Moderate Resolution Imaging Spectroradiometer
MoU	Memorandum of Understanding
MSB	Millennium Seed Bank
NBSAP	National Biodiversity Strategy Action Plan
NGO	Non-governmental Organisation
ODRS	Okavango Delta Ramsar Site
OKACOM	Permanent Okavango River Basin Water Commission
ORI	Okavango Research Institute
PA	Protected Area
PAC	Problem animal control
PEI	Poverty-Environment Initiative
PSC	Project Steering Committee

R&E	Rare and Endangered
RBG Kew	Royal Botanical Gardens Kew
SAREP	Southern African Regional Environmental Programme
SEA	Strategic Environmental Assessment
SoW	Scope of Work
TFCA	Trans-frontier Conservation Area
ToR	Terms of Reference
UB	University of Botswana
UNDP	United Nations Development Programme
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

In view of the Convention on Biological Diversity's (CBD) revised and updated Strategic Plan for Biodiversity and the Aichi Biodiversity Targets for the years 2011-2020, Botswana is aligning its National Biodiversity Strategy and Action Plan (NBSAP) in line with decisions taken at the 10th Conference of Parties. This report represents the stocktaking / assessment and gap analysis phase, and covers an assessment of synergies with other Multilateral Environmental Agreements (MEAs); the current status and trends in biodiversity across Botswana's different ecoregions; the economic value of biodiversity; and the extent to which biodiversity is accommodated in the national accounts; and an evaluation of the degree to which the existing NBSAP has been implemented.

Assessment of synergies with other MEAs

Botswana is party to a number of MEAs, which have varying degrees of overlap and potential for implementation through the NBSAP. Currently, the greatest synergy is with the Ramsar Convention. Other MEAs that would likely share similar targets and activities include: CITES, World Heritage Convention, UN Convention to Combat Desertification, IUCN, SADC Regional Biodiversity Strategy, SADC Protocol on Wildlife Conservation and Law Enforcement, and SADC Protocol on Forestry. Three important MEAs that Botswana has not yet signed, but which could be supportive of CBD initiatives include: Convention on the Conservation of Migratory Species of Wild Animals, International Treaty on Plant Genetic Resources for Food and Agriculture, and Agreement on the Conservation of African Eurasian Migratory Waterbirds.

Status and trends in biodiversity

The rapid assessment was based on the existing stocktake and updated using data, consultations and literature. There was surprisingly little new taxonomic information at the national or population level although there are species specific studies mainly from independent researches. Reductions in funding of surveys and research in both NGO and government and the absence of a biodiversity research and monitoring strategy are to blame for the limited amount of information.

The protected area network covers a significant portion of Botswana and is responsible for much of the biodiversity conservation. There are a few important habitats which are essential for biodiversity yet not formally protected; these include the riparian woodlands of the Okavango Delta Pan Handle and the ephemeral lakes of Ngami and Xau which are important for bird diversity. Game farms and private sanctuaries are becoming increasingly significant in the conservation of biodiversity particularly in eastern Botswana in the South African bushveld ecoregion.

The Okavango Delta remains the national hotspot for biodiversity and is home to both high biodiversity and most of the national endangered species. Recent initiatives such as the update of the Okavango Delta Ramsar Site Management Plan and the drafting of a Strategic Assessment of the Ramsar site together with the activities of OKACOM, the Permanent Commission on the Okavango Basin, has both highlighted conservation concerns in the Delta and management requirements. Continuing work with neighbouring countries on the upper basin and its development are important to the long term protection of Botswana's biodiversity.

In terms of threatened biodiversity, the Zambezian flooded grasslands are important (4 % of Botswana's land area). They hold 20% of the threatened plants, 71% of threatened bird species and 32% of threatened mammal species. The Zambezian Mopane woodlands (5% of Botswana) are also important as they are home to 18% of threatened plant species, 18% of birds and 22% of mammal species.

While climate change remains a long term threat to biodiversity, it is the direct threats, driven largely by policy, which are impacting on species. There is a shift towards commercial development of arable and livestock resources which is leading to habitat fragmentation and closure of wildlife movement routes. Protected areas are becoming isolated and wildlife management areas converted to livestock areas. The Kalahari xeric savanna is under substantial pressure even though the Kgalagadi wildlife management areas have been gazetted. Expansion in the mineral and power sector is of concern in eastern Botswana while the continuing increase in elephant numbers in northern Botswana is resulting in habitat modification with knock on effects on other species. Fire frequency is high in the Zambezian Baikiaea woodlands. Alien invasive species are an increasing threat to biodiversity.

This rapid assessment highlighted the importance of non-governmental organisation (NGO) and private sector support for biodiversity monitoring and protection. NGOs such as Birdlife Botswana are essential to taxa specific management and monitoring. Collaboration between stakeholders, between regulators and interest groups will continue to grow in importance.

Economic value of biodiversity

Economic valuation of biodiversity can largely be based on either direct or indirect use. Direct use values in Botswana are centred on tourism, livestock and crop production, natural resources use, and mining. In Botswana, most economic studies have focused on the wetter northern areas, which are critical for biodiversity, such as the Okavango and Chobe. However, the dryland ecosystems cover by far the greater part of the country, and hence encompass much of the economic use of natural resources.

The largest gap, in terms of biodiversity, is that economic data are not aligned to ecological boundaries such as the ecoregions used for the NBSAP biodiversity analyses. Instead data are collected by political boundaries such as districts, and it is hard to accurately quantify the proportional contribution of the different ecosystem types, and the biodiversity housed in each, to the national economy.

Furthermore, economic valuation in the south and south-west of the country has not been done, despite the fact that it is in the dryland ecosystems that much of the game and livestock ranching, of considerable commercial value, takes place.

In terms of mainstreaming biodiversity into national accounts, little progress has been made, and the present national accounts do not provide any relevant insights into the contribution of Botswana's biodiversity to the national economy, or to its future-use or offset value for evaluating against development opportunities.

Implementation of the existing NBSAP

The assessment of the NBSAP suggests that while most activities are still ongoing, there have been several challenges to more effective implementation. Human and financial resources have been insufficient, and both manpower availability and appropriate skills have restricted implementation. Key lessons learned from the NBSAP evaluation include:

- Implementation works best when responsibilities are assigned at the departmental level. Where technical activities are set at the ministerial level, these tend not to be implemented.
- As may be expected, implementation and collaboration is best for those departments within the Ministry of Environment, Wildlife and Tourism (MEWT), because of the clear environmental mandate. Departments whose mandate only marginally touches on conservation struggle to find the resources to implement their activities. Although the Department of National Museum and Monuments (DNMM) has been moved to MEWT, it continues to be under-resourced, raising concern over the delegation of responsibility for the Global Taxonomic Initiative to it. The Department of Youth and Culture's youth

programme on biodiversity may have been accomplished if it had been led by someone inside the Department of Environmental Affairs (DEA); instead, delegation of this task to a department in another ministry appears to have undermined its implementation.

- It is difficult to develop environmental accounting and integrate biodiversity values into the national accounts unless such accounts are tied to ecosystem services, and such services cannot be evaluated unless they are done at ecosystem or ecoregion level.
- Coordinating implementation is a full-time commitment for a team of two or three people for whom NBSAP implementation is their sole function. Without such a team, communication, awareness-raising, reporting, and ongoing support to other departments (especially those outside MEWT or with a non-environmental core mandate) will not be effective, and will continue to undermine biodiversity initiatives.
- Until DEA's status in the hierarchy of government is changed, it will always struggle to ensure other government departments adhere to the sustainable development approaches that are set up to safeguard biodiversity.
- The housing of the Cartagena Protocol with the Department of Agricultural Research (DAR) is a key success story. The overlap between the objectives of the protocol with the mandate of DAR is strong, and good resources are in place.
- Key challenges repeatedly mentioned are available financial and human resources. Capacity is limited both in terms of available manpower, and in the equipping of staff with appropriate technical skills. If Botswana is to meet its CBD obligations, it will have to invest more in terms of these resources.

Conclusion

Despite the challenges faced, most of the activities in the 2007 NBSAP have been initiated, and are ongoing. Many of these activities extend beyond the 5-year lifespan of an action plan, and so it is unrealistic to see them completed. It is also encouraging to note that many of the departmental mandates – especially of the MEWT departments – already have activities in place that correspond to the Aichi targets. This will streamline the process of adopting and including these targets in the revised NBSAP.

1. INTRODUCTION

1.1 BACKGROUND TO THE PROJECT

Botswana ratified the Convention on Biological Diversity (CBD) in 1992. As a signatory, the Government of Botswana has committed its citizens to actively ensure that its biodiversity resource is maintained for generations to come. In line with the objectives of the convention, Botswana developed its National Biodiversity Strategy and Action Plan (NBSAP) in 2004, which was revised in 2007. The goal of the NBSAP is to contribute to the long term health of Botswana's ecosystems and related species, and to encourage sustainable and wise use of resources through the provision of a framework of specific activities designed to improve the way biodiversity is perceived, utilized and conserved.

In view of the CBD's revised and updated Strategic Plan for Biodiversity and the Aichi Biodiversity Targets for the years 2011-2020, Botswana is aligning its NBSAP in line with decisions taken at the COP10. To this end, the Department of Environmental Affairs (DEA), which is responsible for coordinating activities relating to biodiversity management, has contracted Ecosurv (Pty) Ltd to revise and update its NBSAP and prepare the 5th National Report to the Convention.

The Terms of Reference for this project call for a series of outputs across 5 key phases:

1) Preparation-Inception phase:
2) Stocktaking / assessment and gap analysis phase:
3) Strategy development phase:
4) Development of action / implementation plans
5) Development of the Fifth National Report using data and information collected from the NBSAP stocktaking and review process.

This report represents the Phase 2 output – stocktaking and gap analysis.

1.2 BACKGROUND TO THIS REPORT

In line with the terms of reference, the stocktaking / assessment and gap analysis phase has comprised a series of different activities. These are:

1) Rapid assessment of status and trends of biodiversity
2) Economic valuation of biodiversity in dryland ecosystems
3) Identification of biodiversity hotspots
4) Assessment of synergies with other MEAs and the potential for their implementation through the NBSAP
5) Assessment of the appropriate and most suitable modalities for the implementation of the CBD programmes of work and Protocols
6) Review / evaluation of the NBSAP in light of status and trends, Strategic Plan, and barriers to implementation
7) Evaluation of resource/ financing requirements
8) Rapid assessment of status in integrating sustainable development elements into biodiversity management.

Details of the approaches used to conduct these activities are given in Section 2 below. The outcomes of each of the activities form the body of this report.

2. METHODS

2.1 BACKGROUND AND LITERATURE REVIEW

An extensive body of work was consulted as part of the literature review. Eight different categories of literature were assessed:

1) UN CBD documents
2) Other Multilateral Environmental Agreements (MEAs) to which Botswana is party, and other relevant regional and international protocols, conventions and agreements
3) Botswana NBSAP documents and national reports
4) Relevant and supporting Botswana Government policies, strategies and action plans
5) Relevant and supporting Botswana Government legal acts
6) NBSAP documents and reports for selected other countries
7) Theories, methods and guidelines for biodiversity in development
8) Other reports and academic papers addressing biodiversity and its management.

The full list of documents is included in the References section.

2.2 CONSULTATION PROCESS

The consultation process had two purposes: to obtain data for use in evaluating the current status and trends relating to Botswana's biodiversity; and to engage with those stakeholders involved in NBSAP implementation. Stakeholder engagement focused on the assessment of progress to-date, barriers to implementation, and the way forward for the revised NBSAP.

Data requests were done directly to the relevant organisations. These included a range of Government departments (particularly with those in the Ministry of Environment, Wildlife and Tourism), as well as NGOs, research institutions and special projects. These parties were identified on the basis of their direct involvement with issues relating to biodiversity, or on the listing of the organisation as the lead institution for each of the action items in the 2007 NBSAP.

In addition, two survey instruments were designed and administered. The first questionnaire was targeted at data collectors and providers, and focused on identifying status, trends and threats at both ecoregion and species levels. This was administered to various district officers, as well as representatives of private researchers, academic institutions and NGOs. The second questionnaire was targeted at departmental headquarter level, and focused on both implementation of the NBSAP and biodiversity status, trends and threats.

Four information-gathering focus group workshops were held for selected stakeholders, as follows:

Natural ecosystems

1) Gaborone, 29th October 2013: Representatives of Relevant Government Departments
2) Gaborone, 30th October 2013: NGOs, Special Project Groups and Research Groups
3) Maun, 5th November 2013 : NGOs, Special Project Groups and Research Groups

Agricultural systems

4) Gaborone, 31st October 2013: Representatives of Relevant MoA Government Departments, Research Groups, NGOs.

The selected stakeholders attending the workshops were asked to bring their completed questionnaires with them to form the basis of the discussions.

The full list of stakeholders consulted during this process is provided in Appendix 1, and the focus group workshop programmes are given in Appendix 2.

2.3 DATA REQUESTS, COLLATION AND ANALYSIS

2.3.1 Status and trends of biodiversity and hotspots

2.3.1.1 Survey instruments

Individual data request survey instruments were prepared for and distributed to the following data providers (as identified in the Inception Report):

- Invertebrates (Department National Museum and Monuments (DNMM) – Natural Histories Division) – list and location of rare and endangered (R&E) species in Botswana;
- Small mammals (DNMM – Natural Histories Division) - list and location of rare and endangered (R&E) species in Botswana;
- Large mammals (Department of Wildlife and National Parks (DWNP) reports and survey data 2010 and 2012). Distribution and known threats; lists of those that are R&E.
- Birds (DWNP and Birdlife Botswana). Distribution of R&E species, known threats;
- Fish (Okavango Research Institute (ORI) and DWNP Fisheries Division). R&E species, distribution and known threats;
- Plants (National Herbarium, Botswana College/University of Agriculture, University of Botswana (UB)/ORI and field botanists and Department of Forestry and Range Resources (DFRR)) R&E species, distribution and known threats;
- Agricultural seed crops (Department of Crop Production (DCP); National Plant Genetic Resources Centre; Department of Agricultural Research). Unique genetic material, location and known threats;
- Agricultural livestock (Department of Animal Health and Production; Department of Agricultural Research). Unique genetic material, location and known threats.

2.3.1.2 Stakeholder meetings

The ecologist met with and identified data needs with each stakeholder identified. He also attended all the Gaborone based stakeholder meetings.

2.3.1.3 Review of literature and the ecosystems map

A number of key documents were reviewed for the biodiversity status and trends. These include information and documents collated during the data collection activities, and include:

- UN CBD documents, these included biodiversity monitoring guidelines and the Aichi Targets.
- Botswana NBSAP documents and National Reports. These include the DEA reports and selected biodiversity indicators but also include biodiversity status reports from ORI, DWNP and independent researchers.

- Regional and international protocols, conventions and agreements (reviewed to support the strategic assessment)
- Other reports and academic papers addressing biodiversity and its management.
- The WWF Ecosystems map has been reviewed in relation to national ecosystem and habitat data.
- Data collected relating to the SW Kalahari included aerial survey data (CI, DWNP, 2007), Habitat analysis and review reports carried out for the Western Kgalagadi Conservation Corridor project undertaken by CI between 2007 and 2010.

2.3.1.4 Data collection

Data collection followed on from the survey instrument. A number of meetings were held with technical staff from each of the data-providing institutions. These were then further followed up by mail and visits to obtain the information discussed during the institutional visits. This process was ongoing over two months (October and November).

2.3.1.5 Assessment

The overall threats to biodiversity, as identified in the 2009 Fourth National Report to the CBD, have been revised and mapped at the national scale, in terms of districts and eco-regions (Figure 1). In terms of data accuracy, it is important to note that data in Botswana are not yet systematically collected according to ecoregion boundaries. Instead, they tend to be collected at the district level, which may incorporate portions of more than one ecoregion. While it is possible to infer ecoregion data from district figures, it is important to acknowledge that the information from one district may lead to a slight bias. Nevertheless, any such (minor) inaccuracies are not believed to affect the description of status and trends as presented iin this report.

Threatened and endangered species are categorised on the basis of the2013 IUCN Red Data List categories, as follows:

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Extinct in the wild (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

Near threatened (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Data deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Not evaluated (NE)

A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

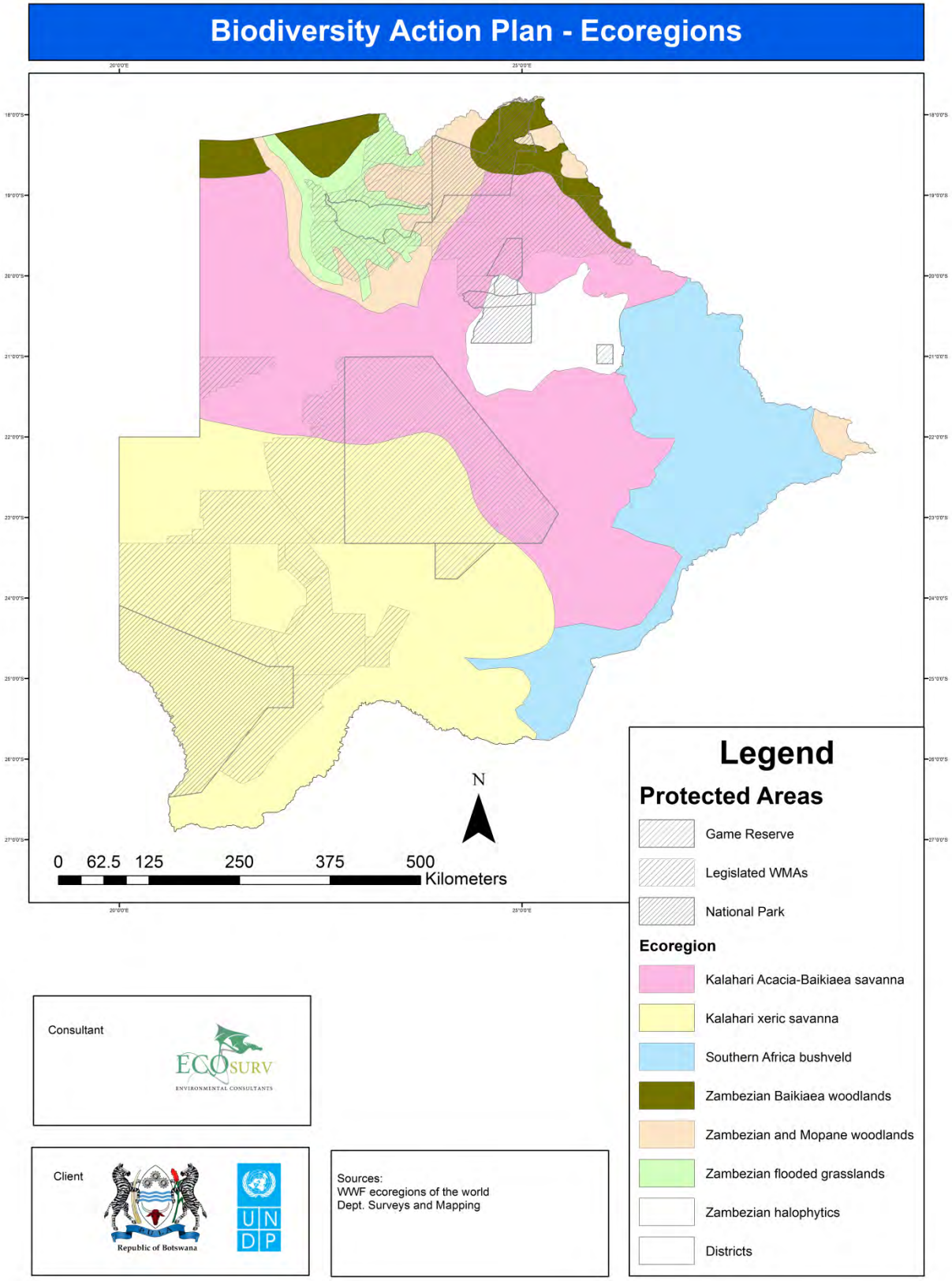

Figure 1: Ecoregions of Botswana indicating relationship with the protected area network (Partially after WWF Ecoregions Map of the World)

2.3.2 Economic valuation of ecoregions

Unlike most economic goods, ecosystems and most natural resources are not marketed or sold. They are public good and/or available free of charge. As a result, their continued presence is often taken for granted by decision makers and resources users; they are over-utilised and no or limited investments are made in their management and conservation. Economic valuation is necessary to remedy this situation when it shows the benefits of ecosystems and resources. Valuation of biodiversity is therefore important for at least four reasons:

1) A valued system or resource is better appreciated in policy and decision making;
2) Resource valuation makes it possible to estimate the economic losses associated with resource degradation and offers justification for preventive and mitigation measures;
3) Valuation makes it possible to integrate biodiversity into the national accounts. Biodiversity (and changes therein) are currently not adequately reflected in countries' national accounts, which do not adequately reflect the sustainable development status of countries;
4) Valuation can provide insight in the distributions of benefits/ values of systems or resources. Therefore, valuation informs policy makers about the possible impacts of degradation on different economic groups and informs policy reduction efforts.

Resource valuation has greatly developed over the last decades. The concept of **Total Economic Value** is now widely accepted (see e.g. Pearce & Moran, 1994) and a variety of resource valuation techniques have been developed and applied over the last few decades. The concept and different valuation techniques have also been applied in Botswana over the last decade.

The Total Economic Valuation (TEV) framework (Barbier *et. al*., 1997; Turpie *et. al.*, 2006 and Hirji *et. al*., 2002) distinguishes two broad value categories: use values and non-use values. These are indicted in Figure 2. The use values are directly related to ecosystem functions[1]. The provisioning of good & services constitutes the direct use value. The regulatory, support and cultural functions of ecosystems constitute indirect use value: they do not lead to direct economic benefits, but if the ecosystem and resources are not maintained, human activities such as water purification, wastewater treatment long distance water transfers need to replace the 'natural functions (such as pollution absorption, groundwater recharge and natural regeneration) or irreversible damage is encountered. Non-use values are sub divided into the option and existence value. The *option value* is the value of a resource or ecosystem as potential *future* use). Environmental degradation may lead to loss of present use values but may also foreclose (unknown) future use options. For example, loss of plant species may affect future development if such a species may prove to have an economic potential in future (e.g. in the pharmaceutical or beauty industries). *The existence value* reflects the satisfaction derived from knowledge that an ecosystem or resource exists without the necessity to utilize the system or resources. Non-use values are more difficult to capture in economic valuations.

Indirect use values, option values and existence values are generally not paid by users or individuals. Production costs, market prices or resource charges can be used to estimate (part of) the direct use value. The user-pays-principle stipulates that resource users need to be the value of the resources used. The available valuation methods are summarised in Table 1.

[1] The Millennium Ecosystem Assessment (MEA) distinguished four ecosystem services: provisioning/ production, regulation, support and cultural services. Ecosystem services may be viewed as the dividend for natural capital (TEEB 2008).

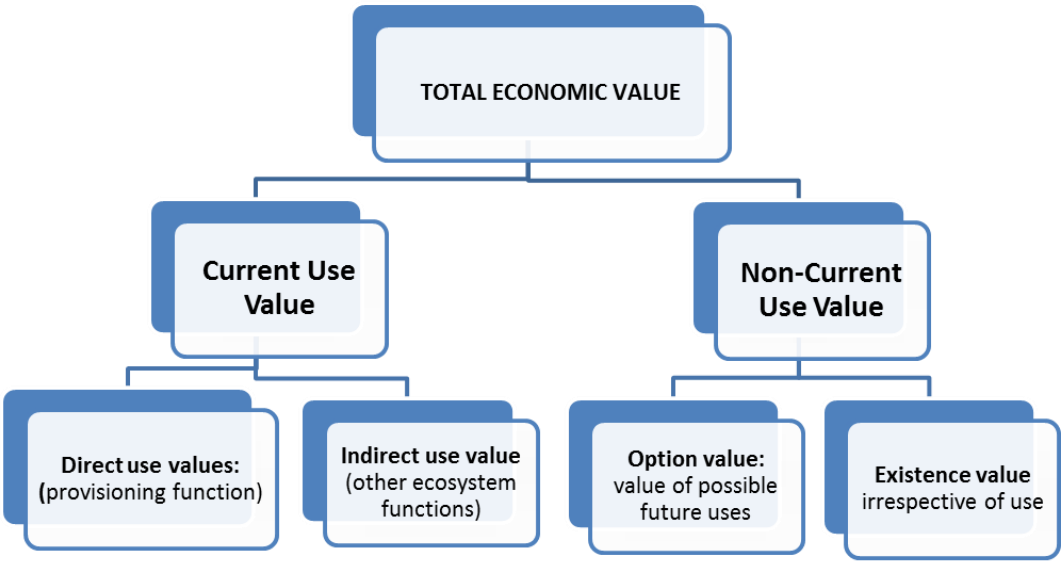

Figure 2: Total economic value framework

Table 1: Available valuation methods

Type of valuation	Methods available
Direct valuation approaches estimate the values (or revealed preferences) of resources directly by asking people their willingness to pay (WTP) for a resource or services or their willingness-to-accept (WTA) an environmental loss	The contingent valuation method involves a survey asking individuals (users and non-users) about the value they place on a good or service provided.
Indirect valuation methods are based on actual and observed markets based values in order to estimate individual's preferences for natural resources products and services (Tietenberg, 2003).	Demand curve method: derived for both consumers and suppliers. The demand functions of these two parties can be used to calculate the WTP for an ecosystem.
	Hedonic pricing method measures the difference in property price between otherwise similar properties, one close to or in the ecosystem and the other one away from it.
	Travel costs method is often used for valuation of national parks etc. 2001). The value of the ecosystem is assumed to be reflected in the travel costs that are visitors willing to incur.
	Replacement and mitigation costs methods refer to the system value as the costs of replacing the ecosystem or mitigation measures to protect it. Considering that some water services and goods may not have markets, more These costs are considered a substitute for ecosystem values.
	Value added approach can be used when the ecosystem provides unpriced inputs into the production process. The resource value is the residual value after deduction of all priced inputs and production factors.

Sources: FAO & CAR, 2013.

The use of valuation methods depends on the local conditions, the system or resource to be valued and the logistical means. There is no single superior method and therefore the common advice is to use different methods and discount rates to check the sensitivity of the results for the method and discount rate used.

Values and benefits may be local, national and global. The benefits of ecosystem services may transcend national boundaries. For example, carbon sequestration in forests generates global benefits in the form of slower climate change.

The benefits and value of biodiversity is generally recognised, but it is not measured explicitly in country's national accounts (Hamilton (2013). Benefits refer to the production and regulatory functions: provision of goods and services, including bio-prospecting for economic diversification, and development of knowledge and insurance services. Hamilton (2013) argues that user fees often do not reflect the willingness to pay and points out that biodiversity benefits are often externalities, which are implicitly included in the value added of economic sectors. Payment for ecosystem services would be a method to make the biodiversity benefit explicit in national accounts.

2.4 Analysis of Implementation and Implementing Environment

The analysis of NBSAP implementation was done by reviewing the relevant documentation and assessing the implementation successes and challenges as reported during the consultations. The MEAs to which Botswana is a party were reviewed and evaluated in terms of their synergies with the NBSAP, and the potential for using the ecosystem approach to bring all sectors together. These analyses then formed the basis for the assessment of appropriate and suitable modalities for implementing the CBD programmes and protocols.

Similarly, the assessment of the degree of integration of sustainable development concepts into management activities was done by evaluating the key legal documents in place – focusing on the Environmental Assessment Act.

3. RELEVANT MEAS, POLICIES, STRATEGIES, PLANS AND KEY PROJECTS

3.1 KEY UN MULTILATERAL ENVIRONMENTAL AGREEMENTS

3.1.1 UN Convention on Biological Diversity

The Convention on Biological Diversity (CBD) arose out of a growing awareness of the critical role that biodiversity places in sustaining the life-supporting systems of the Earth. Being party to the Convention on Biological Diversity is the basis for Botswana's current obligation to revise and update its NBSAP. The Convention's three objectives are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the utilisation of genetic resources.

Cartagena Protocol on Biosafety

This subsidiary protocol to the CBD recognises that biotechnology can be both supportive of, and a potential threat to, biodiversity, and that there is therefore a need to ensure the safety of biotechnology, particularly with regard to maintaining biodiversity. Focusing primarily on transboundary movements, the main objective of the Cartagena Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity.

The protocol provides an international regulatory framework to reconcile the respective needs of trade and environmental protection with respect to a rapidly growing global, biotechnology industry. It also calls for a comprehensive application of biotechnology that enables the use of this biotechnology without having any risks to both the environment and human well-fare, while deriving most benefit out of it. The precautionary discipline that Botswana has applied in dealing with biotechnological aspects has led to safe technological and industrial and other resources for sustainable and prosperous use of resource, and both the NBSAP and the convention will push for further safe application of biotechnology together with biosafety.

Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization

The Nagoya Protocol speaks to the third objective of the CBD – fair and equitable sharing of benefits. It calls for greater legal confidence and transparency for both providers and users of genetic resources. The protocol also sets out to safeguard traditional knowledge as it applies to genetic resources, and to help those communities holding such knowledge to benefit from it.

This Protocol will generate incentives for the preservation and sustainable use of biological diversity and its components, and further enrich the contribution of biological diversity to sustainable development and human welfare, by encouraging the use of genetic resources and associated traditional knowledge, and by solidifying the opportunities for fair and equitable sharing of benefits from their use. The NBSAP specifically addresses this protocol through its objectives related to genetic diversity.

Global Taxonomy Initiative

Taxonomy is the global scientific process of naming, describing and classifying organisms. Having acknowledged the "taxonomic impediment" to the sound management of biodiversity, the parties to the convention have developed the Global Taxonomic Initiative. The initiative

aims to: identify taxonomic needs and priorities, strengthen human capacity in this field, develop infrastructure and mechanisms for generating, storing and sharing information, and to ensure such information is available to inform decision-making.

3.1.2 Ramsar Convention on Wetlands of International Importance

Botswana joined the Ramsar Convention through its submission of the Okavango Delta for inclusion in the List of Wetlands of International Importance. Such a listing places strong obligations on countries to actively manage the wetland for conservation purposes generally, and especially as waterfowl habitat. Importantly, being party to the convention places a further obligation on the member country to promote conservation of all wetlands and waterfowl through the establishment of nature reserves, whether those wetlands are included in the List or not. Other obligations include research and training to support such conservation. The overlap with CBD (and hence NBSAP) comes primarily through the focus on conservation, and that Botswana's wetlands are biodiversity hotspots.

This overlap has been made explicit: In 1996 the Bureau for the CBD and the Secretariat for the Ramsar Convention signed a memorandum of cooperation to promote the shared interest in conserving wetland biodiversity. Practically, this translates to mutual cooperation on the ground within countries that are signatories to both conventions. The memorandum calls for regular information exchange, harmonizing of reporting, and coordination of work plans. In Botswana, this plays out primarily through regular meetings of the Focal Points for the different MEAs. The level of synergy is assessed as part of the evaluation in Section 4 below.

3.1.3 Convention on International Trade in Endangered Species

The main objective of CITES is to ensure that international trade in threatened animals and plant species does not threaten their survival. The convention identifies different categories of extinction: those currently threatened with extinction and which must be subject to strict regulation; those that will become threatened if trade is not restricted; and those species whose trade must be regulated to avoid their over-exploitation.

The focus on endangered species provides a strong overlap with the CBD, one which is made explicit in the CITES text, and through the 1996 Memorandum of Cooperation between CITES and the CBD. The linkages between the two conventions have been further strengthened through the Nagoya Protocol.

3.1.4 UN Framework Convention on Climate Change

This convention is one of the tangible and binding outcomes of the Rio Earth Summit. It is one of the most widely endorsed on the UN conventions. The critical objective of this Convention and its related legal instruments is to achieve the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". In order to ensure that the curbing of greenhouse gases did not negatively impact on food production and sustainable development, the original intention was for a sufficient time frame to be set to cap emissions. The 2005 Kyoto Protocol set out to establish mandatory targets, with commitments varying from nation to nation depending on their level of development and ability to respond to climate change.

The overlap with the CBD and the NBSAP come through the CBD's focus on conserving biota and the physical environment, while the UNFCCC seeks to limit adverse effects on biota and the physical environment – a common goal.

3.1.5 UN Convention to Combat Desertification

As with the UNFCCC, the UNCCD can also be seen as a product of the Rio Earth Summit. The convention's main objective is to combat desertification and strive to mitigate the effects of drought in countries undergoing serious drought and/or desertification, particularly in Africa. The document highlights the need for long-term strategies that simultaneously address land productivity and the rehabilitation, conservation and sustainable management of land and water resources. By so doing, human living conditions would be improved, which in turn would reduce the negative impacts on the environment.

This convention is explicit in its support for the CBD, and that combating desertification would help achieve the objectives of the CBD.

3.1.6 Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention)

As a party to this convention, Botswana has taken on obligations to identify, protect, and conserve for future generations areas of natural and cultural heritage. Apart from one cultural heritage site listed (Tsodilo) and others applied for WHS status for, Botswana has also submitted the following natural heritage sites for listing: Okavango Delta, Central Kalahari Game Reserve, Chobe-Linyanti System, and Makgadikgadi Pans Landscape. World Heritage status is seen as providing an opportunity to provide additional levels of protection to areas already under some form of conservation management. In this way, the opportunities to be aligned with the objectives of the CBD, and for synergised implementation through the NBSAP, are high.

3.1.7 Gaborone Declaration on Commitment to Implement all Conventions that Promote Sustainable Development

Beyond the immediate objective of reaffirming the commitment to sustainable development, this declaration is an important document because it clearly identifies some of the conventions that relate to environmental conservation, and which should all be implemented together for effecting environmental management. These are the African Convention on the Conservation of Nature and Natural Resources, The Declaration of the UN Conference on the Human Environment, The Rio Declaration on Environment and Development (including Agenda 21), the Johannesburg Plan of Implementation from the World Summit on Sustainable Development, the UNCCD, UNFCCC, the CBD, and the UN Millennium Declaration and Development Goals.

The declaration calls for concerted actions to be taken, through the key objective of ensuring that "the contributions of natural capital to sustainable economic growth, maintenance and improvement of social capital and human well-being are quantified and integrated into development and business practice". That is, the declaration calls for environmental values to be made explicit in the national accounts. This latter is a key feature of the revising of the NBSAP, and as such, the Gaborone Declaration sets out to streamline activities that would support biodiversity conservation. In addition, its stated actions of reducing poverty, restoring

ecosystems, and building capacity and communication are shared with those of the current UN Biodiversity Strategy.

3.1.8 Vienna Convention for the Protection of the Ozone Layer

This earlier (1985) agreement may not directly mention biodiversity, but its focus is clearly states as being on limiting harmful impacts on the environment due to depletion of the ozone layer, and consequent climate change. The importance of this convention to long-term sustainability is evident in that it is the first agreement which has now been signed by all UN members. The convention acknowledges the role of human activities in depleting the ozone layer, and places an obligation on parties to control or prevent activities that cause modification to the ozone layer. A key addendum to the Vienna Convention is the Montreal Protocol, which called for the phasing out of key ozone-depleting substances – chlorofluorocarbons and hydro chlorofluorocarbons, an objective that has almost been achieved.

Although its synergies are primarily with the UNFCCC, it also shares with the CBD the end goal of protecting the environment.

3.1.9 Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Other Wastes

Arising in part from the dumping of toxic waste in Africa from countries abroad, this convention sets out to protect human health and the environment from the negative effects of hazardous waste. Since its inception, there have been several amendments that seek to protect vulnerable countries from becoming the dumping ground for end-of-life products and waste, particularly those originated from OECD countries. Although many of the policy instruments are non-binding, they provide practical guidance to the management of waste streams.

The convention places obligations on its member parties to inform other members if they exercise their right to prohibit import, and parties must then prohibit export of hazardous waste to those member parties, or to no-party countries. In addition, parties undertake to ensure that generation of hazardous and other waste will be kept to a minimum, and disposed of adequately.

The Basel Convention is relevant to the NBSAP and its implementation primarily through the shared goal of environmental protection, and the limiting of negative impacts on biodiversity.

3.1.10 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

This convention was developed in response to the rapid increase in the production and trade in hazardous chemicals and pesticides. The focus of the convention is less on restricting the production of such chemicals, and more on the prior informed consent procedure. It is this consent procedure that is legally binding. The central objective is 'to promote shared responsibility and cooperative efforts among parties in the international trade of certain hazardous chemicals in order to protect human health and the environment […]'. Although not directly related to biodiversity conservation, it is supportive of this through its role in

protecting the environment. The focus on environmental protection is one of the means by which the NBSAP promotes biodiversity management.

3.1.11 Stockholm Convention on Persistent Organic Pollutants

Persistent organic pollutants (POPs) are toxic chemical substances that do not degrade easily and which accumulate in living organisms, concentrating as they move up the food chain. The can have severe negative effects on the health of both humans and the environment. The main objective of the convention is to protect human health and the environment from persistent organic pollutants. The convention works on the precautionary principle, which seeks to guarantee the safe elimination of some substances as well as reductions in their production and use. The document covers 12 priority POPs, although the eventual long-term objective is to cover other substances.

POPs are a key threat to biodiversity, because their accumulation up the food chain has the potential to dramatically alter species composition in both terrestrial and aquatic ecosystems. This convention therefore directly supports the maintenance of biodiversity through the shared objective of environmental protection.

3.2 Other Relevant Bilateral or Multilateral Environmental Protocols and Agreements

3.2.1 Rio Declaration on Environment and Development (Agenda 21), Johannesburg Declaration on Sustainable Development and Rio +20 Statement on "The Future We Want"

Although the documents are non-binding, Botswana was present for, and agreed to, the 1992 Rio Declaration on Environment and Development, the 2002 Johannesburg Declaration on Sustainable Development, and the 2012 Rio +20 Statement on "The Future We Want". These statements place environmental protection at the foundation of the development process, and link poverty eradication and the reduction of inequality as a key step to sustainable development. The two later statements basically reaffirm a commitment to Agenda 21, which can be seen as a global plan for sustainability. Section Two of the agenda focuses on conservation and management of resources, and particularly relevant to the NBSAP are the commitments to the conservation of biological diversity and the management of biotechnology.

3.2.2 African Convention on the Conservation of Nature and Natural Resources

First drawn up (and ratified by Botswana) in 1968, this convention was revised and updated in 2003. It commits the Governments of the member states of the African Union to enhance environmental protection, foster conservation and sustainable natural resources use, and to harmonise their policies in these fields. Guiding principles include the rights of all people to 'a satisfactory environment favourable to their development' and that such needs are met in a sustainable and equitable manner. These principles, as well as the convention's objectives, are shared with the NBSAP. Article 9 speaks directly to species and genetic diversity, while Article 10 addresses protected species. Article 12 addresses biodiversity conservation through a focus

on the need to conserve ecosystems that are either characterised by high biodiversity, or that have other special ecological interest.

3.2.3 Agreement on the Conservation of African Eurasian Migratory Waterbirds (accession currently being actively pursued)

In November 2013 Botswana held internal talks to try and further its accession to this agreement. Given the contribution of birdlife to Botswana's overall biodiversity, and its importance to Botswana's environment and tourism industry, and given the key role several of our ecosystems play in providing critical habitat for globally endangered, threatened and vulnerable migratory waterbirds, accession to this agreement seems both logical and likely.

The agreement makes specific references to the CBD (as well as to the Convention on the Conservation of Migratory Species of Wild Animals to which Botswana is not yet party). Acceding to the agreement would bring an obligation to conserve migratory waterbirds through providing strict protection, designation of waterbird habitats to be protected and managed, ensure that use of any such birds is sustainable at both the species and ecosystem level, among other actions. This agreement would synergise well with the NBSAP.

3.2.4 Libreville Declaration on Health and Environment

This 2008 agreement among members of the African Union commits its signatories to address the environmental impacts on health more effectively. It seeks to have the issues of health-environment linkages integrated into national and regional policies and frameworks, and commits its members to focus on issues such as poverty reduction, environmental health monitoring and related research. Synergies with the CBD arise from the focus on the links between poverty-environment-health, and through the explicit call for effective implementation of the CBD and related MEAs.

3.2.5 SADC Regional Biodiversity Strategy

Having a biodiversity strategy at the regional level is an important tool for addressing biodiversity issues that occur at ecological scales broader than those encompassed within national borders. The regional strategy provides the necessary framework for transboundary cooperation in biodiversity management. Its objectives are to provide guidelines to build regional capacity for CBD implementation; establish a framework for reaching regional consensus on key biodiversity issues; act as a vehicle for forming partnerships; and provide a framework for cooperation between members and with relevant MEAs.

Because the Regional Biodiversity Strategy is based on the NBSAPs of participating countries, it takes into consideration the key challenges faced at national level, several of which are common to all member states. It also provides for the implementation of transboundary conservation – such as the two initiatives Botswana participates in: the Kgalagadi Transfrontier Park, and the KAZA Transfrontier Conservation Area.

3.2.6 SADC Protocol on Wildlife Conservation and Law Enforcement

This protocol, which Botswana signed and ratified in 2000, is important in terms of biodiversity in that it provides some of the linkages between national level conservation priorities and global level ones. Taking into consideration the national laws of each of the member

countries, the protocol aims to promote the sustainable use of wildlife; harmonise relevant legal instruments; enforce laws both within and between states; facilitate information exchange on wildlife management; and – in keeping with the SADC Biodiversity Strategy – promote capacity conservation and promote transfrontier conservation. The terms of this protocol are in line with, and supporting of, the NBSAP.

3.2.7 SADC Protocol on Forestry

This 2002 protocol seeks firstly to promote the development, conservation and sustainable use of all types of forests and trees, and in so doing, alleviate poverty and generate economic opportunities while supporting environmental protection. These objectives, as well as the intended activities of addressing deforestation, genetic erosion, and invasive alien species (among others) are in line with those of the NBSAP, and supportive of biodiversity management.

3.2.8 Agreement on the Establishment of a Permanent Commission on the Okavango River Basin (OKACOM)

In 1994 the countries of Botswana, Angola and Namibia formalised their agreement to establish a permanent water commission for the Okavango River Basin. Although OKACOM was formed around the water resource, especially its sustainable and equitable use, the implications of changes in hydrology for the Okavango Delta have ramifications for ecosystems characteristics and functioning. As a result, this agreement is critical to Botswana's obligations to the CBD, since the Okavango Delta is one of Botswana's key biodiversity areas, and the greatest potential threats to its continued healthy state come from the upstream neighbouring countries. Although an important agreement, to date little has been translated into active management decisions on the ground, largely out of concerns for the sovereign rights of the individual countries. Nevertheless, the commission serves as a vital forum for discussions on transboundary environmental issues, and has supported the gathering of critical baseline information of ecological and social aspects of the basin.

3.2.9 Kavango-Zambezi Transfrontier Conservation Area

This transboundary conservation and development initiative covers parts of Botswana, Angola, Namibia, Zambia and Zimbabwe, and arises from a memorandum of understanding signed by the 5 countries in 2006. A secretariat to coordinate the day-to-day activities of the TFCA has been formed. The goal of the initiative is to transform the KAZA TFCA into "a world-class transfrontier conservation area and tourism destination", within the context of sustainable development. The strategic plan for the TFCA acknowledges 4 critical success factors: continued political will and commitment by partner countries; financial sustainability; flexible collaboration; and continuous engagement of local communities.

In common with other regional interventions (and the CBD COP 10 findings), there is an understanding that policies must be harmonised if biodiversity is to be supported. This is both within and between nations. Landscape dynamics – at a scale at which national activities cannot work – need to be understood and conserved as the basis for biodiversity management.

3.2.10 Kgalagadi Transfrontier Park

Although not technically a project, this transboundary initiative has strong positive consequences for biodiversity conservation in the dryland areas of Botswana. It has a long history, in that a 1948 verbal agreement between South Africa and the then-Bechuanaland saw the two countries set aside protected land along a common border. In 1997 the first management plan for the area to be managed as a single ecological unit was approved, with this first 'peace park' in the region being officially opened in 2000. Because there are no physical barriers, the park promotes healthy populations of dryland mammals by allowing their free movement across the international border.

3.3 NATIONAL POLICIES AND STRATEGIES

3.3.1 National Biodiversity Strategy and Action Plan (2007)

The current NBSAP lists eleven strategic objectives whose aim is to achieve the guiding vision of:

> *"A nation in balance with nature, with fair access to biological resources, where the benefits deriving from the use of these resources are shared equitably for the benefit and livelihoods of current and future generations, and where all citizens recognise and understand the importance of maintaining Botswana's biological heritage and related knowledge and their role in the conservation and sustainable use of Botswana's biodiversity."*

These objectives are wide-ranging, addressing understanding and awareness, sustainable development, capacity, and coping with threats.

As the core document under consideration, the NBSAP is reviewed in full in Section 13.

3.3.2 Fourth National Report to the CBD (2009)

This report represents Botswana's most recent submission under the convention. It provides an updated overview of the status and trends in biodiversity, as well as current threats. It also gives an assessment of the country's progress toward implementing the strategic objectives and the NBSAP's 2010 targets.

The report notes that as of 2009, Botswana's extensive wilderness areas still remain a stronghold for several globally-threatened mammals, including elephant and wild dog. However, in terms of fauna, it was noted that there is a paucity of information pertaining to reptiles, amphibians and invertebrates. Similarly, information on Botswana's flora is fairly limited, particularly with regard to the documentation of threatened and endemic species.

In terms of implementation, identified obstacles include: the status of DEA as a department at the same level as those whose activities it is meant to oversee; limited human resources; lack of formal biodiversity information exchange mechanisms; and limited public awareness. These obstacles will be revisited under Section13 where the actual NBSAP is reviewed.

3.3.3 Vision 2016

The Environment is a key focus area in Botswana's National Vision. The aim is that "by the year 2016, economic growth and development in Botswana will be sustainable", with full

integration of conservation and development. In this regard, the National Vision focuses on: equitably distribution of natural resources, direct community benefit from environmental assets, and a balance between the needs of present and future generations. The role of poverty eradication in reducing pressure on natural resources is acknowledged. Finally, the vision pledges that pollution will be limited.

Elsewhere in the vision, growth and development are framed as needing to be "sustainable". However, there is no specific reference to biodiversity or the need to conserve it.

3.3.4 National Conservation Strategy (1990)

The National Conservation Strategy is one of the primary documents underpinning Botswana's commitment to sustainable development. The strategy highlights the commitment to ensuring that present generations consume no more than the annual output of renewable natural resources, and that future generations will have access to capital stocks of natural resources that are similar to those presently available. The strategy clearly defines two sets of goals; those relating primarily to development, and those relating primarily to conservation. The overlaps with the objectives of the NBSAP are clear: conservation of ecosystems, protection of endangered species, and the equitable distribution of benefits, among others.

Importantly, the strategy explicitly states that developments must take into account not only economic costs, but also social and environmental costs.

3.3.5 National Strategy for Sustainable Development

Although in its infancy, it is important to note that Botswana has started developing its strategy for sustainable development. Underpinning this strategy is a history of integrating environmental concerns into development plans; the 1990 National Conservation Strategy; and the Environmental Assessment Act. Further, sustainable development remains one of the country's four key planning objectives.

3.3.6 Wildlife Policy (Draft of 2012)

The new (draft) policy puts forward an important shift away from focusing almost solely on large herbivore and carnivore populations to an aim of conserving 'wildlife and biological diversity'. The policy recognises the contribution of wildlife resources to the economy, while acknowledging the threats arising from habitat destruction and conversion, as well as excessive hunting. Its stated goal is to create an enabling environment for the conservation, sustainable use and management of wildlife and biodiversity resources in order to generate development benefits for current and future generations.

This policy will replace the existing Wildlife Conservation Policy of 1986, which already contains important elements that support biodiversity, such as the recognition of wildlife management as a land use type that allows for landscape-level protection, and the need to allow for movement and migration between protected areas.

The new policy carries its emphasis on biological diversity throughout the document: for example, the first specific objective is biodiversity maintenance and protection. This is an important step in creating a supporting environment for implementing the obligations that the country has as a signatory to the CBD. Indeed, the policy makes direct and specific reference to the NBSAP, and how the policy contributes to its implementation. The new policy will be guided by several principles that are in keeping with those of the NBSAP, such as using an

ecosystem approach, focusing on sustainable development, equitable sharing and poverty eradication. Also in keeping with the NBSAP is the emphasis on benefits as a means to obtaining support for conservation.

3.3.7 National Forest Policy (2007)

This important policy was developed by consciously ensuring its alignment with other natural resources related policies and the existing agreements and protocols to which Botswana is party. Although the overall objective is related to more to long-term socio-economic development and benefit flows (albeit 'sustainable'), the first specific objective to support this focuses on conservation. The policy explicitly recognises Botswana's obligations to adequately protect both forests and biodiversity, through ensuring "environmental stability and the maintenance of ecological balance". This statement is somewhat problematic, in that it refers to a command-and-control paradigm of ecological management, and fails to take into account the inherent dynamism of ecosystems and the need for change and adaptation.

Of direct relevance to the NBSAP is the strategy of "incorporating biodiversity conservation and management guidelines in forest management plans.

3.3.8 Botswana Wetlands Policy and Strategy (Draft of 2007)

This document has as its goal the conservation of Botswana's wetlands "in order to sustain their ecological and socio-economic functions as well as providing benefits for the present and future well-being of the people". It is this document that first highlights the importance of an ecosystem approach to use and management, which means that the system must be managed as a whole, not sector by sector, and that management must accommodate the inherent variability of the system, and not address only one state. The policy highlights the role of wetlands in preserving biodiversity, while the strategy focuses on similar issues to that of the NBSAP, such as environmental management and monitoring, capacity and public awareness. While this policy has strong potential to support NBSAP implementation, after several years it still remains at draft stage.

3.3.9 Botswana Threatened Species Management Action Policy, Implementation Strategy and Action Plan (2007)

The Threatened Species Management Policy and associated strategy and action plan is part of Botswana's way forward for implementing broad-based protection for ecosystems and biodiversity, and is thus directly linked to the objectives of the NBSAP. Specifically, the policy sets out to prevent the extinction of Botswana's flora and fauna, and to provide for the recovery of species that are critically endangered, endangered or vulnerable. The objectives of the strategy seek effective governance, education and awareness, capacity and resources, as well as species-specific management actions.

3.3.10 Predator Management Strategy (Draft of 2013)

This draft strategy has very strong potential to synergise with the NBSAP. It plans to follow the ecosystem approach currently being promoted for the implementation of most conservation activities, both in Botswana and beyond, in order to maintain viable populations of predators, all of which are of global biodiversity concern. It calls for the maintenance of large

conservation areas as a way of ensuring all predator species are afforded protection. While sustainable use of predator species (e.g. hunting) will be allowed as a way of managing populations or reducing human-wildlife conflict, where such populations are threatened or endangered, all "lethal activities" will be banned. The choice of conservation zones also appears to acknowledge the importance of larger landscapes for movement, while still being realistic.

3.3.11 Community Based Natural Resources Management Policy (2007)

This policy is based on the principle that, as those bearing the greatest cost of natural resources conservation, local communities need to benefit from those resources in order to support (and participate in) their conservation. The overall objective is conservation-based development, where the protection of ecosystems and biodiversity is balanced against poverty reduction and rural livelihood improvement.

While the policy holds key concepts that support the NBSAP, its implementation has been slow particularly with regard to communities having the mandate to manage the natural resources in their areas, and in the devolution of land tenure and resource user rights to lover levels. Much of the focus of CBNRM has seen the balance tip toward development, with sound, science-based conservation efforts lagging behind.

3.3.12 Indigenous Knowledge Systems Policy (Final Draft of 2013)

This policy is intended as a first key step to safeguarding indigenous knowledge (IK). In Botswana, where traditional livelihoods are largely based on direct use of natural resources, IK is relevant to biodiversity through both its conservation and its use value. Key areas of IK that would be linked to biodiversity conservation include various farming practices, veld and forest products, and hunting and tracking. The policy notes that existing IK databases include relevant databases such as medicinal plants and entomology.

The policy aims to enhance IK through the protection of intellectual property, regulated access and benefit sharing; develop institutional and legal frameworks, governance structures and a comprehensive research agenda; and mainstream IK into all sectors of the economy.

The document specifically mentions the CBD and Nagoya Protocol. Notably, it calls for the process of implementing the CBD and Nagoya Protocol to take into consideration the policy's principles so that they can be aligned.

3.3.13 Environmental Research Strategy (Draft of 2010)

The draft strategy intends to address the need for a more holistic, coordinated approach to environmental research, so that environmental management decisions can be properly informed by research. It also aims to ensure that such research is problem driven and applied. The strategy will also support and strengthen environmental research capacity within the country. Once implemented, it has the potential to support the monitoring and management of biodiversity called for in the NBSAP.

3.3.14 Waste Management Strategy (1998)

Waste management is seen as a key approach to protecting the environment and natural resources, particularly of water. The strategy states the need for managing at all stages of the waste cycle, from manufacture through to disposal. This strategy is based on three core principles: Prevention, Polluter Pays, and Co-operation. The objectives are on minimising waste, maximising reuse and recycling, and promoting environmentally sound disposal.

3.3.15 National Policy on Agricultural Development (1991)

One of the key objectives of this older policy is the conservation of agricultural and land resources for future generations. Importantly, there is an acknowledgement that Botswana's semi-arid environment does not lend itself to food self-sufficiency, and the policy recommends a shift to food security. The policy focuses on increasing agricultural production, and the number of households participating in agriculture. The key farming subsidies arising under this policy are of the type referred to in the Aichi Targets as needing revision, as they are detrimental to the conservation of biodiversity. These include the indiscriminate clearing of bush for fields, free non-traditional varietal seed hand-outs, tsetse fly eradication spraying, and the livestock disease control campaigns.

The policy also contains a section on forestry and range ecology, which calls for awareness and capacity building for the conservation of forest and range resources. However, this section addresses only the use value and not the environmental values of the resources, and promotes exotic species.

3.3.16 Strategy for Economic Diversification and Sustainable Growth (2006)

This strategy is pertinent through its references to the sustainable development, and its attention to tourism as an area of diversification and growth. The strategy is somewhat troubling in its approach, in that it calls for the expansion of tourism into so-called marginal areas without consideration of the environmental sensitivity of such areas. The attention to sustainable development is not through a call for ensuring that environmental sustainability remain an underpinning principle for economic development, but instead that Botswana use its history of a good sustainability track record as a basis for further diversification through a centre for excellence.

3.3.17 National Settlement Policy (1998)

One of the core objectives of this policy is to promote the conservation of natural resources for the benefit of present and future generations. This includes the identification of fragile and environmentally sensitive areas for zoning as protected or no-development areas, and the protection of land uses from pollution of all kinds, while ameliorating harmful effects of development on the environment. The policy highlights key issues and challenges, such as population growth and sprawl, which have the potential to impact negatively on natural ecosystems and hence biodiversity. Importantly, the Settlement Policy endorses the call for fencing on communal grazing land as stated in the Agricultural Policy, a practice which leads to increasing fragmentation of the landscape.

3.3.18 Revised National Policy for Rural Development (2002)

This policy draws attention to the decline of active participation in subsistence agriculture sector, and the potential for growth in livelihoods based on veld products harvesting and tourism. In this regard, it specifically acknowledges the need to balance conservation objectives with the development of rural livelihoods. The policy takes cognisance of the interplay between poverty and heavy reliance on natural resources, with most of the poor found in rural areas. It also notes that key measures in the National Conservation Strategy had yet to be implemented, and states that environmental conservation remains a priority issue.

While the policy takes note of these environmental concerns, it actively supports the commercialisation of agriculture and increased industrialisation of rural areas, both of which are potential threats to biodiversity conservation.

3.4 PLANS

3.4.1 National Development Plan 10 (2009-2015)

NDP 10 represents the current fiscal planning period, and outlines the main actions (and estimated costs) to be taken by each sector in order to pursue its mandate. Directly relevant to this review are the activities listed for the Ministry of Environment, Wildlife and Tourism (MEWT). A major project for MEWT during this planning phase is ensuring optimal natural resources management, with the overriding objective being the maintenance of natural diversity. It also includes funding for inventories and monitoring, especially in wetland systems.

Implementation of many of the NDP 10 activities have been delayed or postponed due to the strong global economic downturn of the past 5 years.

3.4.2 Okavango Delta Management Plan (2008)

The ODMP addresses Botswana's obligations under the Ramsar convention to prepare and implement a management plan for the Okavango Delta, a Ramsar Wetland of International Importance. It was the first plan to explicitly use the ecosystem approach. This means it is already set out for a cross-sectoral approach to integrated conservation and natural resources management. As such, the opportunities for synergies with the broader-level goals of the NBSAP are high.

The ODMP states clearly that it is the NBSAP forms part of the policy framework into which it fits, and acknowledges the Okavango as a hotspot for biodiversity – particularly with regard to reptiles, birds, plants and mammals.

3.4.3 Okavango Delta Ramsar Site Strategic Environmental Management Plan (Draft of 2012)

The ODRS SEMP arose out of the review of the ODMP. The purpose of the review was twofold: to establish environmental thresholds of change, and to evaluate the status of implementation of the ODMP. The SEMP document contains the background strategic environmental assessment, findings and recommendations, as well as the management plan itself. Importantly, the SEMP zones the ODRS into four levels of protection based on environmental sensitivity: the primary (or core) zone, secondary, tertiary, and "other" – this latter being areas

with high human populations and development pressures. The SEMP vision specifically targets biodiversity maintenance, and together with this focus and the call for equitable and sustainable benefits, shares very similar goals with the NBSAP.

3.4.4 Elephant Management Plan (Draft of 2013)

Although globally elephants are a threatened species, in Botswana populations have reached a level where there are concerns that their changes to habitats, such as changes in woodland composition and structure, may be having a negative effect on biodiversity. In addition, their high population is leading to increased human-wildlife conflict, which threatens to undermine public support for wildlife and natural systems as a whole. As with other plans developed subsequent to ratification of the CBD, the elephant management plan is intended to follow an ecosystem approach. This plan aims to conserve the elephant population at an optimum level that ensures their viability without jeopardising habitats and biodiversity. As such, it can be seen as a specific initiative that would feed into the broader objectives of the NBSAP.

3.4.5 Integrated District Land Use Plans

District-level land use plans also offer an opportunity for implementing the principles and objectives of the NBSAP. Recently, the focus has shifted onto 'integrated' planning, which is intended as a unifying approach that brings together all sectors, so that land resource use can be guided in a sustainable and equitable manner. Typically, such plans are increasingly paying attention to ecosystem-level processes, and acknowledge the importance of landscape-level linkages. In the Ngamiland plan, for example, the importance of biodiversity and different scales (e.g. species, habitat) is recognised, and the role of land use and land zoning in preserving biodiversity is considered. These plans are important vehicles for transmitting the national-level objectives of the NBSAP to the implementing level of the district.

3.5 KEY PROJECTS

3.5.1 Biokavango Project

The Biokavango was a 5-year UNDP GEF-funded project design to support the ODMP – specifically in terms of mainstreaming biodiversity conservation objectives into three key sectors that use the Okavango: water, tourism and fisheries. The project's interventions focused on a) building capacity within relevant agencies to incorporate biodiversity management into their decision-making, and b) to use pilot projects to show how best to incorporate biodiversity concerns into daily management activities. Although the project did to some extent achieve its objectives, it is important to note that the project evaluation notes that such processes require a much longer time-frame than the project's 5- years, and that sufficient resources (continuity of staff, permission to make decisions, financial resources) to ensure implementation need to be provided at the implementing level. It is believed that these are constraints that also affect NBSAP implementation.

3.5.2 Biochobe Project

Seen as follow-on to the Biokavango, this project aims for improved management effectiveness of the Chobe-Kwando-Linyanti matrix of protected areas. Although it does not specifically target biodiversity as a topic, it addresses the underlying processes that support

biodiversity: maintaining large, healthy, functioning ecosystems that are under threat from loss of wildlife corridors, incompatible land and resource uses, large numbers of elephants and climate change. Further, it directly addresses one of the key strategic biodiversity objectives of improving the sustainability of protected area systems. This project seeks to take a landscape approach to management, and to bring about changes in land use and management through appropriate channelling of benefits arising from such management. Again, these principles are very much in line with those of the NBSAP.

3.5.3 Biofin Project

Botswana is one of several countries taking part in the Biodiversity Finance Initiative (Biofin). The project is based on the belief that transformation is needed in the way that biodiversity finance is planned and managed. Without such a transformation, countries will struggle to access the financial resources needed to meet the Aichi Targets and the CBD's 2011-2020 Strategic Goals. Biofin aims to support biodiversity conservation through the promotion of sustainable development and the eradication of poverty. It is also intended that the Biofin project will set up frameworks and methods for financing NBSAP implementation as well as support for protected areas. As such, it will have a key role to play in ensuring the success of this revised version of Botswana's NBSAP.

3.5.4 Sustainable Land Management Project

The full title of this district-level project is "Mainstreaming SLM in rangeland areas of Ngamiland district landscapes for improved livelihoods". It aims to improve the livelihoods of the rural poor, especially women, through maintaining healthier ecosystems so that greater benefits may be sustainably derived from these systems. The project stems from the need to change existing land use practices that are compromising savanna ecosystems, particularly in terms of current livestock husbandry. This is a pilot project, which if successful, could be rolled out across the whole country. The project will focus on resource governance, but will also work at increasing skills and knowledge. The project document specifically draws attention to the threat to biodiversity that degradation of savanna ecosystem represents. The fact that this project is in its initial stages, and with the shared agenda of environmental conservation, means that it presents a good opportunity for aligning project activities to the objectives of the revised NBSAP.

3.5.5 Poverty and Environment Initiative

This programme seeks to integrate environmental sustainability in national development plans and the development process in general, thus ensuring that unsustainable use of natural resources does not undermine development efforts in the country. Poverty is believed to lead to heavy reliance on natural resources, possibly contributing to resource over-exploitation, but certainly this heavy reliance creates a strong feedback to increased poverty as natural resources are depleted through overuse.

The initiative focuses at the planning level, by ensuring that policy planning at all scales (district, national, sector) integrate these linkages between poverty and environment into their planning and management activities.

Areas of synergy with other projects lie in the focus on mainstreaming environmental sustainability. More specifically, the Poverty and Environment Initiative (PEI) shares several

ideals with the NBSAP; namely, the need for sustainable development, the concern about environmental conservation, the recognition of ecosystem services, inter alia.

4. SYNERGIES WITH OTHER MULTILATERAL ENVIRONMENTAL AGREEMENTS

The MEAs relevant to Botswana are presented in the table below. Based on their host department, host ministry, inclusion in the MEA committee, and areas of synergy, the MEAs are evaluated in terms of their potential for implementation through the NBSAP. The premise is that conventions housed in the same department would have greatest opportunity for active collaboration, while those at least in the same ministry would be able to have strong potential for aligning activities, and those in the MEA Committee would have good opportunities for communication and information exchange. Areas of synergy may seem high for all where the shared goal is environmental protection or conservation; however, in practical terms the opportunities for shared action will depend on whether the impetus for the MEA comes from a need to a) limit impacts on, or b) promote and protect, the environment. The latter involves specific biodiversity management activities, while the former tends to include mitigating activities related to industry and development.

It is important to note that there is an Authority for all Multilateral Affairs; and Secretariat to the Inter-Ministerial Committee on Multilateral Agreements, housed in the Department of Multi-lateral Affairs in the Ministry of Foreign Affairs and International Cooperation. In addition, the Attorney-General Chambers play an active role in evaluating new agreements and policies in terms of their compatibility and synergy with existing frameworks.

Table 2: List of MEAs and their synergies with the CBD and potential for implementation through the NBSAP

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
Key UN Multilateral Environmental Agreements						
Convention on Biological Diversity	The conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.	DEA	MEWT	Yes	--	--
Cartagena Protocol	To contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity	DAR	MoA	Yes	As a subsidiary to the CBD, the Cartagena Protocol directly addresses one of the key objectives of the CBD	High
Kuala Lumpur supplementary Protocol	To contribute to the conservation and sustainable use of biological diversity, taking also into account risks to human health, by providing international rules and procedures in the field of liability and redress relating to living modified organisms	DEA	MEWT	Yes	As a subsidiary to the CBD, the Kuala Lumpur Supplementary Protocol directly addresses one of the key objectives of the CBD	Very High
Nagoya Protocol	The fair and equitable sharing of the benefits arising from the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding, thereby contributing to the conservation of biological diversity and the sustainable use of its components	DEA	MEWT	Yes	As a subsidiary to the CBD, the Nagoya Protocol directly addresses one of the key objectives of the CBD	Very High

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
Global Taxonomy Initiative	a) To contribute to the implementation of the Convention's Strategic Plan; b) To set operational objectives with clear expected outputs and ways and means through which to achieve the set objectives; c) To provide the rationale for the choice of the operational targets, with indications of opportunities for further elaboration of the programme of work; and d) To serve as a guide to all biodiversity stakeholders on specific objectives to which they can contribute individually or collectively, at the local, national or international level.	DNMM	MEWT	Yes	In order to conserve biodiversity, organisms should be inventoried. This initiative would directly support the CBD objectives.	Medium , This department continues to be under-resourced, placing constraints on implementation
Ramsar Convention on Wetlands	To protect wetlands as important ecosystems for the maintenance of biodiversity	DEA	MEWT	Yes	Wetlands tend to be hotspots of biodiversity, and the objectives of the Ramsar convention have evolved to emphasise the focus of biodiversity. This is acknowledged in the 1996 memorandum of cooperation to promote the shared interest in conserving wetland biodiversity. Practically, this translates to mutual cooperation on the ground within countries that are signatories to both conventions.	Very high The memorandum calls for regular information exchange, harmonizing of reporting, and coordination of work plans. In Botswana, this plays out primarily through regular meetings of the Focal Points for the different MEAs
CITES	To ensure that international trade in threatened animals and plant species does not threaten their survival	DWNP	MEWT	Yes	Protection of threatened and vulnerable species is a key aspect of biodiversity conservation	High
UNFCCC	The stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	DMS	MEWT	Yes	The shared goal of seeking to limit adverse effects on biota and the physical environment.	High
UNCCD	To combat desertification and strive to mitigate the effects of drought in countries undergoing serious drought and/or desertification, particularly in Africa	DFRR	MEWT	Yes	Desertification is a major potential threat to biodiversity, especially in semi-arid countries like Botswana. Combating desertification would support biodiversity maintenance	High

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
World Heritage Convention	To identify, protect, and conserve for future generations areas of natural and cultural heritage	DEA	MEWT	Yes	The conservation of natural heritage would provide additional protection to systems that are important for biodiversity	Very high
Gaborone Declaration	To reaffirm the commitment to sustainable development, and to the signed conventions that protect the environment	DEA	MEWT	Yes, once the agreement is complete	The Gaborone Declaration streamlines activities of all conventions that support the environment. In addition, its stated actions of reducing poverty, restoring ecosystems, and building capacity and communication are shared with those of the current UN Biodiversity Strategy	Very high
Vienna Convention for the Protection of the Ozone Layer	To limit harmful impacts on the environment due to depletion of the ozone layer, and consequent climate change	DMS	MEWT	Yes	The link is not that direct; instead it comes through the UNFCCC, and through the motivation behind reducing human-induced climate change and the need for environmental protection. One of the reasons climate change is of concern is through its potential impact on biodiversity primarily through habitat loss.	Medium Though the goal of environmental protection is shared, the specific activities that can be shared are likely to be limited to communication and capacity building
Basel Convention on Trans-boundary Movement of Hazardous Waste	To protect human health and the environment from the negative effects of hazardous waste	DWMPC	MEWT	Yes	The shared goal of environmental protection would be the main opportunity for alignment.	Medium Though the goal of environmental protection is shared, the specific activities that can be shared are likely to be limited to communication and capacity building
Rotterdam Convention on the International Trade in Hazardous Chemicals	To promote shared responsibility and cooperative efforts among parties in the international trade of certain hazardous chemicals in order to protect human health and the environment	DWMPC	MEWT	Yes	As with the Basel Convention, the area of synergy is limited to the overall aim of protecting the environment.	Medium Though the goal of environmental protection is shared, the specific activities that can be shared are likely to be limited to communication and capacity building

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
Stockholm Convention on Persistent Organic Pollutants	To protect human health and the environment from persistent organic pollutants	DWNPC	MEWT	Yes	Bioaccumulation of POPs can change species composition in ecosystems, directly impacting biodiversity. However, the main area of synergy is through the goal of environmental protection.	Medium Though the goal of environmental protection is shared, the specific activities that can be shared are likely to be limited to communication and capacity building
Convention on the Conservation of Migratory Species of Wild Animals	a) To promote, co-operate in and support research relating to migratory species; b) To endeavour to provide immediate protection for migratory species included in Appendix I; and c) To endeavour to conclude agreements covering the conservation and management of migratory species included in Appendix II.	Not signed or ratified	Not signed or ratified	Not signed or ratified	Migratory species form a critical part of both national and global biodiversity. There are overlaps with the Ramsar convention through the focus on waterbirds, many of which are migratory. There could be synergies with both the CBD and CITES since several of the migratory species are threatened or endangered.	Not (yet) signed or ratified
International Treaty on Plant Genetic Resources for Food and Agriculture	The conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security	Not signed or ratified – DAR would likely house	Not signed or ratified – would probably be MoA	Not signed or ratified	This would overlap with the Nagoya Protocol through the focus on genetic resources. All agricultural biodiversity material can be protected under the two action plans (animals and plants), and DAR is already working in this framework. Note the clear reference to the CBD in the objective	Not (yet) signed or ratified, although DAR currently is responsible for Nagoya Protocol, and could align these action plans, that it is currently implementing, with it.
Agreement on the Conservation of African Eurasian Migratory Waterbirds	To take co-ordinated measures to maintain migratory waterbird species in a favourable conservation status or to restore them to such a status	Not signed or ratified, but DWNP would likely house	Not signed or ratified, MEWT	Not signed or ratified	This would overlap with the Ramsar Convention, and provide protection for a range of vulnerable and threatened species, whose protection is a key part of the CBD.	Accession is being actively pursued, but it would likely have many action plan items in common with the NBSAP.
Other Relevant Bilateral or Multilateral Environmental Protocols and Agreements						
IUCN	To influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable	DEA	MEWT	No	Although not strictly an agreement, Botswana is one of the nation members of the IUCN. It is a highly active organisation in the field of biodiversity conservation, and has both intellectual and financial resources that may potentially be able to support NBSAP activities	High

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
African Convention on the Conservation of Nature and Natural Resources	To adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people	Unclear – DEA?	Unclear – MEWT?	No	This convention does not appear to be actively implemented. However, it is one of the key documents referred to in the Gaborone Declaration. Its focus on conservation of natural resources brings it in line with the objectives of the CBD.	Medium The shared basic principles would make it likely, but this agreement would need to be proactively resuscitated
SADC Regional Biodiversity Strategy	To provide guidelines to build regional capacity for CBD implementation; establish a framework for reaching regional consensus on key biodiversity issues; act as a vehicle for forming partnerships; and provide a framework for cooperation between members and with relevant MEAs	DEA	MEWT	No, but represented indirectly through national focal point	The regional strategy takes the national BSAPs into consideration, and so tends to encompass the key biodiversity issues of each member's NBSAP.	Very high Because the SADC regional strategy is based on the national level documents, implementation would largely come through meeting the national targets and obligations.
SADC Protocol on Wildlife Conservation and Law Enforcement	To establish within the Region and within the framework of the respective national laws of each State Party, common approaches to the conservation and sustainable use of wildlife resources and to assist with the effective enforcement of laws governing those resources.	DWNP	MEWT	No, but represented indirectly through national focal point	Botswana's wildlife is a key component of both national and global biodiversity. Its conservation is a common goal.	High
SADC Protocol on Forestry	a. promote the development, conservation, sustainable management and utilisation of all types of forests and trees; b. promote trade in forest products throughout the Region in order to alleviate poverty and generate economic opportunities for the peoples of the Region; and c. achieve effective protection of the environment, and safeguard the interests of both the present and future generations.	DFRR	MEWT	No, but represented indirectly through national focal point	There is a strong focus on biological diversity in this protocol, and the objectives and proposed actions are strongly linked to biodiversity conservation.	High
OKACOM and SADC Revised Protocol on Shared Watercourses	Although a standalone agreement, OKACOM falls under the framework of the regional protocol on shared watercourses. In keeping with the SADC initiative, OKACOM's objective is to act as technical advisor on matters relating to the conservation, development and use of water resources shared by the three countries of Botswana, Angola and Namibia	DWA	MMEWR	No, but represented indirectly through national focal point	There is a common focus on conservation, equity and sustainable use.	Medium Not only is this housed in a different ministry, but also there are challenges to accommodating regional-level interests in a national-level plan

	Key Objective	Focal Point Dept	Focal Ministry	Part of MEA Committee	Area of Synergy with CBD	Potential for implementation through the NBSAP
KAZA TFCA	a. Foster trans-national collaboration and co-operation in implementing ecosystems and cultural resource management; b. Promote alliances in the management of biological and cultural resources and encourage social, economic and other partnerships among their Governments and stakeholders; c. Enhance ecosystem integrity and natural ecological processes by harmonizing natural resources management approaches and tourism development across international boundaries; d. Develop mechanisms and strategies for local communities to participate meaningfully in, and tangibly benefit from, the TFCA; and e. Promote cross-border tourism as a means of fostering regional socio-economic development.	Ministerial level only	MEWT	No	This project could offer good opportunities to implement the objectives of the CBD. The area in Botswana encompassed by the KAZA region includes those ecosystems with highest biodiversity.	Medium The ability to bring about effective implementation is dependent on being able to delegate responsibilities at departmental level. Rather than implementing this project through the NBSAP, the project should be seen as a way to ensure that NBSAP actions take place on the ground.
Kgalagadi Transfrontier Park	a. To preserve the diversity of organisms indigenous to the southern Kalahari as functional elements of the ecosystem, with predators receiving priority. b. To maintain those ecological processes that characterise the Kalahari ecosystem. c. To provide facilities and opportunities for research and monitoring to advance understanding of the physical and biological processes of the Kalahari ecosystem. d. To provide educational and interpretative programmes for visitors to foster a better understanding and appreciation of the Kalahari ecosystem. e. To realise economic returns from tourism while safeguarding the ecological integrity and pristine wilderness of the Kalahari	DWNP	MEWT	No	The objectives of the park are strongly directed to biodiversity conservation and enhancing ecosystems processes to maintain biodiversity. Thus the overlap with the objectives of the CBD is very high.	High Ranked higher than the KAZA TFCA primarily because of the clear mandate given to DWNP, but also because as a bilateral arrangement, the number of external players is restricted and therefore more manageable. Again, this should be seen as an opportunity to ensure that NBSAP actions take place on the ground – particularly with regard to promoting biodiversity conservation in dryland ecosystems.

5. IDENTIFICATION OF BIODIVERSITY HOTSPOTS

This section identifies the biodiversity hotspots, focusing on areas of known endemism, high biodiversity and habitats of high biodiversity.

5.1 HABITATS OF HIGH BIODIVERSITY

Figure 3 is based on an analysis of geographic features such as pans, wetlands, rivers, hills and outcrops, caves, habitat transition zones, protected areas, existing natural habitat. These features are known to be related to areas of higher biodiversity of Botswana.

Habitats of highest biodiversity are associated with wetlands features such as the Okavango Delta, rivers (perennial, ephemeral and fossil), pans and rocky outcrops. Figure 3 indicates that most of the rocky outcrops occur in eastern Botswana, the main wetlands are the Okavango Delta and Makgadikgadi while numerous smaller pans are found throughout the Kalahari system. In the north the parallel inter-dunal valleys become important.

5.2 SPECIES RICHNESS

The 2003 Biodiversity Stocktaking Report prepared a map of species richness. To provide a proxy on abundances of the species or their relative abundance distributions, the species richness map has been combined with the threatened, vulnerable and endemic species and the habitat diversity (Figure 4). The areas of highest species diversity are the Okavango to Chobe area, the Makgadikgadi and eastern Botswana (due to habitat diversity and relatively high levels of vulnerable plant species).

5.3 DISTRIBUTION OF THREATENED, VULNERABLE AND ENDEMIC SPECIES

The known distribution of plant and animal red data, vulnerable and endemic species are combined in Figure 3. The predominance of these species in northern Botswana is largely due to the extensive protected area network and the Okavango wetlands.

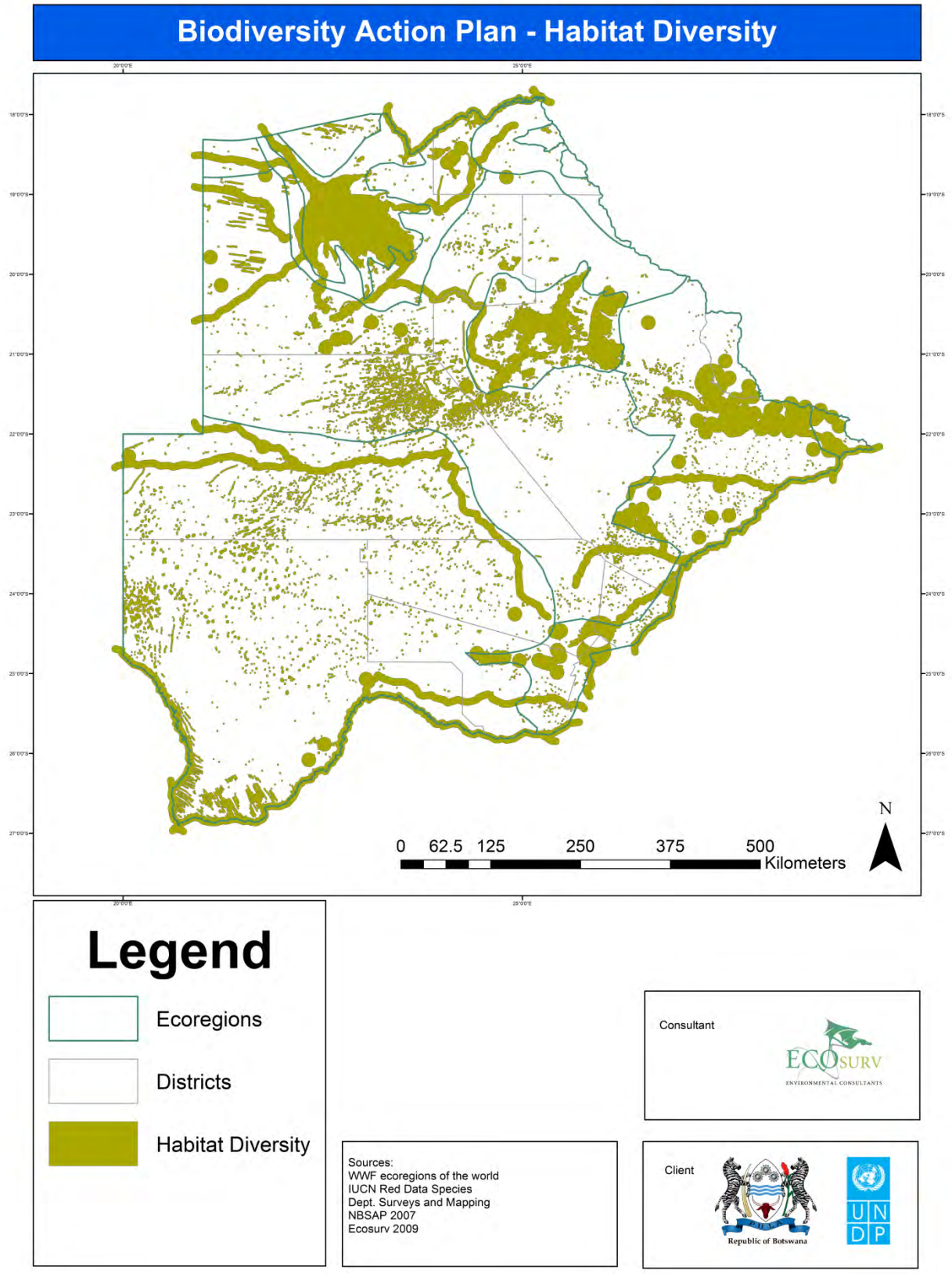

Figure 3: Habitats of potential high biodiversity

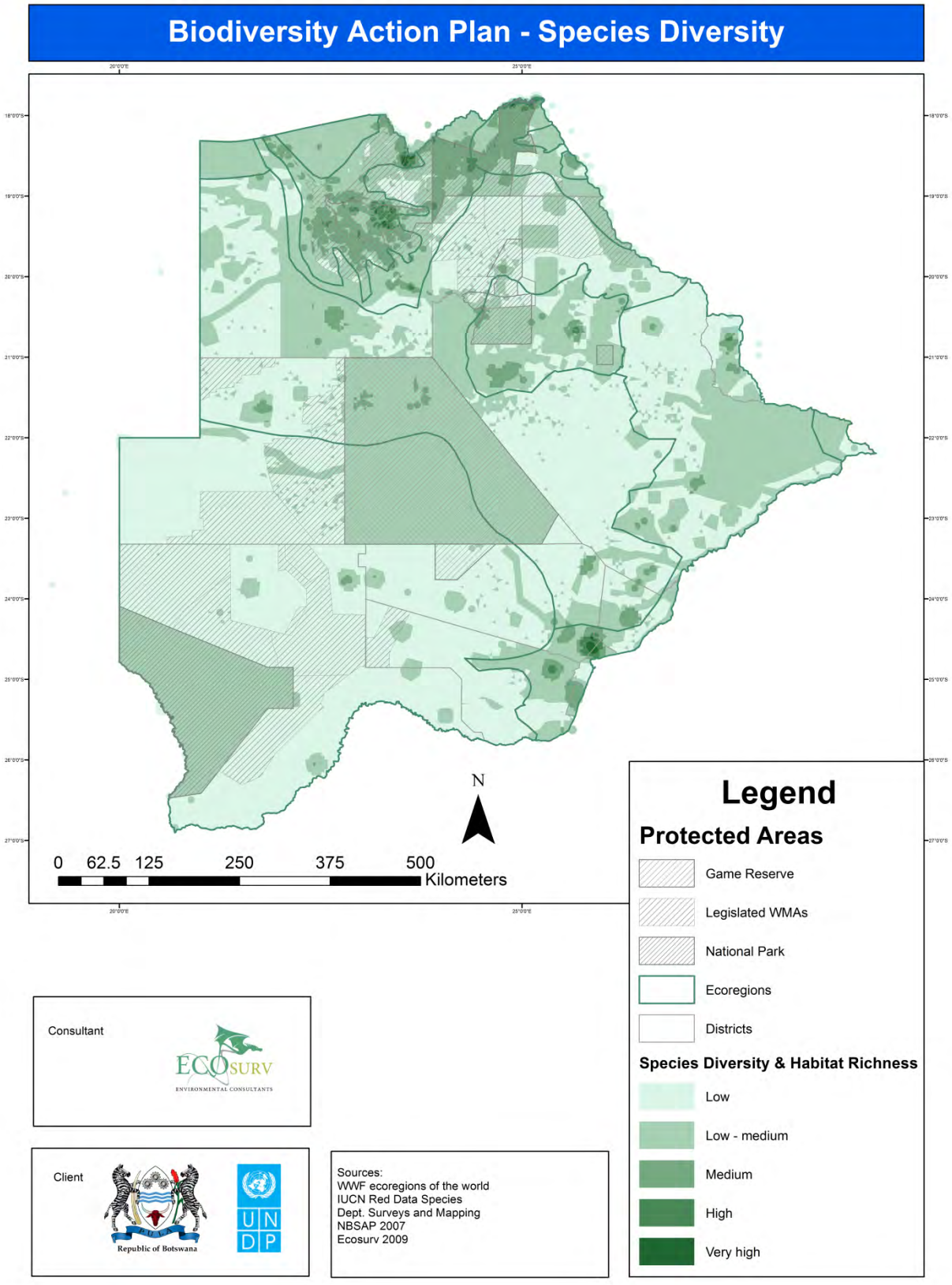

Figure 4: Species diversity

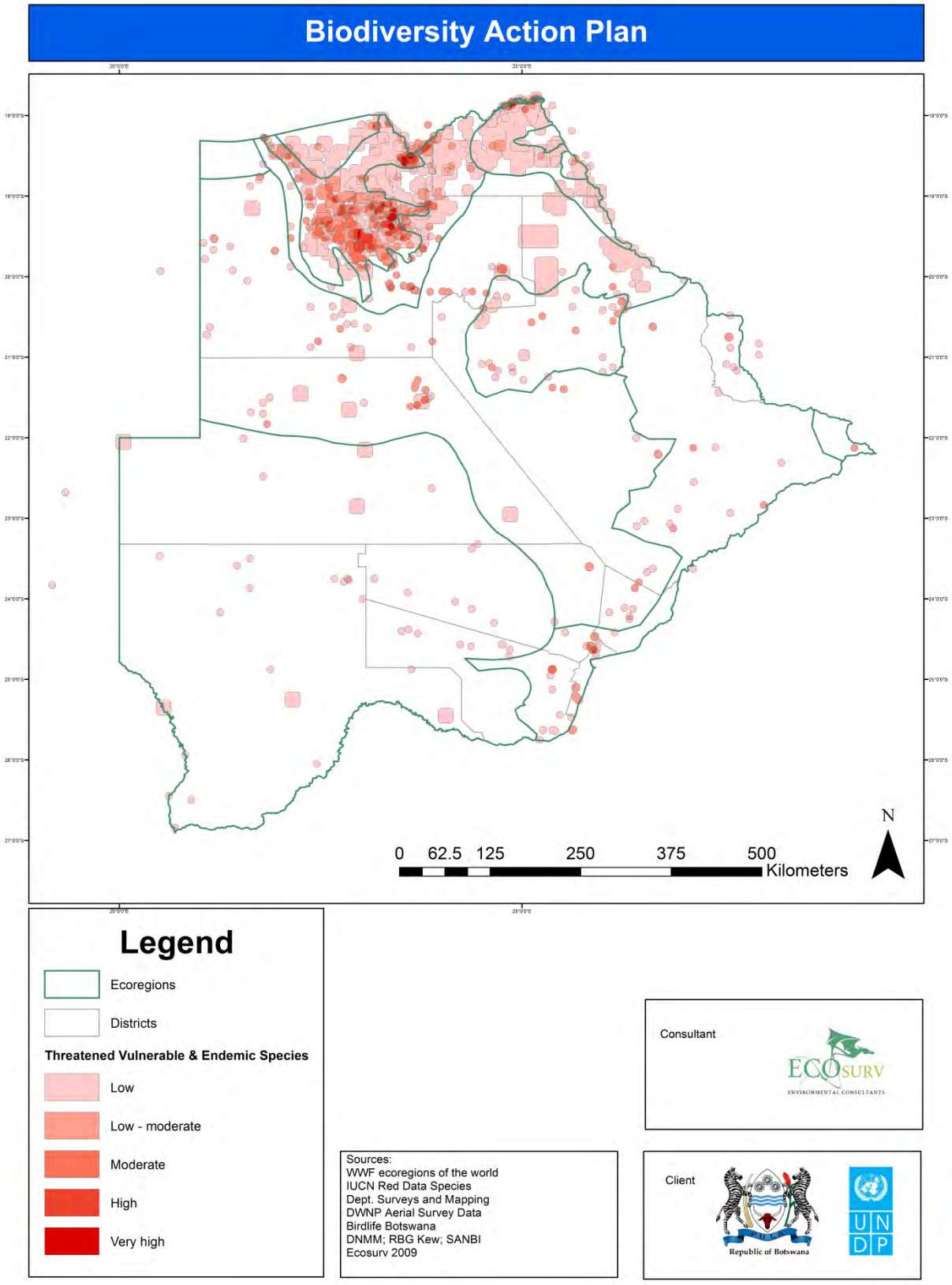

Figure 5: Distribution of threatened, vulnerable and endemic species in Botswana (plants, birds and wildlife)

6. RAPID ASSESSMENT OF BIODIVERSITY STATUS

This section highlights the results of the rapid assessment and is based on the existing data and updates to the 4th National Report to the CBD.

6.1 AVAILABLE DATA FOR BIODIVERSITY STATUS

There have been some improvements in national species lists between the Biodiversity Stocktake in 2003 (Ecosurv 2003) and present. Mammals have increased from 147 to 157 (improvement of small mammal inventories); amphibians increased from 34 to 44 species and invertebrates have improved from a total absence of species lists to lists for 10 taxa. Plant species lists have improved from an estimate to a specific number of species.

Table 3: Species lists within Botswana taxa

Taxon	Number of described species in Botswana	Sources and Remarks
Mammals	157	DWNP, DWNP/EU 2009
Birds	587	Birdlife
Amphibians	44	NBSAP 2007, DWNP/EU 2009, 4 Corners, 2004
Reptiles	131	NBSAP 2007
Freshwater fish	99	Skelton 2001, ORI web site, Mostly found in the large permanent river ways of the Limpopo, Chobe-Linyanti-Kwando system and the Okavango Delta.
Invertebrates	Dragonflies 127 Grasshoppers 152 Butterflies 252 Antlion 62 Beetles 65 Water beetles 117 Ladybirds 32 Water Bugs 2 Dung Beetles 55 Scorpions 14	Kipping 2010 Johnsen 1990-1 in DWNP/EU 2009 Henning et al 1994 (in DWNP/EU 2009), Butterflies of Africa Database. ORI ORI ORI ORI ORI ORI DWNP/EU 2007
Plants	3096	DNMM, Setshogo 2005, RBG Kew 2013

6.2 NATIONAL ASSESSMENT

6.2.1 Status of protected areas

The Botswana Biodiversity Strategy and Action Plan (BSAP) adopted the definition of protected areas from the Fourth World Congress on National Parks and Protected Areas:

An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Botswana has set aside a total of 41 %[2] of its land area as protected areas. This includes national parks, game reserves, private wildlife and nature reserves, wildlife management areas

[2] Calculated from National Parks, Game Reserves, Forest Reserves (natural), private reserves and game farms, National Monuments and Wildlife Management Areas. WHS and Ramsar sites not included to prevent duplication

(WMAs), forest reserves and national monuments. According to the definition, though, effective protection only occurs in the national parks (17.4 %; National Parks and Game Reserves) while other areas with legal protection such as the Forestry Reserves and legislated WMAs increase this figure to (36.8 %). There are a number of WMAs that have not as yet been legislated (4.4 %).

National parks, game reserves, and WMAs (see Table 4) are governed by the provisions in the Wildlife Conservation and National Parks Act, 1992.

Table 4: Types of protected areas in Botswana

Type of area	Km^2	% of total land area	Legal constitution	Level of protection [a]
National Parks	44,390	7	Wildlife Conservation and National Parks Act No 28 of 1992	Ib No hunting
Game Reserves Flamingo Sanctuary declared 2010	59,590 + 408	10	Wildlife Conservation and National Parks Act No 28 of 1992	Ib No hunting
Wildlife Management Areas (WMAs)	Legislated 111,650 Not legislated 26,220	23	Wildlife Conservation and National Parks Act No 28 of 1992	V Hunting ban 2014
Forest Reserves Partial degazetting of Kasane, Chobe and Kazuma FRs	4,095.4	1	Forest Act, 1968	II -Protection of Trees
National Monuments	<100	<1	Monuments and Relics Act 2001	III – Botanical monuments
Private Wildlife & Nature Reserves and game farms	951	0.15	No act deals with this although wildlife falls under the 1992 Act	IV
World Heritage Sites: Tsodilo Hills (existing) and proposed Okavango Delta	Tsodilo 48 + buffer zone 704 Proposed for Okavango Delta approximately 33,000 (No new protection as it falls into PAs and WMAs	<1, will increase to 5.6%	Monuments and Relics Act 2001	World Heritage listing standards
Ramsar Sites	55,374	9.2	Wildlife Conservation and National Parks Act No. 28 of 1992 Aquatic Weeds Control Act Cap: 34:04	Ramsar management standards

Source: BSAP, 2007, updated this study

a: According to IUCN guidelines on protected areas

- Ia Strict Nature Reserve: protected area managed mainly for science
- Ib Wilderness Area: protected area managed mainly for wilderness protection
- II Ecosystem conservation and recreation (i.e. National Park)
- III Conservation of natural features (i.e. Natural Monument)
- IV Conservation through active management (i.e. Habitat/Species Management Area
- V Landscape/seascape conservation and recreation (i.e. Protected Landscape/Seascape)
- VI Sustainable use of natural ecosystems (i.e. Managed Resource Protected Area)

In addition to the National Parks and Game Reserves, the Forest Act of 1976 has designated 5 areas in the north of Botswana as Forest Reserves (See Figure 6 and Table 5). Approximately 4,095 km² of Zambezian Baikiaea and Zambezian and Mopane Woodlands is protected. WMAs

are buffer zones between incompatible land-uses particularly livestock and wildlife and in some cases they also serve as migratory corridors for wildlife. These buffer zones are often designated adjacent to national parks and game reserves for purposes of sustainable management of wildlife usually through CBNRM activities (see Figure 6). Within these non-consumptive (photographic) based commercial wildlife operations are executed.

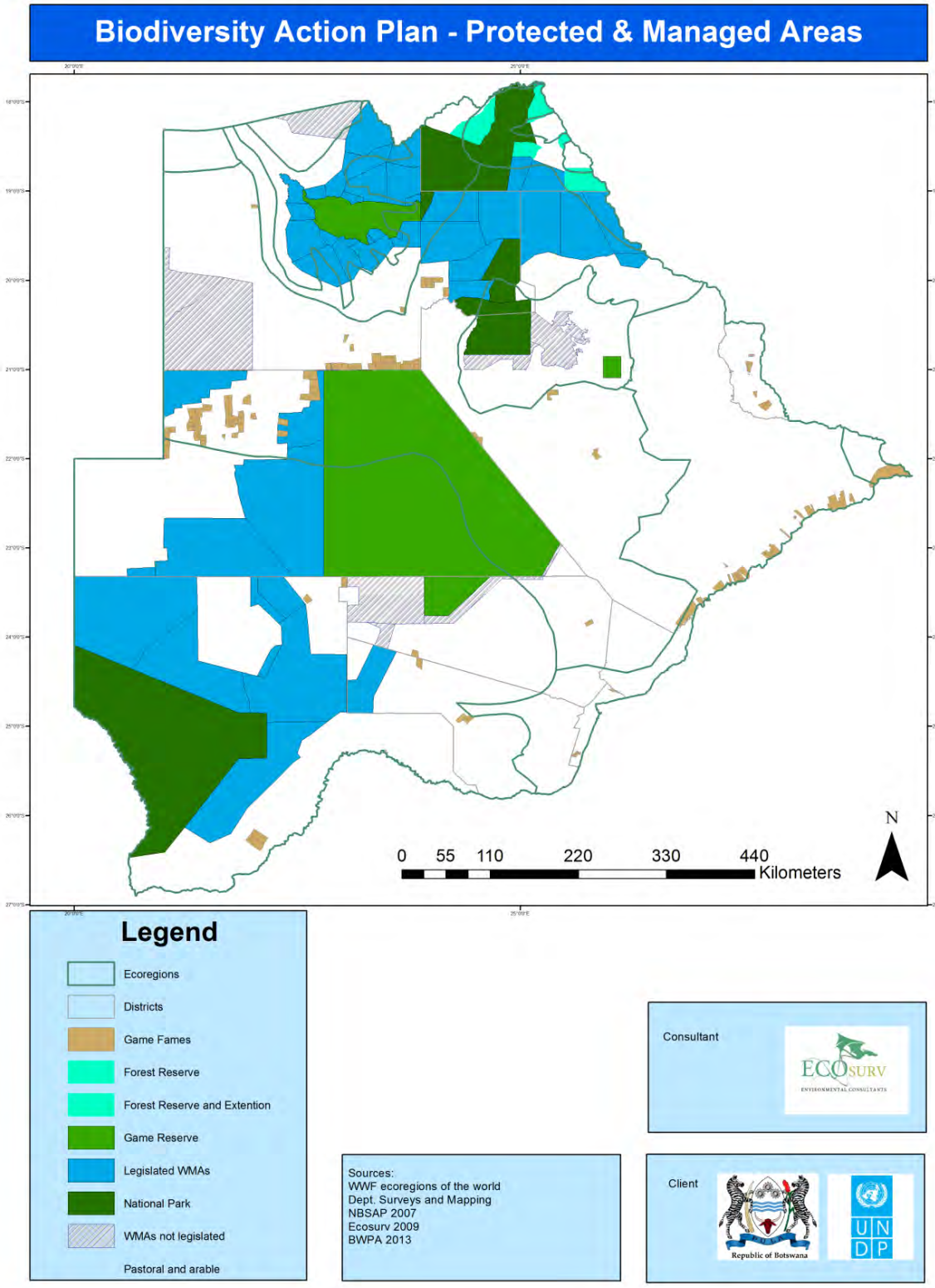

Figure 6: Protected areas of Botswana

Table 5: Botswana's Forest Reserves

Forest Reserve	Ecoregion Protected	Area (km^2)
Chobe Forest Reserve	Zambezian Baikiaea and Zambezian & Mopane Woodlands	1485
Kasane Forest Reserve and Extension	Zambezian Baikiaea and Zambezian & Mopane Woodlands	750
Kazuma Forest Reserve	Zambezian Baikiaea Woodlands	157
Sibuyu Forest Reserve	Zambezian Baikiaea Woodlands	1161
Maikaelelo Forest Reserve	Zambezian Baikiaea Woodlands	543

Source: DFRR, 2013

The Department of National Museum and Monuments is responsible for a number of botanical monuments (Table 6). Botswana has one designated Ramsar site, covering the Okavango Delta, and one World Heritage Site, the Tsodilo Hills. These areas are protected through the management standards attached to Ramsar and World Heritage Site listings. The Makgadikgadi pans have been proposed for Ramsar listing and a framework management plan has been prepared. The DNMM is presently applying to UNESCO for listing of the Okavango Delta as a World Heritage Site.

In addition to the formally protected areas, there are a large number (108) of private game farms of which effectively work as conservation areas. The approximate area of the farms is: 951 km^2 or 1.5 percent of Botswana (Figure 6).

Table 6: Botanical monuments in Botswana

Name of Monument	District and Location	Remarks
Molepolole Aloe Forest Reserve	Kweneng (Molepolole)	Preserved because Bakwena believe that they saved them from the Boers
Mahalapye Baobab	Central (Mahalapye)	Southern most occurring and eye catching
Pelotshetlha *Lithops*	Southern (Pelotshetlha)	Occurs on a small hill-size of football pitch. Only located area so far
Makosho trees	Central (Lecheng)	Known to occur in riverine areas but in this place not close to any river. They have a limited distribution of 42 in this area
Sesamothamnus lugardii (Thobega) Trees	Central (Boteti sub District)	Limited distribution, threatened and occur in a quarried area
Baines Baobabs	Ngamiland (Nxai Pan)	Spectacular for their unusual clusterings
Mamuno Aloe Forest Reserves	Gantsi (Mamuno)	Attractive forest of *Aloe marlothii*
Sowa Morula	Central (Sowa)	Stand of Morula trees
Maitengwe Mopane Forest Reserve	Central (Maitengwe)	This area is secured as an in-situ area for protection of and research on vegetation
Sokwe forest reserve	Central (Serowe)	Area rich in botanical diversity
Mowana Prison Tree	Chobe (Kasane)	Tree historically used as a prison cell
Mazilibgwa's Mowana	Central (Mosu)	Historic huge baobab tree
Green's Gutsaa Baobab	Central (Gweta)	Historic huge baobab tree
Marula-mantsi Tree Trail	Central (Gweta)	Morula is now being harvested for commercial projects. This area has been secured/protected for research purposes.

Source: Botswana National Herbarium and Botanical Gardens

The protected area network in Botswana provides good *in situ* conservation for most of the ecoregions and many wildlife species, except in the north eastern part of Botswana. While the vegetation in national parks and game reserves is protected and the forest reserves offer

protection of certain species, the protected area network offer less protection for Botswana's rare and endangered plants as most of these occur outside the protected area network (BSAP, 2007). The recently adopted Botswana Threatened Species Policy compensates for this limitation by establishing a complete scheme for the protection and recovery of threatened species and for the inventorying of endemic species for the purpose of protecting them when they are threatened or data deficient (BTSP, 2007). Comprehensive legal support for the policy is however lacking and there has been no implementation of proposed actions.

The *ex situ* conservation facilities for wildlife is limited for all organisms. However, through the Millennium Seed Bank Project, 595 collections of Botswana plant seeds, herbarium vouchers and live specimens have been obtained so far for *ex situ* conservation, and the project is on track of reaching the Global Plant Conservation Strategy target no 8 of 60 % of threatened plant species in accessible *ex situ* conservation by the end of 2010.

The Millennium Seed Bank (MSB) Project is an international collaborative plant conservation initiative managed by the Royal Botanic Gardens, Kew in the United Kingdom. The global project acts as an umbrella for a number of national MSB programmes. The MSB Project is the largest *ex situ* conservation project in the world. By the end of this decade the MSB partners in over 20 countries will have banked seed from 10% of the world's wild plant species, and thus secured these species against possible extinction. The long-term goal is to have 40 % of the world' flowering wild plant species in *ex situ* conservation by 2040.

6.2.2 Status of biodiversity

This section outlines the available updated species lists for Botswana.

6.2.2.1 Biodiversity lists

There have been a few biodiversity surveys carried out within Botswana between 2007 and the present. Of importance are the updating and listing of species within the Okavango Delta (ORI; http://www.orc.ub.bw/) and the taxonomic survey data for five protected areas In Botswana in 2007.

Avifauna

Birdlife Botswana maintains an up-to-date bird checklist which can be obtained at http://www.birdlifebotswana.org.bw/publications.html. The last update online is 2010. There are 587 bird species recorded in Botswana.

Mammals

The mammal fauna of Botswana comprises a total of 157 species, of which 114 can be classified as small mammals. Large mammals are species in excess of five kilograms. Based on the numerical criterion of species richness, the dominant representatives among small mammals are the Rodentia, Insectivora (hedgehogs and shrews) and Chiroptera (bats) (DWNP & EU 2007).

Fish

There are no new fish species lists; the number of recorded species remains 99.

Reptiles and Amphibians

Some collection of reptiles and amphibians has been undertaken in the protected areas although this has not greatly added to the national species lists. The number of recorded reptiles is 131 and of amphibians, 44.

Invertebrates

There are few inventories of invertebrates. The most comprehensive lists are of dragonflies and butterflies.

The dragonflies in Botswana are fairly well known, primarily through the ORI lists of Odonata of the Okavango Delta and research by Jens Kipping (2010). Recent, comprehensive studies by Jens Kipping on dragonflies indicate that they interact strongly with elephants in Botswana, with elephants having a very similar disturbance effect upon the Odonata fauna as do humans (Samways and Grant 2008). A checklist of the Odonata of Botswana has been developed. In 2007 three additional species were added to the list so that the known number of species is presently 127 (Kipping, 2010). Of note is the near-threatened, possibly endemic Swamp emperor dragonfly (*Anax bangweuluensis*), and two other near-threatened species: Dusky Dropwing (Trithemis aequalis) and Black Dropwing (*Trithemis brydeni*).

There are 252 butterfly species listed for Botswana in the Butterflies of Africa Database (http://en.wikipedia.org/wiki/List_of_butterflies_of_Botswana).

Plants

Dr Setshogo prepared a Draft Checklist of Plants (2005) as part of the Southern African Botanical Diversity Network (SABONET) programme. He listed 3,086 species as outlined in Table 7.

Table 7: Summary of numbers of plant families, genera and species in infraspecific taxa in Botswana (Setshogo, 2005 SABONET Report No. 37)

	Families	Genera	Species
Bryophytes	13	21	45
Pteridophytes	12	18	47
Dicotyledons	123	671	2,145
Monocotyledons	34	201	849
Total	**182**	**911**	**3,086**

The Millennium Seed Bank (MSB) and Botswana National Plant Genetic Resources Centre have been collecting plant seeds and storing them *ex situ*. To date (December 2013) the MSB has stored seeds from 595 Botswana species and identified an additional 10 new species thus increasing the listed species to 3,096 (Royal Botanical Gardens Kew 2013). The present seed collection represents 19.2 % of all recorded plants species in Botswana.

The purpose of the MSB Programme, which started in 2003, is "To contribute to the health and survival of Botswana's wild plant species, through seed conservation and strengthening of Botswana's seed conservation capacity". The project is focusing on collections and *ex situ* storage of the rare and endangered plant species as well as those wild species with economic potential.

Table 8: New species of plant not previously collected in Botswana

Family	Genus	Species	Author	Verifier
ACANTHACEAE	*Barleria*	*albostellata*	C.B.Clarke	Iain Darbyshire, Kew
ACANTHACEAE	*Thunbergia*	*annua*	Hochst. Ex Nees	Kai Vollesen, Kew
AIZOACEAE	*Hereroa*	*glenensis*	(N.E.Br.) L.Bolus	Prisilla Burgoyne, SANBI
AIZOACEAE	*Nananthus*	*aloides*	(Haw.) Schwantes	Emma Williams, Kew
ASTERACEAE	*Gutenbergia*	*polycephala*	Oliv. & Hiern.	Emma Williams, Kew
CONVOLVULACEAE	*Merremia*	*xanthophylla*	Hall.f.	Emma Williams, Kew
CYPERACEAE	*Alinula*	*lipocarphioides*	(Kük.) J.Raynal	K.Bauters, Ghent University

LEGUMINOSAE	*Indigofera*	*baumiana*	Harms (LC)	Brian Schrire, Kew
MALVACEAE	*Corchorus*	*fasicularis*	Lam.	Emma Williams, Kew
VITACEAE	*Cyphostemma*	*kilimandscharicum*	(Gilg) Desc. Ex Wild & R.B.Drumm.	Emma Williams, Kew

Source: Unpublished data gathered by Emma Williams – Copyright Royal Botanical Gardens Kew

6.2.2.2 Red Data Lists

The common globally accepted standard of extinction risk assessment is the IUCN Red Listing of Threatened Species. However the IUCN's Global Red List of Threatened Species is not a comprehensive list of all species in Botswana and may not reflect the national status of species in Botswana (Botswana Threatened Species Management Policy, Implementation Strategy and Action Plan, 2007).

Large Mammals

Botswana's ecosystems support a variety and abundance of mammals which are globally threatened. It harbours many threatened large mammal species and contains one of the largest remaining populations of the African wild dog (*Lycaon pictus*) and the largest remaining population of African Elephant (*Loxodonta 47ebbie4747*). The distribution of globally threatened large mammal species found in Botswana is shown by Figure 7.

Table 9: List of globally threatened large herbivores in Botswana

No	Scientific Name	Common Name	Conservation Status	Population Trend
2	*Ceratotherium simum*	White Rhinoceros	Near Threatened	Increasing
3	*Diceros bicornis*	Black Rhinoceros	Critically endangered	Increasing
6	*Hippopotamus amphibius*	Hippopotamus	Vulnerable	Declining
7	*Hippotragus equines*	Roan Antelope	Least Concern	Declining
9	*Kobus vardonii*	Puku	Near Threatened	Declining
11	*Loxodonta Africana*	African Elephant	Vulnerable	Increasing

Table 10: Conservation status of carnivore species in Botswana

No	Scientific Name	Common Name	Conservation Status	Population Trend
1	*Acinonyx jubatus*	Cheetah	Vulnerable	Declining
5	*Felis nigripes*	Black-footed Cat	Vulnerable	Declining
8	*Hyaena brunnea*	Brown Hyaena	Near Threatened	Declining
13	*Panthera leo*	Lion, African Lion	Vulnerable	Declining
14	*Panthera pardus*	Leopard	Near Threatened	Declining

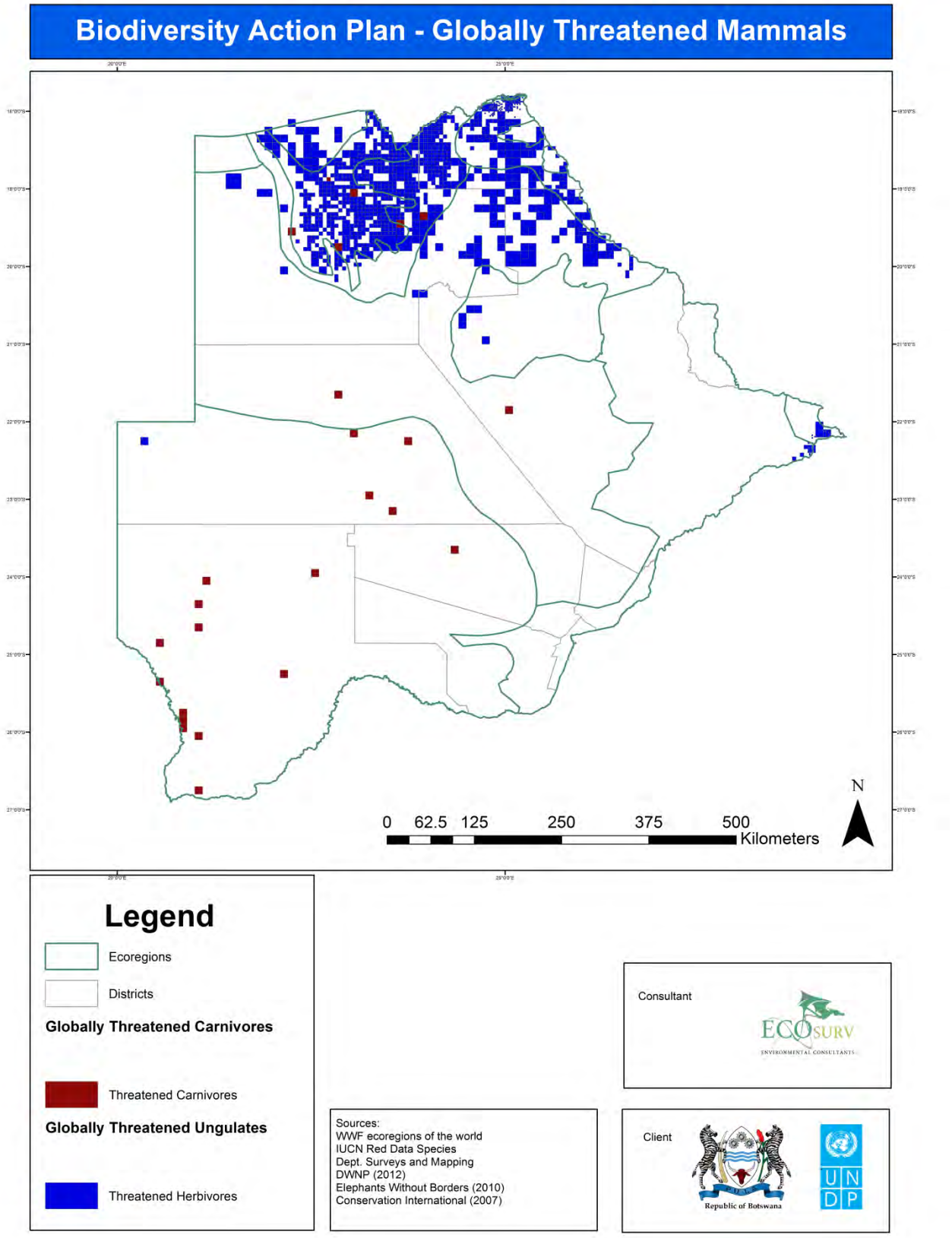

Figure 7: Distribution of globally threatened mammals (population numbers) in Botswana

In addition to the Red Data species, the DWNP has indicated a concern with declining populations of certain large ungulate species that are not of international concern. These include springbok (particularly in the Kalahari xeric savanna and Zambezian halophytics), tsessebe, roan and sable antelope and giraffe in northern Botswana in the Kalahari Acacia-

Baikiaea savanna and Zambezian Mopane woodlands and lechwe and sitatunga in the Zambezian flooded grasslands.

Small Mammals

There is limited data on small mammal distribution, species and threats. The 2003 biodiversity stocktake specialist report on mammals (Caracal, 2003; updated EU/DWNP 2007) listed a number of vulnerable species (Table 11, Table 12 & Table 13).

Table 11: Conservation status of Insectivora, Macroscelidea and rodent species in Botswana

Species Common Name	Scientific Name	Status IUCN Red Data Book
South African Hedgehog	*Atelerix frontalis*	Least concern
Rock Elephant-Shrew	*Elephantulus myurus*	Least concern
Angolan Marsh Rat	*Dasymys nudipes*	Data deficient
Setzer's Pygmy Mouse	*Mus setzeri*	Least concern (rare)
Southern African Mastomys	*Mastomys coucha*	Least concern

Woosnam's desert rat (*Zelotomys woosnami*), endemic to the arid areas of Botswana, has been recorded in the Gchwihaba caves (NG4 Management Plan, Ecosurv 2010).

Table 12: Conservation status of Chiroptera species in Botswana (Caracal 2003, updated DWNP/EU 2007)

Species Common Name	Scientific Name	Status IUCN Red Data Book
Long-crested free-tailed bat	*Chaerephon shortridgei*	Least concern
Natal clinging bat	*Miniopterus natalensis*	Near threatened
Giant leaf-nosed bat	*Hipposideros vittatus [ex Marungensis]*	Near threatened
Short-eared trident bat	*Cloeotis percevali*	Least concern
Lesser woolly bat	*Kerivoula lanosa*	Least concern (rare)
Rendall's serotine bat	*Neoromicia rendalli*	Least concern (rare)
Botswana long-eared bat	*Laephotis botswanae*	Least concern (rare)
Anchieta's bat	*Hypsugo anchietae*	Least concern (rare)
Butterfly bat	*Chalinolobis variegatus*	Least concern
Straw-coloured fruit bat	*Eidolon helvum*	Near threatened
Peters' epauletted fruit bat	*Epomophorus crypturus*	Least concern
Dobson's fruit bat	*Epomops dobsonii*	Least concern
Cape serotine bat	*Eptesicus capensis*	Least concern
Sundevall's leaf-nosed bat	*Hipposideros caffer*	Least concern
Commerson's leaf-nosed bat	*Hipposideros commersoni*	Near threatened
Schreibers' long-fingered bat	*Miniopterus schreibersii*	Near threatened
Common slit-faced bat	*Nycteris thebaica*	Least concern
Schlieffen's bat	*Nycticeius schlieffenii*	Least concern
Banana bat	*Pipistrellus nanus*	Least concern
Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Least concern
Dent's horseshoe bat	*Rhinolophus denti*	Least concern
Flat-headed free-tailed bat	*Sauromys petrophilus*	Least concern
Yellow house bat	*Scotophilus dinganii*	Least concern
Pale free-tailed bat	*Tadarida (Chaerephon) chapini*	Least concern
Nigerian free-tailed bat	*Tadarida (Chaerephon) nigeriae*	Least concern
Little free-tailed bat	*Tadarida (Chaerephon) pumila*	Least concern
Angola free-tailed bat	*Tadarida (Mops) condylura*	Least concern
Midas free-tailed bat	*Tadarida (Mops) midas*	Least concern
Egyptian free-tailed bat	*Tadarida (Tadarida) aegyptiaca*	Least concern
Tomb bat	*Taphozous mauritianus*	Least concern
Egyptian tomb bat	*Taphozous perforatus*	Least concern

Table 13: Conservation status of Galagidae in Botswana

Species Common Name	Scientific Name	Status IUCN Red Data Book
Lesser bushbaby	*Galago moholi*	Least concern
Thick-tailed bushbaby	*Otolemur crassicaudatus*	Least concern

Avifauna

In 2008, there were 25 globally threatened bird species in Botswana, and a further eight species regarded as nationally threatened or Birds of Conservation Concern in Botswana (Table 14). Among the globally threatened species, it is significant to note that Botswana has no Critically Endangered bird species. There are only two Endangered species (both vagrants), nine Vulnerable and 14 Near Threatened species. On the whole, the status of birds throughout the country is relatively good (Kootsositse et al, 2009).

Table 14: List of globally threatened bird species found in Botswana

No	Scientific Name	English Name	Conservation Status
1	*Neophron percnopterus*	Egyptian Vulture	Endangered
2	*Acrocephalus griseldis*	Basra Reed Warbler	Endangered
3	*Egretta vinaceigula*	Slaty Egret	Vulnerable
4	*Falco naumanni*	Lesser Kestrel	Vulnerable
5	*Torgos tracheliotos*	Lappet-faced Vulture	Vulnerable
6	*Circus maurus*	Black Harrier	Vulnerable
7	*Anthropoides paradiseus*	Blue Crane	Vulnerable
8	*Grus carunculatus*	Wattled Crane	Vulnerable
9	*Gyps coprotheres*	Cape Vulture	Vulnerable
10	*Crex crex*	Corn Crake	Least Concern
11	*Trigonoceps occipitalis*	White-headed Vulture	Vulnerable
12	*Phoenicopterus minor*	Lesser Flamingo	Near Threatened
13	*Circus macrourus*	Pallid Harrier	Near Threatened
14	*Neotis denhami*	Denham's Bustard	Near Threatened
15	*Gyps africanus*	White-backed Vulture	Endangered
16	*Rhynchops flavirostris*	African Skimmer	Near Threatened
17	*Glareola nordmanni*	Black-winged Pratincole	Near Threatened
18	*Gallinago media*	Great Snipe	Near Threatened
19	*Mirafra cheniana*	Latakoo (Melodious) Lark	Near Threatened
20	*Oxyura maccoa*	Maccoa Duck	Near Threatened
21	*Charadrius pallidus*	Chestnut-banded Plover	Near Threatened
22	*Coracias garrulous*	European Roller	Near Threatened
23	*Falco vespertinus*	Red-footed Falcon	Near Threatened
24	*Limosa limosa*	Black-tailed Godwit	Near Threatened
25	*Numenius arquata*	Eurasian Curlew	Near Threatened
26	*Polemaetus bellicosus*	Martial Eagle	Vulnerable

None of the avifauna species in Botswana are endemic and there are only two near-endemics: the Slaty Egret, which has approximately 85% of its global population in the Okavango Delta; and the Short-clawed Lark, which has more than 90% of its global population in South-eastern Botswana. Figure 8 shows the distribution of threatened and vulnerable bird species in Botswana.

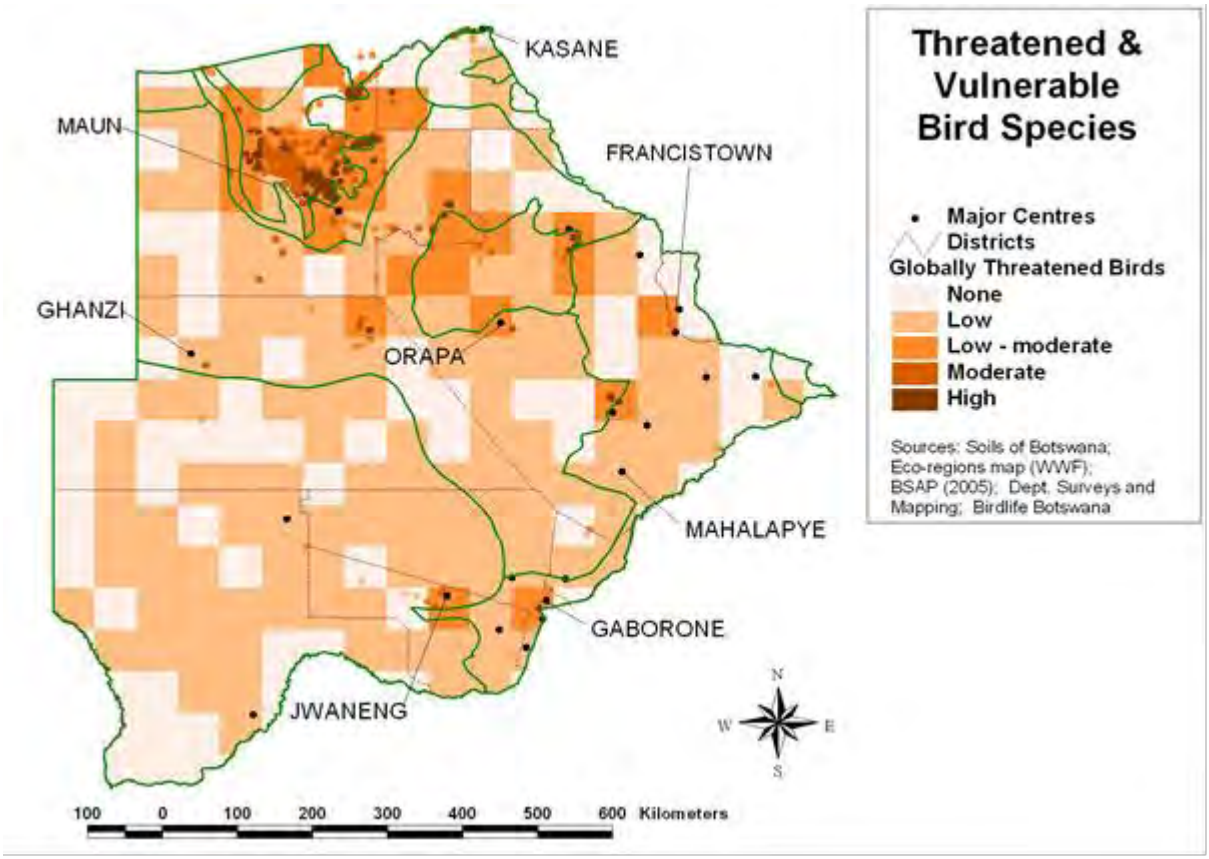

Figure 8: Distribution of threatened and vulnerable bird species in Botswana (Source: Birdlife Botswana)

Botswana also hosts large populations of regionally vulnerable species such as White-headed Vulture (*Trigonoceps occipitalis*), Lappet-faced Vulture (*Aegypius tracheliotus*, formerly *Torgos tracheliotus*), Martial Eagle (*Polemaetus bellicosus*) and Lesser Kestrel (*Falco naumanni*). These species are widespread in Botswana, and/or less threatened than elsewhere in southern Africa. Large proportions of the southern African populations of Wattled Crane (*Bugeranus caranculatus*) and Slaty Egret (*Egretta vinaceigula*) occur in northern Botswana.

In addition to the Vulnerable species, there are also several Near-threatened. This category includes the African Skimmer (*Rynchops flavirostris*), with the Okavango Delta thought to hold around 10% of the global population. Other Near-threatened species for which Botswana represents an important centre of distribution are Denham's Bustard (*Neotis denhami*), Chestnut-banded Plover (*Charadrius pallidus*) and Lesser Flamingo (*Phoenicopterus minor*). The Makgadikgadi Pans represent a key breeding area for the latter two species.

Fish

There are two globally threatened fish species in Botswana (see Table 15). *Oreochromis andersonii* is susceptible to fishing pressure while both species (*O. andersonii and O. macrochir*) are potentially threatened by the occurrence of the alien and invasive species *O. niloticus* (Nile Tilapia), which is widely distributed in the Zambezi, Kafue and Limpopo systems. The Nile tilapia unfortunately hybridise with local *Oreochromis* species in Africa, causing a threat to local and indigenous tilapia. It was distributed to the Kafue River and Lake Kariba in the Zambezi in the 1980's where it presently replaces the indigenous Kariba tilapia or bream [*Oreochromis mortimeri*]. In 1996 it was first collected in the Limpopo River and has been collected 100 km downstream of the Motloutse/Limpopo confluence in 2002. A survey carried out in 2010 (B. van der Waal) identified *O. mossambicus x niloticus* hybrids in Letsibogo Dam (Eastern Botswana) and upstream water bodies.

At present, the Okavango population is not immediately threatened, but this system is intermittently linked to the Zambezi and thus it is inevitable that *O. niloticus* will invade the system (Tweddle & Marshall, 2008 and confirmed by DWNP during consultations).

Table 15: List of globally threatened fish in Botswana

No	Scientific Name	Common Name	Conservation Status
1	*Oreochromis andersonii*	Threespot Tilapia	Vulnerable
2	*Oreochromis macrochir*	Greenhead Tilapia	Vulnerable

Reptiles and Amphibians

The EU/DWNP biodiversity studies of protected areas (2007) improved our understanding of the distribution and conservation status of replies and amphibians.

There are currently no reptile or amphibian species Red Listed in Botswana (IUCN 2007). There are, however, two endemic reptiles (one not found in protected areas) and several near-endemic reptile and amphibian species (EU/DWNP, 2007)

Pelusios bechuanicus – Okavango Hinged Terrapin. Near-endemic, restricted to the Okavango Basin and the Zambezi River above Victoria Falls.

Pelusios rhodesianus – Mashona Hinged Terrapin

Atractaspis duerdeni – Duerden's Burrowing Asp

Typhlosausus gariepensis – Gariep Blind Legless Skink. A very restricted range, occurring in Kgalagadi Transfrontier National Park and adjacent Botswana, Namibia, South Africa.

Limnophis bangweolicus – Eastern Striped Swamp Snake. This species occurs only within the Zambezi and Okavango drainage basins

Crotaphopeltis barotseensis – Borotse Water Snake. Near-endemic, restricted to the Okavango and Zambezi systems in Papyrus swamp.

Agama makarikarica – Makgadikgadi Spiny Agama. A true endemic, restricted to Makgadikgadi Pans and Nxai Pans National Parks (Branch 2004).

Pachydactylus tsodiloensis – Tsodilo Thick-toed Gecko. Endemic to Botswana, specifically to the Tsodilo Hills in Northern Botswana.

Crocodylus niloticus – Nile crocodile

Although not Red Listed, the crocodile is considered a "keystone species" that maintains ecosystem structure and function. The decline of this species in the Okavango Delta and Chobe River systems may have catastrophic effects. It has been shown (Bourquin 2007) that the Okavango panhandle crocodile population has declined significantly over the last 80 years.

Two of internationally protected species of reptiles, the Nile crocodile (*Crocodylus niloticus*) and the African rock python (*Python sebae*) occur in Botswana and are protected by the Wildlife Conservation and National Parks Act of 1992.

Invertebrates

Odonata are one of the best studied families of invertebrate. Kipping (2007) lists 14 species that are classified as data deficient by IUCN.

Table 16: IUCN Red Data species for Odonata occurring in Botswana (Kipping 2007)

Scientific Name	Common Name	Conservation Status
Anax bangweuluensis	Brown Swamp Emperor	Near threatened
Brachythemis wilsoni	Wilson's Groundling	Least concern
Ceriagrion katamborae	Katambora Citril	Data deficient
Elattoneura cellularis	Zambezi Threadtail	Least concern
Ictinogomphus dundoensis	Swamp Tigertail	Least concern
Lestinogomphus silkeae	Silke's Fairytail	Data deficient
Nesciothemis minor	Small Blacktail	Least concern
Neurogomphus cocytius	Kocytos Syphontail	Data deficient
Phyllomacromia kimminsi	Kimmin's Cruiser	Least concern
Pseudagrion fisheri	Fisher's Sprite	Least concern
Pseudagrion helenae	Helen's Sprite	Least concern
Trithemis sp. Nov. Giere subm	Okavango Dropwing	Data deficient
Trithemis aequalis	Dusky Dropwing	Near threatened
Trithemis brydeni	Black Dropwing	Near threatened

The DWNP/EU report notes that butterflies have been fairly well-collected in Botswana (252 species recorded) but for most other taxa there is very little information. There are presently no butterflies of conservation concern in Botswana.

There have been 152 grasshopper species recorded (Johnsen 1990; 1991a; 1991b).

Table 17: IUCN Red Data species for invertebrates (apart from Odonata) occurring in Botswana (DWNP/EU, 2007 and this review)

Scientific Name	Common Name	Class	Conservation Status
Mutela zambesiensis		Bivalvia	Least concern
Potamonautes warreni		Crustacea	Least concern
Burnupia trapezoidea		Gastropoda	Data deficient
Bulinus depressus		Gastropoda	Least concern
Pila occidentalis		Gastropoda	Least concern
Melanoides victoriae		Gastropoda	Least concern
Doratogonus rugifrons		Diplopoda	Least concern
Doratogonus stephensi		Diplopoda	Data deficient
*Erikssonia edgei (*May occur in Botswana but not collected)	Eriksson's 53ebbie mimic	Lepidoptera, Lycaenidae family	Vulnerable but considered critically endangered in South Africa

Flora

The SABONET 2002 Database of Southern African Plant Red Data Lists of extinct and threatened plant species (2002) remains the most comprehensive list. Generally, though, little protection is given to flora. The Forest Act of 1968, as amended by Act No.8 of 2005, allows for the declaration of protected species and lists ten tree species (Table 18) to be protected.

The SABONET list contains approximately 43 of Botswana plant species (Table 19). The Database lists 13 endemic, and 10 potentially endemic and 7 near endemic plant species in Botswana (see Table 20). The Royal Botanic Gardens, Kew lists an additional 14 species as endemic and near endemic. Figure 9 shows sites where Botswana's threatened and vulnerable plant species have been collected.

The MSB together with the Botswana National Plant Genetic Resources Centre have collected and stored seeds from just over half of Botswana's Red Data List Species.

Table 18: List of plant species protected under Forest Act, 1968

Family	Botanical Name	Status
Bombaceae	*Adansonia digitata L*.	Protected
Ebenaceae	*Diospyros mespiliformis* Hochst ex A.D.C.	Protected
Euphorbiaceae	*Spirostachys africana*	Protected
Fabaceae	*Afzelia quanzensis* Welw.	Protected
	Baikiae plurijuga Harms.	Protected (Near threatened)
	Brachystegia spp.	Protected
	Guibourtia coleosperma (Benth) J. Leon	Protected
	Pterocarpus angolensis D.C.	Protected (Near threatened)
Meliaceae	*Entandrophragma caudatum* Sprague	Protected
Rhamnaceae	*Berchemia 54ebbie545454* (Klotzsch) Mensley	Protected

Table 19: Flora species listed in the SABONET Plant Red Data List (with updates from RBG Kew and the IUCN Red Data List)

Family	Species name	Status	*Ex situ* Storage
Acanthaceae	*Barleria matopensis* S. Moore	Least concern	No
	Blepharis bainesii S.Moore ex C.B.Clarke	Least concern	Yes
Apocynaceae	*Adenium boehmianum* Schniz	Endangered	No
	Adenium oleifolium Stapf	Vulnerable	Yes
Asclepiadaceae	*Ceropegia floribunda*	Data deficient	No
	Hoodia currori subsp. *Lugardi* (N.E. Br.) Bruyns	Vulnerable	Yes
	Huernia levyi Oberm.	Vulnerable	No
	Orbea tapscottii (I.Verd.) L.C.Leach	Endangered	Yes
	Orbea knobelii (E.Phillips) L.C.Leach	Vulnerable	Yes
Asteraceae	*Arctotis rogersii* (Benson) M.C.Johnst.	Data deficient	No
	Arctotis serpens (S.Moore) Lewin	Data deficient	No
	Erlangea remifolia Wild & G.V.Pope	Data deficient	Yes
	Rennera laxa (Bremek. & Oberm.) Källersjö	Data deficient	No
Aizoaceae	*Nananthus aloides* (Haw.) Schwantes	Data deficient	Yes
	Nananthus margaritiferus L.Bolus	Data deficient	No
Capparaceae	*Boscia foetida* Schinz subsp. *Minima* Toelken	Least concern	Yes
Cyperaceae	*Eleocharis cubangensis* H.E. Hess	Data deficient	No
	Pycreus okavangensis Podlech	Least concern	Yes
Droseraceae	Aldrovanda vesiculosa	Endangered (IUCN)	No
Eriospermaceae	*Eriospermum linearifolium* Baker	Data deficient	No
	Eriospermum seineri Engl. & K.Krause	Data deficient	No
Euphorbiaceae	*Euphorbia venteri* L.C.Leach ex R.H.Archer & S.Carter	Endangered	Yes
	Jatropha botswanica Radcl.-Sm.	Least concern	Yes
Fabaceae	*Acacia hebeclada* subsp. C*hobiensis* (O.B.Mill.) A.Schreib.	Least concern	Yes
	Acacia hebeclada DC. Subsp. *Tristis* A.Schreiber	Rare	Yes
Leguminosae	*Dalbergia melanoxylon*	Near threatened (IUCN)	No
Indigofera	*Indigofera baumiana* Harms (LC)	Least concern	Yes
Lythraceae	*Nesaea minima* Immelman	Vulnerable	No

Family	Species name	Status	*Ex situ* Storage
Orchidaceae	*Ansellia 55ebbie5555* Lindl.	Vulnerable	Yes
	Eulophia angolensis (Rchb.f.) Summerh.	Vulnerable	No
	Eulophia latilabris Summerh.	Vulnerable	Yes
	Habenaria pasmithii G.Will.	Data deficient	No
	Zeuxine 55ebbie5555 Rchb.f.	Rare and threatened	No
Pedaliaceae	*Harpagophytum procumbens* DC.	Vulnerable	Yes
	*Harpagophytum zeyheri (*sub species *zyheri* and *sublobatum)* Decne.	Least concern	Yes
Poaceae	*Aristida wildii* Melderis	Data deficient	Yes
	Panicum coloratum var. *makarikariense* Goosens	Data deficient	No
	Panicum gilvum Launert	Data deficient	Yes
	Panicum pilgerianum Schweickerdt Clayton	Data deficient	No
	Sporobolus bechuanicus Gooss.	Data deficient	Yes
Portulacaceae	*Avonia rhodesica* (N.E.Br.) G.D.Rowley (formerly *Anacampseros rhodesica*)	Vulnerable	Yes
Rosaceae	*Grielum cuneifolium* Schinz.	Data deficient	No
Santalaceae	*Thesium dissitum* N.E.Br.	Data deficient	No
Sapindaceae	*Erythrophysa transvaalensis* I.Verd.	Vulnerable	Yes
Scrophulariaceae	*Jamesbrittenia integerrima* (Benth.) Hilliard	Data deficient	No
	Jamesbrittenia concinna (Hiern) Hilliard	Data deficient	No

Source: Setshogo & Hargreaves, 2002, RBG Kew 2013

Table 20: Endemic, near endemic and potentially endemic plant species of Botswana

Family	Botanical Name	Status
Acanthaceae	*Blepharis bainesii* S.Moore ex C.B.Cl.	Potentially Endemic
Amaranthaceae	*Amaranthus dinteri* subsp. *Dinteri*	Endemic
Anacardiaceae	*Rhus magalismontana subsp. Magalismontana* Burch x *Rhus pyroides* var. *pyroides*	Endemic
Asclepiadaceae	*Orbea knobelii* (Phill.) Leach	Endemic
Asteraceae	*Arctotis rogersii* S.Moore	Potentially Endemic
	Arctotis serpens S.Moore	Potentially Endemic
	Erlangea remifola Wild & Pope	Endemic
	Rennera laxa (Brem. & Oberm.) Kallersjo	Endemic
Capparaceae	*Boscia matabelensis* Pest	Near Endemic
	Cleome kalachariensis (Schinz) Gilg & Ben	Endemic
Convolvulaceae	*Ipomoea fanshawei* Verdc.	Near Endemic
Eriospermaceae	*Eriospermum linearifolium* Bak.	Potentially Endemic
	Eriospermum seineri Engl. & Krause	Potentially Endemic
Euphorbiaceae	*Euphorbia rubriflora* N.E.Br.	Near Endemic
	Jatropha botswanica Radcliff-Sm.	Endemic
	Tragia gardneri Prain	Near Endemic
Iridaceae	*Gladiolus rubellus* Goldblatt	Endemic
Lythraceae	*Nesaea minima* Immelman	Endemic
Neuradaceae	*Grielum cuneifolium* Schinz	Potentially Endemic
	Neuradopsis bechuanensis Bremek. & Oberm	Endemic
Poaceae	*Aristida stipitata* subsp. *Spicata* (De Winter) Meldeis apud Launert	Endemic
	Aristida wildii Meld.	Potentially Endemic

Family	Botanical Name	Status
	Eragrostis leptotricha Cope	Near Endemic
	Eragrostis phyllacantha Cope	Near Endemic
	Eragrostis subglandulosa Cope	Endemic
	Sporobolus bechuanicus Goossens	Endemic
Rutaceae	*Thamnosma rhodesica* (Baker f.) Mendonca	Near Endemic
Santalaceae	*Thesium dissitum* N.E.Br.	Potentially Endemic
Scrophulariaceae	*Jamesbrittenia integerrima* (Benth.) Hilliard	Potentially Endemic
Scrophulariaceae	*Jamesbrittenia concinna* Hiern	Potentially Endemic

Source: Setshogo & Hargreaves, 2002, RBG Kew 2003

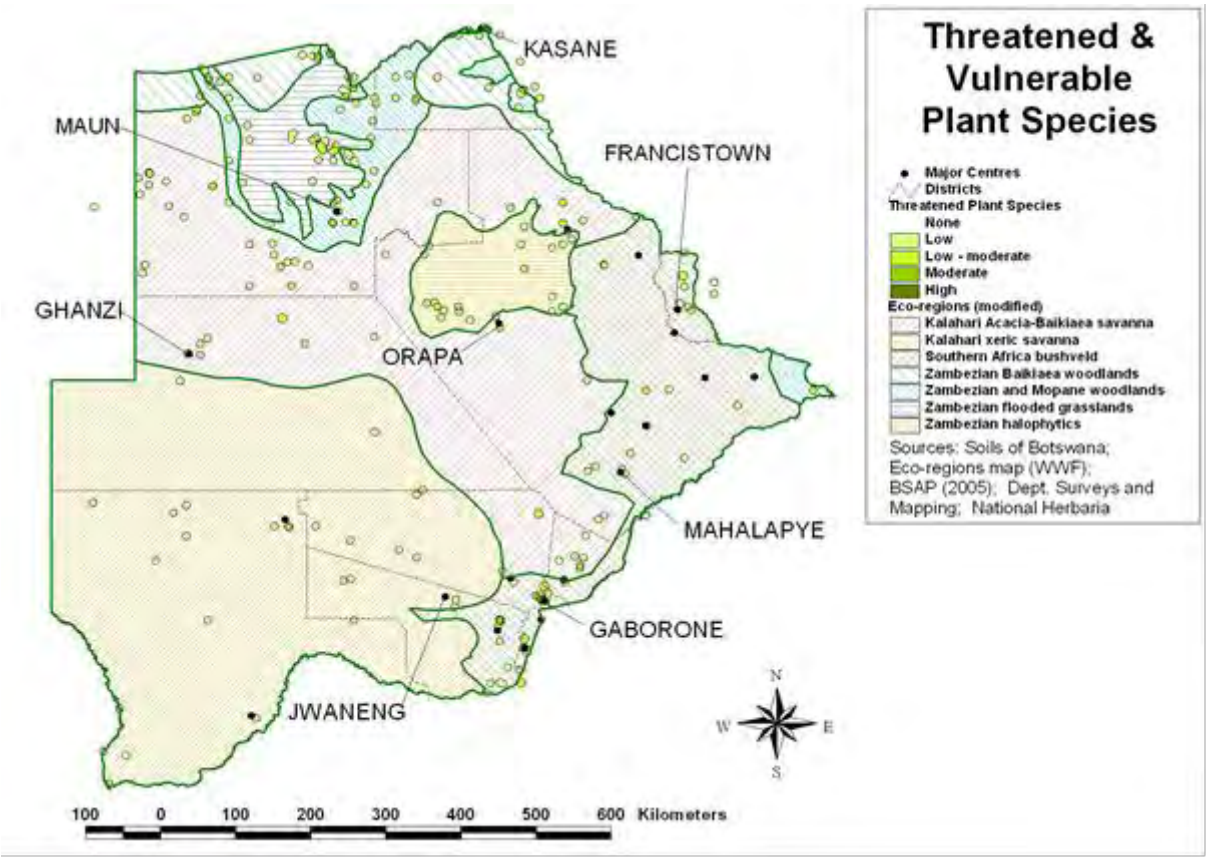

Figure 9: Distribution of threatened and vulnerable plant species in Botswana (Sources: South African National Biodiversity Institute, National Herbarium (Botswana), RBG Kew)

6.3 ECO-REGION ASSESSMENT OF BIODIVERSITY THREATS

In summary, the Zambezian and Mopane Woodland and the Zambezian Flooded grasslands show a high distribution of vulnerable and threatened species. This is an indication that continued protection of these ecoregions is essential for conservation of vulnerable and threatened species. As noted in the methods in Section 2.3.1.5, data presented at the ecoregion level was not necessarily collected by ecoregions. Apart from key systems such as the Okavango, in many cases data are collated at district level, and then regrouped according to the ecoregions.

Table 21 indicates the high distribution of threatened plant species in the Kalahari Acacia-Baikiaea savanna, while the Zambezian flooded grasslands is important for threatened species of avifauna and mammals.

Table 21: Percentage of threatened species distribution within each ecoregion (Figure for plants and birds is a percentage of recorded sitings, for mammals it is a percent of the known range). Major concerns are highlighted.

Ecoregion	Threatened Plants (%)	Threatened Birds (%)	Threatened Mammals (%)	Ecoregion as % of Botswana
Zambezian and Mopane Woodland	18.30	17.86	22.5	5
Southern African Bushveld	16.18	0.87	0	13
Kalahari Xeric Savanna	9.28	1.84	3.4	38
Zambezian Halophytics	9.02	1.62	2.1	4
Zambezian Baikiea Woodland	4.77	0.22	22.5	4
Zambezian Flooded Grasslands	19.63	70.67	32.4	4
Kalahari Acacia-Baikiaea savanna	22.81	6.93	16.9	32

Source: Ecosurv 2009

6.3.1 Ecosystem assessments

There have been a number of recent assessments of ecosystem health and a taxonomic assessment of biodiversity of the national parks and game reserves. :

- Strategic Environmental Assessment of the Okavango Delta Ramsar Site (ODRS) (Ecosurv & SAIEA, 2012)
- Rapid assessment of the Okavango River Basin and concomitant ecological systems based on a Delphi approach (Ecosurv 2011).
- Analysis of habitats for key wildlife in the Western Kgalagadi Conservation Corridor (Green Mamba 2010)
- Taxonomic assessment of five protected areas (DWNP/EU 2007)

These studies focus on the key areas of biodiversity and concern. The DWNP/EU study of the protected areas supports the findings of the NBSAP that the national biodiversity hot spot is the Okavango Delta. The SEA of the ODRS identifies the main threats to biodiversity to the hot spot as changes in hydrology, sediment dynamics and water quality, isolation of the Okavango Delta from the surrounding ecosystems due to spread of settlement and arable lands areas, high frequency of fires, alien invasive species and loss of the ungulate wildlife wet season range.

In the southern Kgalagadi conservation corridor the main threats to biodiversity are habitat fragmentation, loss of the key habitats to livestock (pans), high levels of poaching. The results can be monitored through the decline in the springbok populations which is predicted (in the Corridor Report) to be heading for extinction.

Nationally, the Rapid Assessment, which used a Delphi[3] expert system approach, identified a set of agreed open systems and then used expert opinion to assess them. The findings highlight the decline and imminent collapse of the arid wildlife systems (Figure 10) mainly due to habitat fragmentation, loss of key ecosystem components, expansion of cattle posts, range

[3] The Delphi system is a structured communication technique, and interactive forecasting method which relies on a panel of experts. The experts answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymous summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments.

degradation and the development of fenced ranches. Most of the threats are a result of conflicting policy objectives.

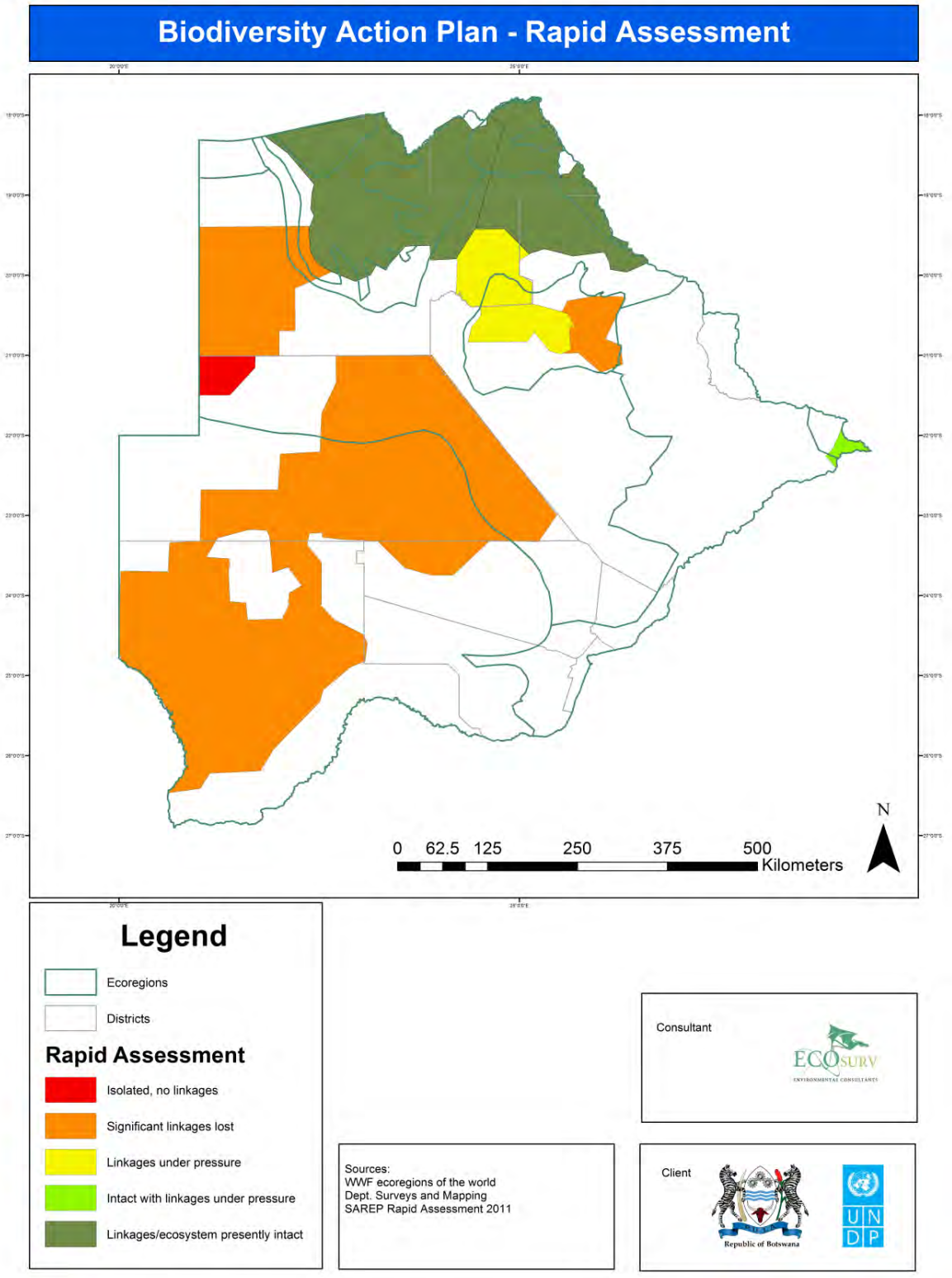

Figure 10: Assessment of open wildlife systems of Botswana (Ecosurv & SAREP 2011)

6.4 GAP ANALYSIS ON STATUS OF BIODIVERSITY IN BOTSWANA

Between the 2007 NBSAP and this update there has been one serious taxonomic survey that was (co)funded by government which assessed biodiversity in the National Parks and Game Reserves. Most of the aerial surveys of wildlife populations were funded by NGOs in a cooperative arrangement with government. The undertaking of the 2012 national survey by DWNP indicates an increase in government funding.

Most of the botanical survey and collecting work has been undertaken in partnership with international agencies or herbaria such as the Food and Agricultural Organisation, the Royal Botanical Gardens Kew and South Africa National Biodiversity Institute. Resources for national herbaria are severely limited and little new work has been undertaken by national institutions apart from Department of Agricultural Research.

Research oriented institutions such as the Okavango Research Institute have added to national taxonomic literature and both species and ecosystem understanding, far greater support for these activities is required.

Indigenous knowledge (IK) could provide additional information on the location and status of rare and endangered species – especially plants. This is a key gap that organisations should be supported to fill.

7. TRENDS IN BIODIVERSITY OVER NEXT 10 YEARS

This section initially discusses the threats as identified during the assessment; it then examines trends and finally assesses the level of threats to each ecoregion. The data in this section were compiled directly by ecoregion.

7.1 THREATS

Threats are derived from a combination of the literature, consultations at national and district levels and from trends identified from the rapid assessment of biodiversity.

The threats identified in the 2007 NBSAP, outlined in the 4th National Report to the CBD (2009) and arising from recent key stakeholder consultations. These have been divided into internal and external threats.

Internal threats:

- Habitat destruction and habitat conversion;
- Barriers to wildlife movement;
- High populations of elephant;
- Closure of the safari hunting industry;
- High frequencies of fire in some areas of the country;
- Overuse and over collection of wild species;
- Alien Invasive species.

External threats:

- Climate change;
- Changes to hydrology of inflowing rivers

The Biodiversity in Development Project (2002) identified that loss of biodiversity is a result of direct threats and the underlying causes. The above threats have been brought into this framework (Figure 11).

It should be noted that many of the direct threats are a result of a complex interaction between many underlying causes. For example, “habitat destruction and land conversion” is driven by demographic change, poverty, national policies, macroeconomic policies and perverse subsidies, ineffective government, social change and development bias and changes in the major river basins feeding into Botswana. The direct threats that appear to have multiple underlying causes affecting them are (1) habitat destruction and land conversion; (2) Ecosystem collapse and loss of function or process; (3) unsustainable land uses and overuse of biodiversity and (4) Changes in hydrology (and function) of inflowing rivers.

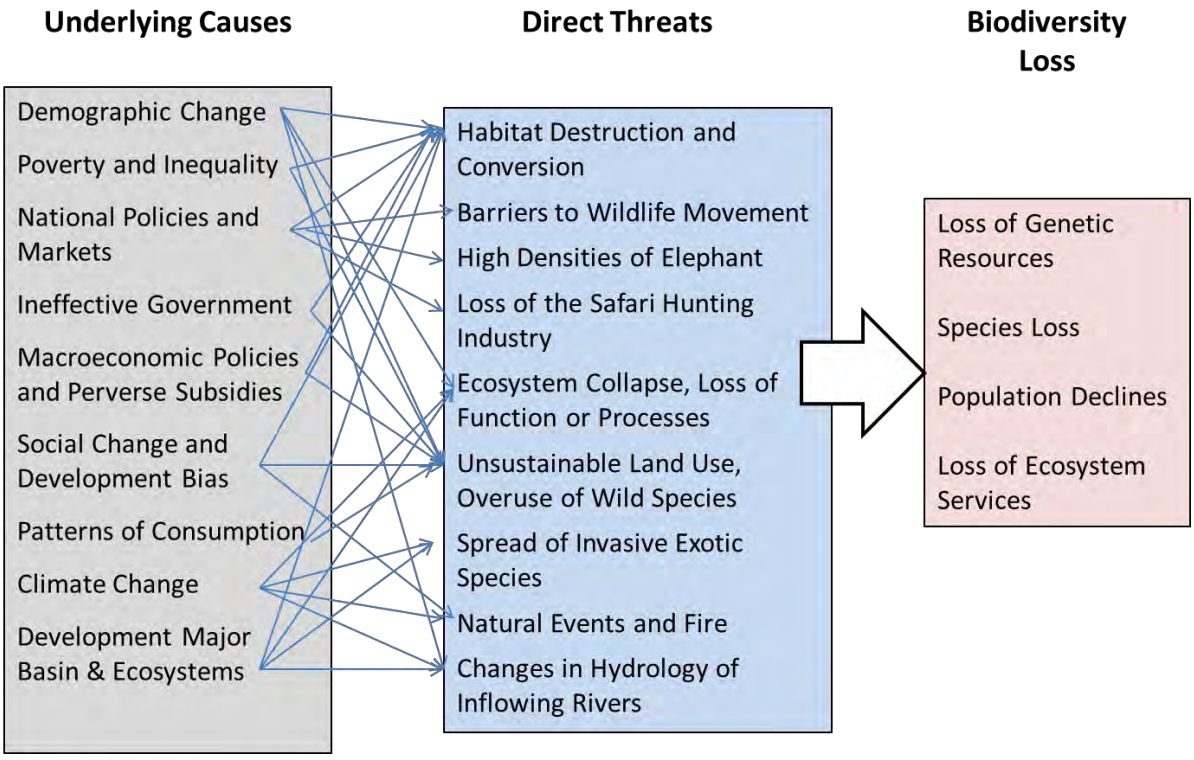

Figure 11: Threats to biodiversity

7.1.1 Habitat destruction, habitat conversion and disturbance

Habitat destruction and habitat conversion due to changes in land use. Particularly expansion of settlement into sensitive areas, expansion of livestock into Wildlife Management Areas and the establishment of large areas of arable agriculture in wildlife rich habitats has led to high levels of predator depredations on livestock (Figure 12). Compensation payments exceed a million Pula per annum.

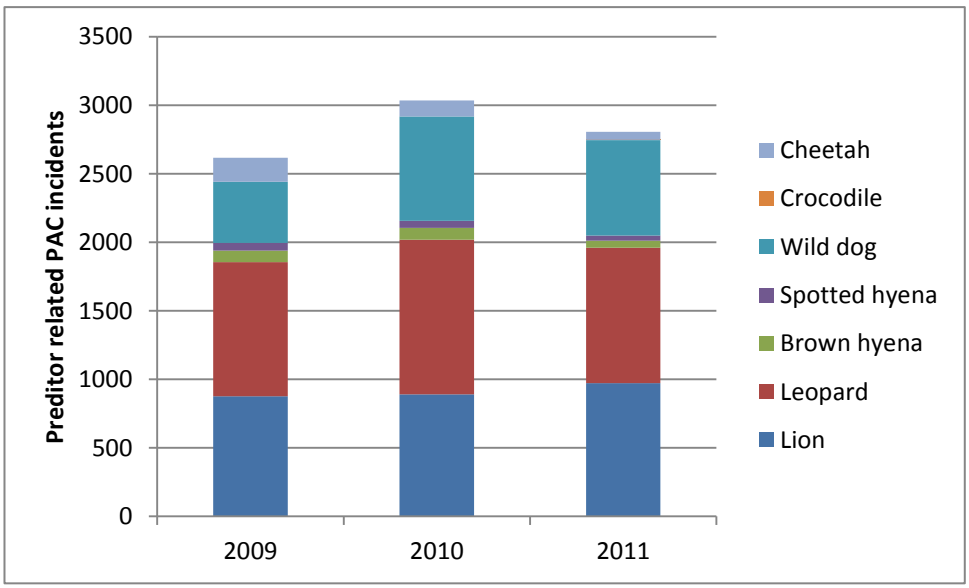

Figure 12: National predator related PAC incidents 2009 - 2011 (Source DWNP statistics)

The expansion of livestock into traditional wildlife areas (Figure 14) has created high levels of predator depredations. The DWNP records for animal deaths 2009-2011 indicate that the most

common cause of wildlife death in Botswana (excluding natural deaths and licenced hunting) is problem animal control followed by poaching (Figure 13).

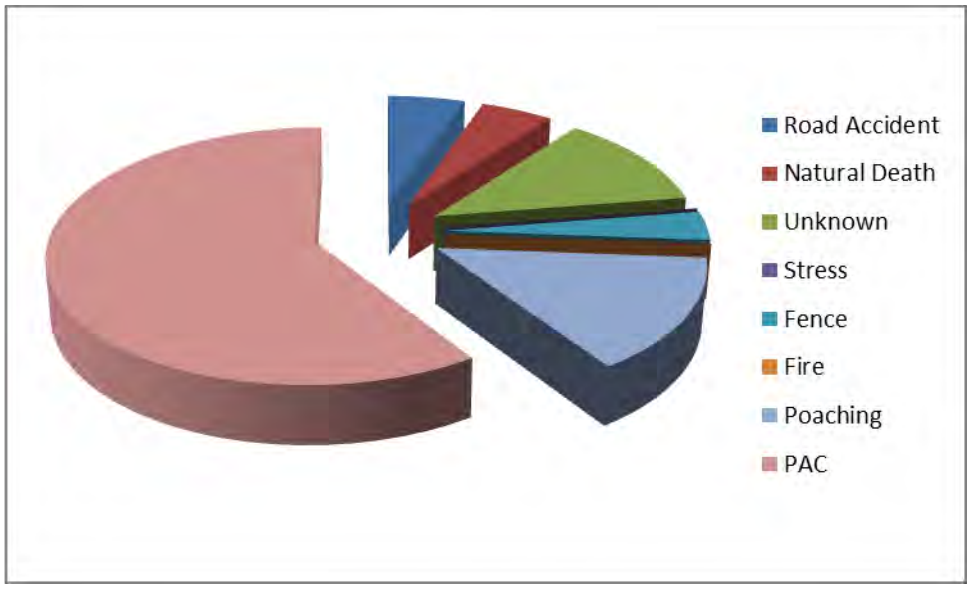

Figure 13: National wildlife mortalities 2009 – 2011 (DWNP records)

Much of the expansion of livestock has been into the proposed and legislated WMAs. As indicated in Figure 14 the main expansion areas are:

9) livestock are expanding east of the Okavango Pan Handle along the Magwegqana (Selinda) spillway and into NG/13. As the area has high wildlife densities (approximately 16,000 elephant reside in the area) the expansion is leading to high HWC and PAC issues.

10) Westward expansion of livestock and land allocation into the Gcwihaba WMA (not legislated). The expansion is reducing the likelihood of the WMA being legislated.

11) Expansion of cattle into the main Ghanzi WMAs which link the CKGR with the Schwelle.

12) Encroachment of cattle into across the Schwelle effectively preventing seasonal movements of wildlife across the area.

13) Expansion of cattle throughout the proposed Makgadikgadi WMAs.

14) Establishment of cattle posts in the plains north of Pandamatenga and the expansion of commercial arable agricultural from ca 35,000 ha to a proposed 75,000 has created a barrier between the protected areas of Zimbabwe and Botswana. Extremely high PAC levels particularly on lion.

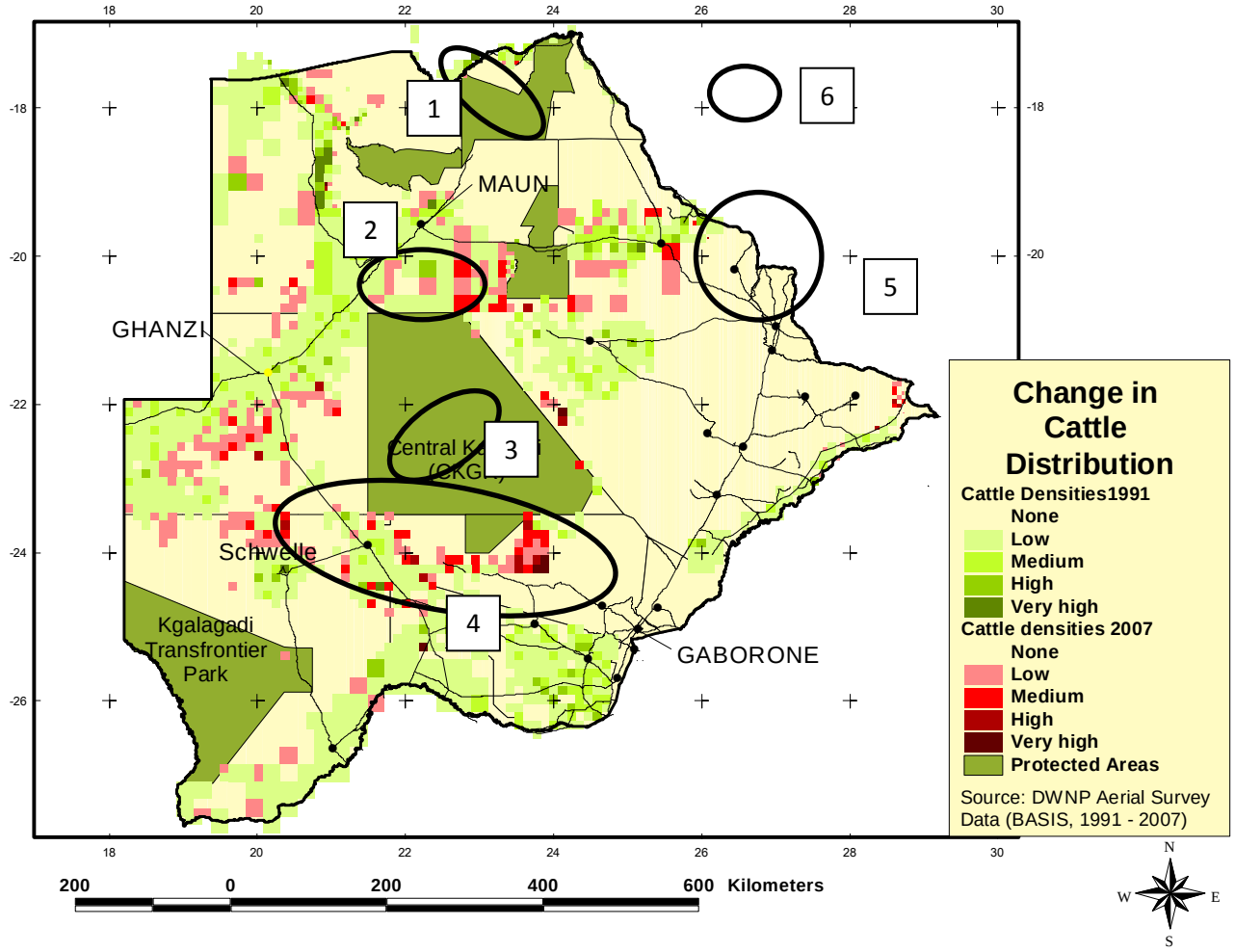

Figure 14: Expansion of livestock based on DWNP aerial survey data. Red squares denote livestock expansion into new areas mostly during the last decade. Major conflict areas indicated with circles. Note: the absence of livestock in eastern Botswana is because no aerial surveys were undertaken in the area

Communally nesting birds are a special case as they tend to nest in habitats traditionally safe from disturbance such as islands, open pans (protected through seasonal flooding), cliffs, etc. Increasing human pressure through expansion of livelihood practices (including fishing and hunting) and ecotourism visitors to nesting sites are increasing the levels of disturbance and threatening breeding success and the use of nesting sites that have been used for decades.

The rapid and increasing diversification of the mining sector from a few economically important diamond mines[4], into a number of smaller diamond operations (including mining in the CKGR) at Gope; copper nickel (and associated smelting of ore). There are advanced designs for open pit coal mines and associated power stations and power transmission lines; coal bed methane abstraction; uranium oxide mining, iron ore abstraction and expansion of soda ash abstraction towards the newly proclaimed Flamingo Sanctuary in Sua Pan (Proclaimed in 2010). These developments will occur across the country with the majority in eastern Botswana. The potential impact of these proposed developments on air and water quality and the expansion of the power grid will have implications on the aquatic and terrestrial environments.

[4] In addition to the diamond mines, there was one soda ash mine, one underground colliery and copper nickel abstraction.

7.1.2 Barriers to wildlife movement

Barriers to wildlife movement, initially through veterinary disease control fences but accelerated within the last decade through the policy to allocate fenced ranches in communal areas. The country has been changing from one of open ecosystems through to a number of closed systems and from open communal land to one of partial privatisation and fenced commercial ranches.

The increase in fencing of range land together with the expansion of livestock distribution has led to the permanent separation of the CKGR system from the Makgadikgadi/Nxai Pans complex; progressive isolation of the SW Kgalagadi from the CKGR and Ghanzi WMAs; isolation of the Quihaba WMA and Lake Ngami from the Okavango Delta; the growth of a significant barrier between the Chobe and Zimbabwe wildlife systems. The KAZA TFCA which is meant to link Botswana with Namibia, Angola, Zambia and Zimbabwe has been largely truncated (30 km remain open) with the border and animal disease control fence across the Caprivi Strip.

In addition to the ongoing fenced ranches, the Review of the National Land Use Map (MLM, 2009) proposes the allocation of fenced ranches on either side of all veterinary disease control fences. Such a development would change the veterinary fences from semi porous to non-porous and extend the levels of disturbance into previously wildernesses areas.

7.1.3 High populations of elephant

High populations of elephant affecting woody biomass and plant and animal species composition in northern Botswana. The dispersal of elephant into new ranges is bringing them into conflict with existing and expanding human population thus increasing conflict between elephants and communities. Elephant populations have increased from an estimated low of 8,000 in 1960 to the present 2012 estimate of 208,398.

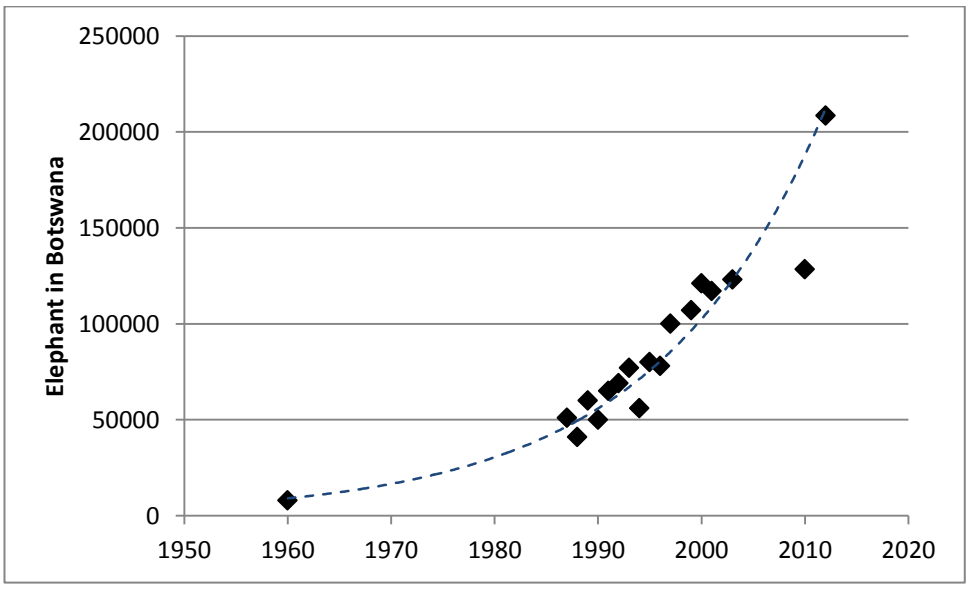

Figure 15: Estimates of elephant numbers in Botswana 1960 – 2012 (Source: 1960 from literature and aerial surveys for the other points – DWNP, KCS, Elephants Without Borders)

The high densities of elephant and the resulting habit modification and disturbance is thought, by the DWNP to be depressing wildlife populations of species sensitive to disturbance and habitat modification.

7.1.4 Closure of the safari hunting industry

Closure of the safari hunting industry due to the hunting ban has resulted in the termination of the policing effects of hunting companies in wilderness areas, the loss of significant revenue streams to most of the more marginal CBNRM areas and subsequent loss of rural communities' support for conservation of biodiversity resources. Figure 16 indicates the decline in hunting licences issued in all categories. There will be no hunting licences issued in 2014.

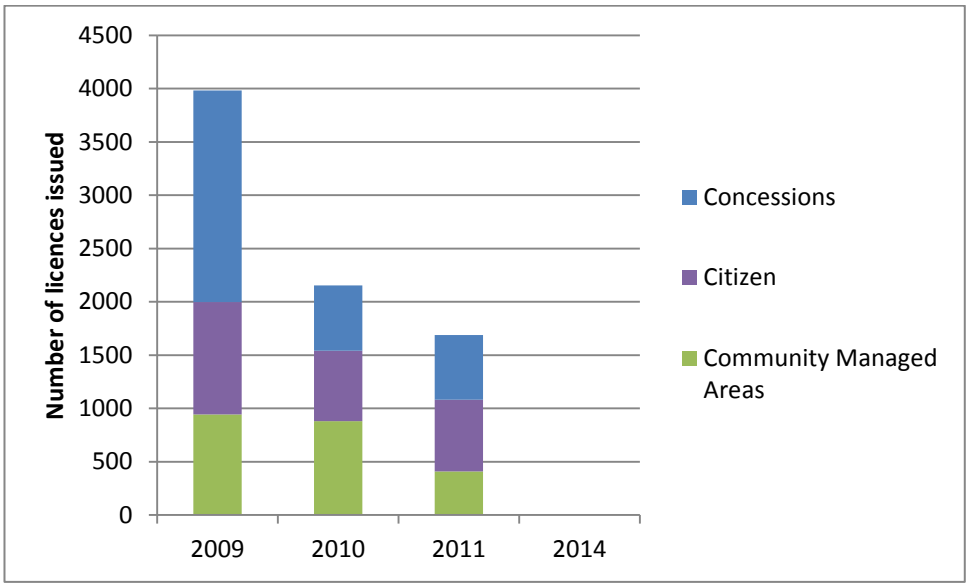

Figure 16: Hunting licences issued per use category (Source: DWNP statistics)

In an extensive review of the hunting industry in Botswana outlined in a paper prepared by the KCS and funded by WWF Norway (KCS 2009), it is concluded that:

- Hunting has to be well managed and based on a detailed understanding of species population dynamics;
- Well managed hunting does not deplete species populations;
- Where ecosystems are in good health and habitats not degraded, should hunting severely deplete wildlife populations, they can rapidly spring back when hunting pressure is reduced;
- In 2007 hunting contributed 2.7 % to the national GDP while travel contributed 4.3 % and (non-consumptive) tourism 9.7 %;
- In 2005 CBOs involved in CBNRM generated 72 % of their total income from trophy hunting;
- Botswana is signatory to a number of international conventions such as the Convention on Biological Diversity and CITES which promote sustainable use of natural resources;
- Community attitudes towards conservation are likely to worsen should they be prevented from deriving benefits. In some areas this can be replaced by photo-tourism although most CBNRM areas of the country cannot support photo-tourism.

The review concludes with a statement that "rather than abandoning the proven benefits from sustainable use, we advise the Government of Botswana to adjust strategy and invest in research to identify factors currently limiting the value of hunting to conservation and rural development, and to identify steps to improve the industry."

The concern is that the ban on hunting will not only undermine an important industry in low (tourism) value areas is will lead to the collapse of support for CBNRM and a loss of public support for biodiversity conservation. Rapid conversion of wildlife ranges to livestock husbandry can be expected.

7.1.5 Disruption of natural fire regimes

Birdlife Botswana considers human-modified fire regimes in riparian woodlands to be a serious threat to nesting colonies/heronries. A map of fire frequency over 13 years indicates that high fire frequencies are occurring in northern Botswana in the Teak woodlands and in the Okavango Delta. In the Okavango Delta timing of fires is of concern where pre-flood (April) fires impact on floodplain nesting.

The fire frequencies 1997-2012 (Figure 17 & Table 22) indicate that the Zambezian Baikiaea Woodlands are subject to the highest frequency of fires and have most of the area burned (82% of area with 28% of the area being burned most years). This is followed by fire in the Zambezi flooded grasslands (77% of area), the more arid Kalahari Acacia-Baikiaea savanna (67% of area) and Kalahari xeric savanna (67% of area). There are also high frequencies (although lower overall area burned in the Zambezian and Mopane woodlands. Fire frequency varies considerably in the Zambezian flooded grasslands (Okavango Delta) with extremely high frequency and percentage during low flood periods but reducing during high flood periods. The MODIS point data is more effective in identifying fires within the flooded grasslands than the DFRR shape files.

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Table 22: Proportional areas of Ecoregions burned 1997-2012 (Source: MODIS 1997-2008, DFRR 2010-2012)

Ecoregion	Ecoregion (km^2)	Ecoregion as % of Botswana	Surface Area Burned (%)	Surface Area Burned Most Years (%)	Accumulative Area Burned over 13 Years (km^2)	Accumulated Burns as a % of Ecoregion
Kalahari Acacia-Baikiaea savanna	185522	32	67	1	229966	124
Kalahari xeric savanna	216947	37	67	0	254508	117
Southern Africa bushveld	77371	13	19	0	19304	25
Zambezian and Mopane woodlands	29913	5	58	3	39649	133
Zambezian Baikiaea woodlands	21598	4	82	28	79539	368
Zambezian flooded grasslands	22745	4	77	5	48931	215
Zambezian halophytics	25189	4	36	0	13261	53

(Source: MODIS 1997-2008, DFRR 2010-2012)

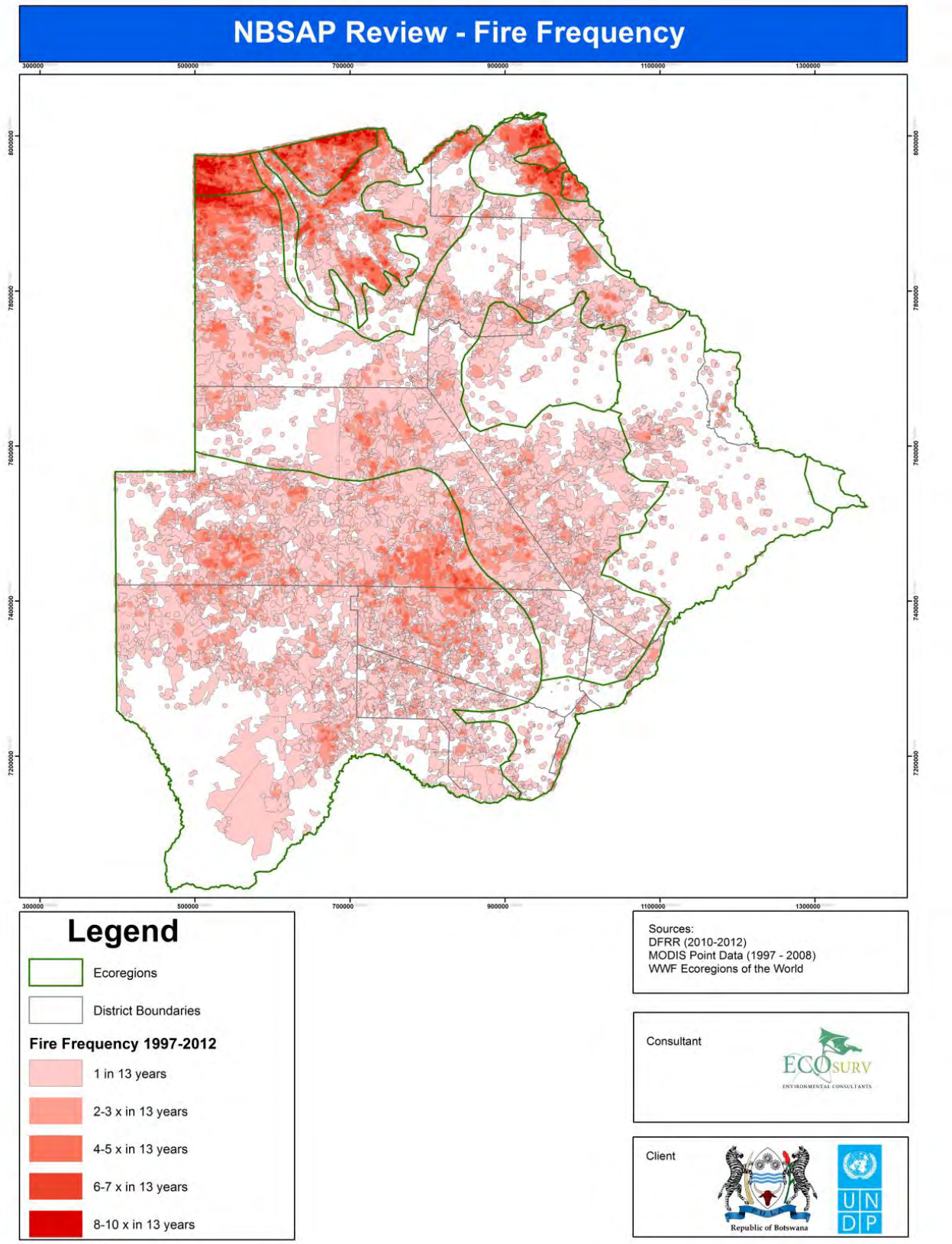

Figure 17: Fire frequency based on MODIS data (1997-2008) and DFRR data (2010 – 2012)

7.1.6 Overuse and over-collection of wild plant species

Overuse and over collection of wild plant species is a problem in localised areas of the country where the population pressure is higher and for certain valuable or medicinal species. There is depletion of wood and veld products around most of the settlements in Ghanzi and Kgalagadi Districts. Overuse of plant products particularly medicinal plants is occurring in eastern Botswana.

Illegal hunting of wildlife species appears to be a growing problem. DWNP data indicate that it is second only to Problem Animal Control as a non-natural case of wildlife deaths (Figure 13). An analysis of the causes, underlying cases and potential solutions for the ODRS (Ecosurv & SAIEA 2012) indicate that high levels of poaching are driven by: weakness of CBNRM, overvaluing livestock, and rural population increase and associated expansion of cattle posts all underlie the high levels of poaching.

Given the low levels of policing of natural resource use, absence of monitoring and limited public support due to the weakness of CBNRM, it is likely that present levels of natural resource use will not diminish or become more sustainable. As a result some of the plant species may become threatened and wildlife species of concern such as springbok populations will continue to decline. However, work by CESRIKI to document the traditional importance of, and indigenous knowledge relating to, these species will contribute to appropriate measures to regulate use.

7.1.7 Alien invasive species

Alien invasive plant species, although relatively low on a national scale, is increasing. In the southwest of the country *Prosopis glandulosa* is perceived to be a problem and a draft Prosopis management plan is being prepared by DFRR (2013). Department of Forestry and Range Resources estimated the area covered by Prosopis to be 4,090 ha in 2008 (Statistics Botswana 2013)

In the Okavango Delta *Pistia stratiotes* and *Salvinia molesta* poses a threat to the aquatic environment particularly if water quality deteriorates.

More recently the threat of terrestrial invasive species has been highlighted and the spread of invasive weed species through tourism in wilderness areas of the Okavango Delta (Mendelsohn et al, 2010). Common invasive species are thorn apples (*Datura ferox* and *D. stramonium*), the burweed (*Achyranthes aspera)*, cocklebur (*Xanthium stramonium*), catclaw mimosa (I) , Sesbania species, 68ebbie68 (*Melia azederach*), thorn apples and burweed sometimes cover large areas of disturbed ground in the Delta. In addition, the herbarium of the Okavango Research Institute noted the following species of concern in the Okavango Delta:

- *Ailanthus altissima* (Prison Tree or Tree of heaven);
- *Ricinus communis* (Castor oil bush);
- *Xanthium strumarium* (Cocklebur) terrestrial species which invades floodplains.

In eastern Botswana *Argemone 68ebbie6868* (Yellow-flowered Mexican poppy) invades disturbed areas. *Melia azedarach* (Syringa) and *Jacaranda mimosifolia* (Jacaranda) invades riparian woodlands along rivers in eastern Botswana.

Cenchrus biflorus (Cram-cram), the Department of Agricultural Research is concerned with this invasive species of grasslands and arable fields (Charles Hill and Ghanzi). In many countries it is perceived as a famine food as the grain is edible and highly nutritious.

The SABONET plant species list (Seshogo; 2005) identified the following as additional invasive species:

- *Xanthium spinosum*
- *Opuntia ficus-indica*

- *O. imbricate*
- *Salsola kali*
- *Senna occidentalis*
- *Phtolacca dioica*
- *Cardiospermum halicacabum (both var halicacaum and microcarpum)*
- *Solanum seaforthianum*
- *Nicotiana glauca*
- *Lantana camara*
- *Duranta erecta*
- *Agave 69ebbie696969*
- *A. sisalina*
- *Arundo donax*
- *Sorghum bicolor*

An invasive bird species, the Indian Myna (*Acridotheres tristis*), has established itself in Gaborone and is spreading across urban areas of eastern Botswana (Birdlife Botswana, pers. com.).

Alien invasive species are posing an increasingly significant threat to biodiversity. The aquatic systems appear to be most vulnerable particularly as the upper catchments to major river basins are not within the national borders. Dryland invasive plant species may be an emerging threat and need to be monitored.

7.1.8 Climate change

Climate change due to anthropomorphic activities is an ongoing and increasing threat. According to Chapter 19 of the Intergovernmental Panel on Climate Change (IPCC) fourth assessment report authored by Schneider et al. (2007), each additional degree of warming increases disruption of ecosystems and loss of species. Individual ecosystems and species often have different specific thresholds of change in temperature, precipitation or other variables, beyond which they are at risk of disruption or extinction. Some of these thresholds may have already been exceeded for sensitive species.

Predicting the specific impacts of climate change are difficult and changes as modelling improves. The present predictions for Botswana are that there will be warming (an average of 2 degrees Celsius by 2030) warming will be most pronounced over existing desert regions. Extreme cold events will be fewer and extreme warm events will increase. Rainfall will become even more variable, extreme rainfall events will increase and rainfall could decline by up to 25% although it could also increase in some areas by up to 10% (Botswana's National Communication to the UNFCCC (MWTC, 2001 and MEWT, 2011).

A recent review of the models by CSIRO (Post et al, 2012) predicts the following for Botswana:

- Under the dry future projections, an average reduction in rainfall of 50 mm (10%). The median projection is for a reduction of 15 mm (3%), and the wet projection is for an increase of 13 mm.
- For potential evapotranspiration, there is a projected increase by ~2030. Averaged across the country, these increases range from 20 mm (1%) up to 60 mm (3%) with the median result being an increase of 35 mm (2%).
- Runoff, averaged across the country, under the dry future projection, is projected to decrease by 5 mm (30%); under the median projection, runoff is projected to decrease

by 2 mm (12%); while under the wet future projection, runoff is projected to increase by just 1 mm (6%). Earlier and last longer by ~2030 due to the impacts of climate change.

The implications of climate change on biodiversity are that linkages between wet and dry season ranges or resource areas will become increasingly more important. Surface water and runoff into national rivers and water bodies will reduce, breeding areas relying on water and flooding will come under increasing threat. The conversion of woodlands to shrublands and open savannas will accelerate due to the complex interaction between reduced rainfall, increasing temperatures, fire and elephant. Overall biodiversity will have to adapt far more quickly than it has in the past to the changes.

Flexibility in adaptive planning and management and a move towards planning at the broader landscape will be the keys to securing the persistence of species within and around protected areas in the future. Flexibility on a temporal scale of decades and centuries and spatially across whole regions and transboundary areas will be required if a major crisis in biodiversity conservation is to be averted.

7.1.9 Changes to hydrology of inflowing rivers

The single biggest potential threat to the primary biodiversity hotspot of the country is changes to the hydrology (volume, frequency, variability, sediment and pulse[5]) and water quality (decrease in water quality, eutrophication) of the Okavango Delta. These threats have been highlighted in the recent Strategic Environmental Assessment (SEA) of the Okavango Delta Ramsar Site (ODRS) and the more recent assessment of the entire Okavango River Basin. Predictions are dire; coming from the Trans-boundary Diagnostic Assessment (TDA, prepared for OKACOM, 2011), upstream water consumption in a high use scenario could result in the Okavango River ceasing to flow for months during the low flow of poor rainfall years. Similar threats within the Limpopo and the Zambezi river basins are occurring. In general biodiversity that is reliant on wetland systems will come under increasing pressure in the future.

Climate change is also expected to result in nationally reduced runoff into streams and rivers, less surface water and an increase in flash flooding events (MEWT, 2011).

7.2 TRENDS BY SPECIES GROUPING

7.2.1 Large mammals

Wildlife, by its nature of needing to disperse between wet and dry season resource areas, is easily threatened by habitat fragmentation and physical barriers. In a recent assessment of the health or viability of the remaining open wildlife systems of Botswana (Ecosurv 2011), the arid systems (which are more reliant on movement) are very likely to experience a collapse of wildlife populations while the northern ones, particularly the Okavango – Linyanti and the Chobe are in reasonable condition.

The most recent aerial survey (DWNP 2012) has highlighted a number of concerns. These are:

- Declines of certain species within some of the protected areas whole the populations remain stable nationally, examples are:
  - A non-significant decline in eland populations in the CKGR;
  - Non-significant declines of gemsbok in Mabuasehube, CKGR and Nxai Pans;
  - Non-significant declines of giraffe in CNP, CKGR and Makgadikgadi Pans;
  - Non-significant decline in hartebeest in CKGR;

[5] The flood pulse refers to the initial floodwater surge

  - Significant decline in lechwe populations in Moremi;
  - Non-significant declines of ostrich in Moremi, CKGR Mabuasehube and Nxai Pans;
  - Non-significant decline in sable population in Moremi;
  - Significant decline in springbok in CKGR and non-significant in all other reserves except Khutse;
  - Non-significant decline in wildebeest in CKGR, Khutse and Moremi;
- Significant national declines of lechwe, sitatunga (Okavango system), tsessebe and springbok populations;
- Significant increase in elephant numbers and range.

In general there are worrying declines in wildlife populations of the protected areas in arid systems (CKGR, Mabuasehube, Khutse) while populations appear to be increasing under the management of the Kalahari Trans-frontier Park (TFCA area).

The main threats to wildlife populations are:

- Restriction to animal movements and increased disturbance (and poaching) through expansion of the livestock sector in the arid SW Kalahari;
- High levels of PAC on lion, leopard, cheetah and wild dog populations;
- Increase in fenced ranches, arable agriculture and land uses that are creating barriers to animal movement (whole country);
- High densities of elephant in northern Botswana which may be depressing populations of more sensitive species (roan, sable, tsessebe, wild dog and cheetah);
- High levels of poaching.

Wildlife populations in game farms and private sanctuaries are improving. A recent report prepared by the Botswana Wildlife Producers Association (BWPA) indicates that the private ranchers now manage most of the national rhino population and increasing proportions of other key species.

7.2.2 Small mammals

The DWNP/EU (2007) survey of small mammals of protected areas found that a number of bat species may be threatened due to:

- Depletion or thinning of woodlands due to a combination of elephant damage and high fire frequencies within Botswana together with deforestation in Zambia and Zimbabwe (*Chaerephon shortridgei* Long-crested free-tailed bat).
- Loss or disturbance of riparian woodlands particularly within the Pan Handle of the Okavango Delta (*Neoromicia rendalli*, *Laephotis botswanae*, *Hypsugo anchietae* and two rodents *Mus setzeri* and *Mastomys shortridgei*).)
- Absence of protection for cave rooting sites (*Cloeotis percivali*, Short-eared trident bat) in eastern Botswana (Molepolole and Kanye)
- *Hipposideros vittatus* Giant leaf-nosed bat: The long term conservation of this species in its range hinges on maintaining the integrity of these relatively few roosts where it breeds. Gcwihaba Caves is the only known roost of *H. vittatus* in Botswana.

The pressure on riparian woodlands in the Panhandle, continuing increase in elephant populations and high fire frequencies in the teak woodlands, absence of protection of cave sites in eastern Botswana and the tourism development of the Gcwihaba Caves will increase the threat on the above bat species.

7.2.3 Avifauna

The threats to birds has been summarised by Birdlife Botswana as disturbance, fire in key habitats such as the riparian woodlands and accidental poisoning.

The presence of extensive seasonal pans in the Makgadikgadi makes it an important breeding area for several species that are of conservation significance. The area is a key breeding site for Lesser Flamingos (*Phoenicopterus minor*; Near-threatened), with the largest numbers of breeding birds in southern Africa recorded at Sua Pan – 80,000 pairs bred there in 2000 (Simmons 2005). This colony is threatened through lowering of the water table by a nearby soda-ash mine, and plans to dam the Mosetse River which floods onto the pan just north of the main breeding site. A further threat involves colony desertion resulting from disturbance by low-flying aircraft.

Birdlife is particularly concerned about the widespread use of poison on carcasses killed by predators which is resulting in unprecedented levels of vulture deaths. The Director of Birdlife considers accidental poisoning are topmost threats to vultures in Botswana. In addition deliberate poisoning of illegally hunted animals may also be a way to reduce detection by anti-poaching units. In July 2013 at least 600 vultures were poisoned at a single elephant carcass in Bwabwata National Park just north of Botswana. As vultures are long lived and keystone species, it is possible that poisoning will severely deplete populations and result in some species of vulture becoming locally extinct. The knock on effect of depletion of vulture populations on other biota could be severe.

The Ngamiland branch of Birdlife are concerned that the critically important bird breeding areas, the ephemeral lakes of Ngami and Xau have no formal protection status and are not included in the Wildlife Management Areas (refer to the information box below).

Box 1: The importance of Lake Ngami to avian biodiversity

The Importance of Lake Ngami to National and International Bird Populations
Lake Ngami Management Plan (Ecosurv 2013)

Lake Ngami is unique in Botswana and southern Africa with respect to birdlife. There is no other comparable birding area in the region. A total of 328 species have been recorded at the lake. Sixteen congregatory waterbird species occur in spectacular numbers at the lake, each exceeding a minimum of 0,5% of their regional or global population, the threshold required to designate Lake Ngami an Important Bird Area (IBA). In some species, such as the Great White Pelican, Lake Ngami supports over 80% of the Southern African population.

Tyler and Bishop (1998) summarized the importance of Lake Ngami for birdlife during its previous wet period (before the dry basin conditions of the 80's and 90's). Back then the lake was used as a feeding area by both species of flamingos and by large numbers of waterfowl, notably red-billed teal (more than 500,000 were counted in 1978), as well as a breeding area for waterfowl. The regionally threatened Eurasian Bitter and Caspian Tern, and regionally near-threatened Lesser Jacana, were also recorded. Several species of waterfowl occurred in numbers that exceeded 0.5% of the total species population. For example, in 1979 an estimated 27,000 red billed and 7,000 Hottentot teal were recorded, whilst in 1989 about 10,000 Black-winged Pratincole were counted along 5 km of shore (10% of the total shore); similar numbers of Collared Pratincole and over 1,000 Whiskered tern were also recorded there. Other species of interest included Montagu's Harrier, Red-footed falcon (a roost occurred by the lake in 1996), Temminck's Plover, Double-banded Courser and Bronze—winged Courser, and Burchell's Sandgrouse. The surrounding Acacia woodland supports high numbers of Icterine Warbler, as well as a range of species restricted to the Kalahari–Highveld biome.

Lake Ngami also provides a very important breeding site for wetland birds, with over 40 species having been recorded breeding there. There are numerous large heronries where herons, egrets, storks, cormorants and darters breed annually (Tyler and Hancock, 2006). Thousands of waterbirds congregate at the lake to nest from the time the annual floodwaters from the Okavango Delta arrive in mid-winter, and continue right through to the end of summer. White pelican were recorded to breed at the Lake, making it one of only two breeding sites for the species in Botswana, and one of five in the whole of southern Africa. They were recorded breeding sporadically since at least 1872, with the last well-documented breeding years being 1972, when 3,000–5,000 adults were at the lake between May and July, and 1981, when 4,000 birds were at the Lake.

7.2.4 Fish

At present the most serious threat to fish is the potential for the alien invasive Nile Tilapia (*Oreochromis nilotica*) to be introduced into the Okavango system either through people wanting to farm the species or via migration up the Selinda Spillway which links Zambezi system (where they are present) to the Okavango system. A physical barrier on the Selinda has been proposed (Botswana Government 2012, selected Botswana Biodiversity Indicators 2011, Department of Environmental Affairs, Ministry of Environment, Wildlife and Tourism, page 28).

7.2.5 Reptiles and amphibians

Bourquin (2007) found that the Okavango panhandle crocodile population has declined significantly over the last 80 years. This is considered to be due to harvesting of adults and crocodile eggs, disturbance by boat motors fires and destruction of nests and eggs by fishermen, habitat loss, crocodile / human conflict and pollution (Bourquin and Leslie 2011).

Very little is known of the status of other reptiles and amphibians in Botswana.

7.2.6 Invertebrates

Of the 252 species of known butterflies, none are endangered. There are no known threats to this taxon.

The dragonflies (127 species recorded – Kipping, 2010) are considered to be sensitive to changes in water quality and have been identified as a potential indicator species for wetland health. Changes to the Okavango wetlands would affect dragonflies.

There is insufficient information on the other invertebrates.

7.2.7 Vegetation

There are 43 threatened Botswana plant species, 13 endemic species, 10 potentially endemic and 7 near endemic plant species. There are a number of threats; these include overharvesting of medicinal or economically valuable plants; alien invasive species of aquatic and terrestrial plants; development and land conversion and a combination of high frequency of fires together with high densities of elephant.

Forest cover in Botswana has declined from 23.6 % in 1990 to 19.7 % in 2010 (Statistics Botswana, 2013), the reasons identified are fuel wood harvesting and land clearing for human settlements and livelihoods.

7.3 THREATS BY ECO-REGION AND TYPE OF THREAT

The threats outlined in Section 7.1 were discussed with stakeholders (Appendix 1). The ecoregions in which stakeholders identified that these threats are most prominent are indicated in Table 23.

Biodiversity in the Zambezian flooded grasslands is most threatened flowed closely by both the Zambezian mopane and Kalahari xeric savanna (Figure 18).

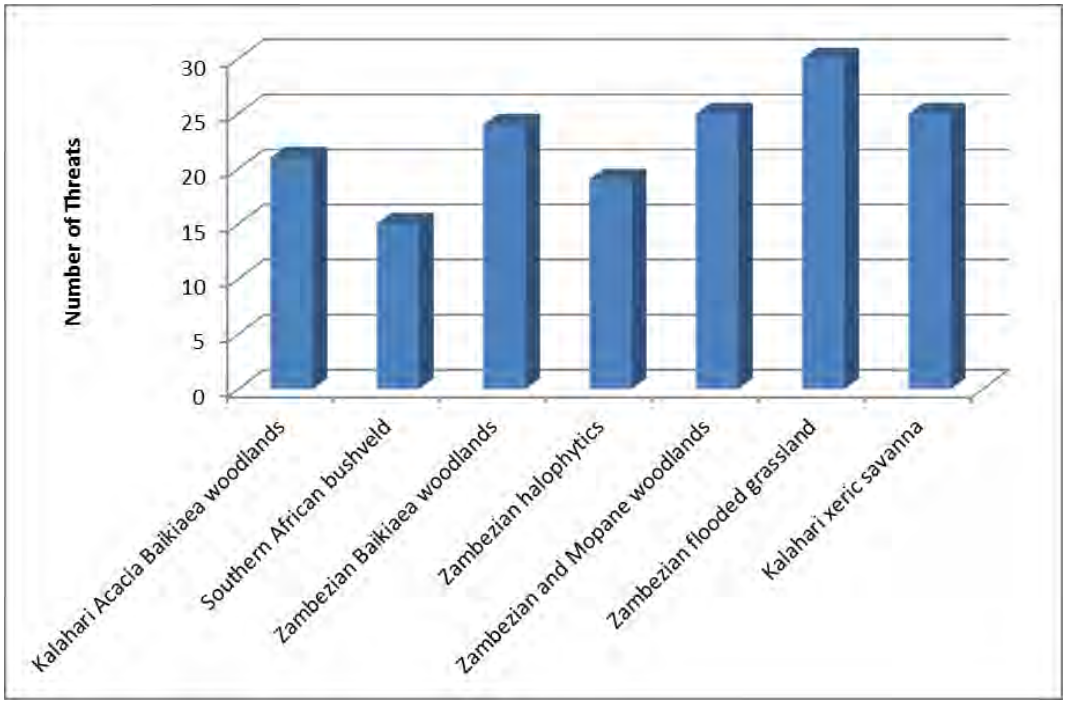

Figure 18: Accumulated biodiversity threats per ecoregion

The most serious threats to biodiversity at present appear to be land conversion to livestock, habitat fragmentation due to establishment of barriers and the high fire frequencies (particularly in the Baikiaea woodlands and the CKGR) (Figure 19).

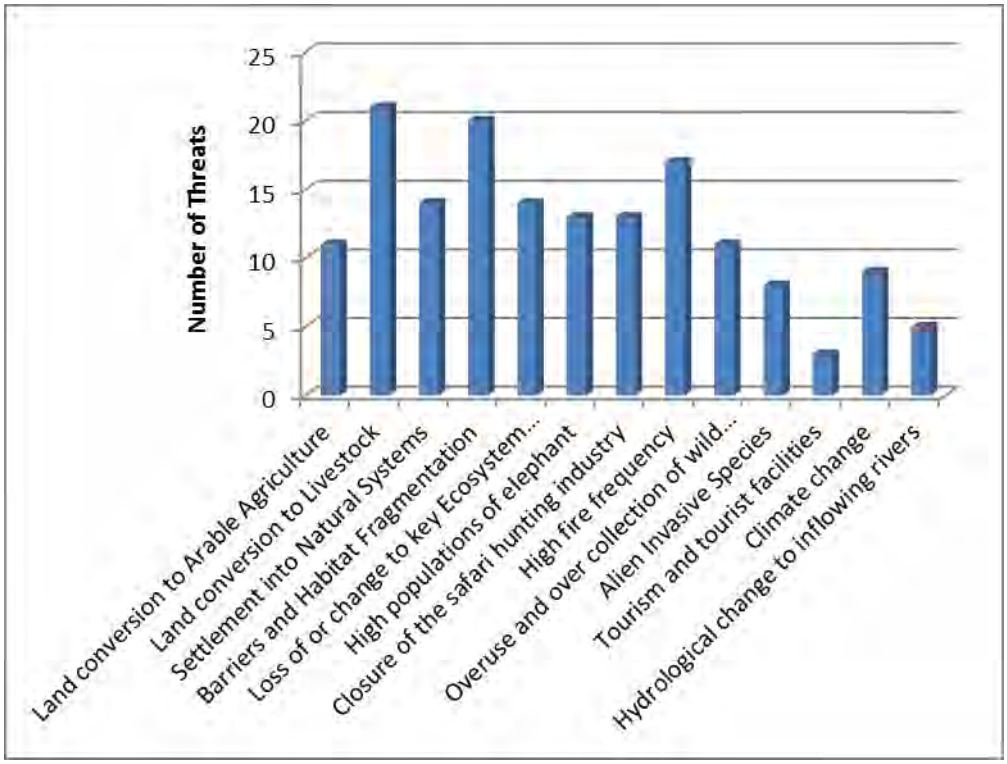

Figure 19: Total accumulated ranking per biodiversity threat

A map of combined threats (Figure 20), comprising the NBSAP threats (2007), the 2012 livestock distribution, rankings from the rapid assessment of wildlife systems and the threats by ecoregion (also shown in Table 23) highlights the following:

1) Livestock expansion east towards the Kwando. Pressure on riparian woodlands in the Pan Handle affecting bat species.
2) Potential impacts on biodiversity from upstream changes to hydrology, sediments and water quality of the Okavango River.
3) Ribbon settlement and lands areas isolating the Okavango Delta
4) Livestock pressure on the Gcwihaba WMA and Lake Ngami (an IBA). No formal protection.
5) Expansion of livestock sector and occupation of most major pans isolating the CKGR from the Kalahari Gemsbok National Park.
6) Eastern Botswana, population pressure, land conversion, expansion of mining sector, and insignificant amount of land (3.5 %) under protected areas (and only private).
7) High biodiversity with no formal protection.
8) Livestock pressure on protected areas, failure to legislate the WMAs, presence of high bird biodiversity at Lake Xau with no formal protection.
9) Expanding arable and livestock agriculture in a high density wildlife system, high PAC.

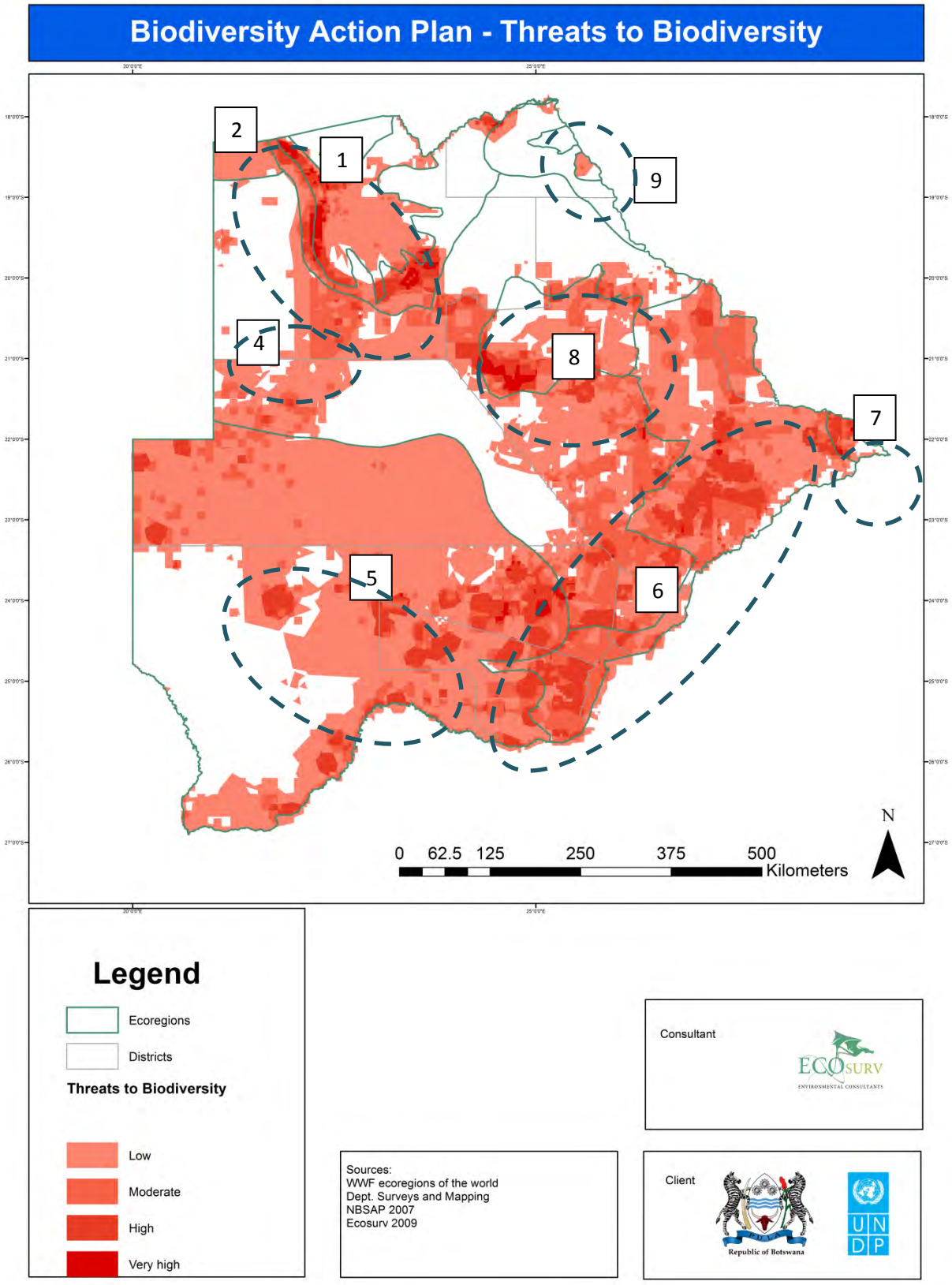

Figure 20: Threats to biodiversity (Sources: NBSAP 2007, DWNP 2012, SAREP 2012 and this study)

Table 23: Severity of threats to biodiversity in each ecoregion (Ranking 0 = none; 1 = low; 2 = medium, 3 - high and 4 = very high)

Threat/Ecoregion	Kalahari Acacia Baikiaea woodlands	Southern African bushveld	Zambezian Baikiaea woodlands	Zambezian halophytics	Zambezian and Mopane woodlands	Zambezian flooded grassland	Kalahari xeric savanna	Totals
Land conversion to arable agriculture	1	3	1	1	3	2	0	11
Land conversion to livestock	3	2	4	4	2	2	4	21
Settlement into natural systems	1	1	2	2	3	3	2	14
Barriers and habitat fragmentation	4	1	4	3	3	3	4	20
Loss of or change to key ecosystem components	3	0	1	3	2	2	3	14
High populations of elephant	2	0	3	1	4	3	0	13
Closure of the safari hunting industry	4	0	3	0	2	0	4	13
Disruption of fire regime	3	1	4	1	2	3	3	17
Overuse and over collection of wild species	2	3	1	2	1	2	1	11
Alien Invasive Species	0	2	0	0	1	3	2	8
Tourism and tourist facilities	0	0	0	0	1	2	0	3
Climate change	1	1	1	2	1	2	2	9
Hydrological change to inflowing rivers	0	1	0	1	0	3	0	5
Totals	24	15	24	20	25	30	25	

7.4 STATUS OF BIODIVERSITY IN THE KALAHARI XERIC SAVANNA ECO-REGION

This section has been singled out for more detailed discussion due to concerns raised by stakeholders and specific reference to it in the terms of reference. The Kalahari xeric savanna has one of the highest proportions of protection in Botswana with 56.8 % of the ecoregion being under legislated protection. This occurred when the WMAs were legislated.

Table 24: Area under protection in the Kalahari xeric savanna

Kalahari xeric savanna (216947 km^2)			
	Type of Protection	**Area (km^2)**	**%**
	Forest Reserve	0.00	0.0
Percent Protected	Game Reserve	26314.57	21.4
56.8 %	Legislated WMAs	62859.87	51.1
	National Park	26208.60	21.3
	WMAs not legislated	6457.68	5.2
	Game Farm	1284.36	1.0
	Total protected	123125.08	

From available research, it appears that the principal threat to biodiversity in the SW Kalahari is livestock pressure through livestock distribution change and population increase. This is directly linked to Botswana's Livestock Development Programs. Lesser threats include poaching and other forms of land use change, such as mining or high-volume tourism development. Tourism development is, nonetheless, the "only realistic developmental path to secure economic growth and livelihood opportunities for most of the rural people in that region" (Braack 2010; Green Mamba 2010).

General trends established in aerial surveys are that livestock are increasing, while wildlife species are in decline (DWNP 2012). Of significance to the SW Kalahari is the exceptional decline in springbok numbers (71%) between 1992 and 2012 (DWNP 2012), as this area is their stronghold in Botswana.

An appropriate management response is warranted, including but not limited to: improved monitoring of wildlife resources, improved law enforcement, increased understanding and gains of CBNRM, and policy review (DWNP 2012). There is also a need for adaptive livestock management. Monitoring and review of conservation/development policies; and the promotion of integrated landscape management that involves community-based natural resource management strategies, is also necessary (Western, Russel and Cuthill 2009; Green Mamba 2010; DWNP 2012).

A means of identifying which biodiversity types are under most threat – and from which threat – should be identified. Monitoring of biodiversity trends in response to identified threats is a plausible method. In this respect, the use of Biodiversity Indicators will be helpful – data should be collected specifically for the indicators to ensure representativeness, usefulness and accuracy; important in ensuring direct results and thus correctly guiding management response. Monitoring of wildlife trends using spoor-based monitoring (for example) should employ local, under-privileged talent – the benefits being, for example, a reduction in poaching and encouraging/empowering local communities to feel more involved in biodiversity conservation (Keeping 2009).

Key wildlife corridors present in the SW Kalahari (as identified by Green Mamba and recently legislated as WMAs), should be maintained as much as possible, for as long as possible – these are critically important to the perseverance of biodiversity as they allow migration and prevent

full fragmentation. Changing climate will increase their role in maintaining biodiversity. No surface watering points or any cattle-related development should be permitted in these corridors (Landflow 2010). Wildlife in the SW Kalahari are extremely mobile, and their conservation depends on their ability to move through space and time in response to grazing availability (directly linked to the highly variable rainfall of the area) (Green Mamba 2010).

Poaching should be addressed more effectively in the SW Kalahari: according to Keeping (2009) the current process of identifying and prosecuting poachers is inefficient. The intended increase in boreholes and cattle will negatively impact on wildlife populations, biodiversity and socio-cultural aspects in the area: caution should be used to ensure sustainable development (Keeping 2009).

Within pastoral Kalahari systems, ecological resources and their dynamics are critically important for livelihoods (Sallu et al. 2009). Loss of biodiversity through cattle ranching will decrease the quantifiable benefits of ecosystem services, such as fuel wood, construction material, grazing for livestock, medicines, veld foods (vegetables and fruits) and scenic landscape with high tourism potential (IUCN 2008). In an assessment of the ecological and social resilience of CBNRM areas and communities within the SW Kalahari system, only KD1, 2 and 15 were found to have relatively high resilience to change while all the other CHAs had low social and environmental resilience (Ecosurv 2011).

Low volume 4X4 tourism is an option that would minimize human disturbance and be an attraction in the vast landscape of the SW Kalahari, as well as generate revenue. In comparison to hunting though, the economic benefits are small. Hunting tourism provides economic benefits while maintaining ecosystem integrity and ensuring a biodiversity-conservation mind set. Hunting is a successful conservation tool and would be the best land use in terms of conserving the highly valuable biodiversity of the SW Kalahari; assuming local communities are the main beneficiaries (Keeping 2009). Biodiversity in WMAs is comparably high. These areas should have a strong focus on biodiversity conservation as they are vitally important to meeting the needs of local communities. The feasibility of mixed game and cattle farms to serve as wildlife/cattle buffer should be explored, but impacts on biodiversity need to be minimized or mitigated where possible (Landflow 2009).

7.5 Sector Policies and Implications for Biodiversity

Conflicting sector strategic directions have implications for biodiversity. These are outlined in Table 25 below.

Table 25: Sector implications on the environment and associated biodiversity

Sector Policy/Strategy/Programme	Implications on Environment	Impact on Biodiversity
Arable agriculture and irrigation using available water resources, tax incentive and programmes to encourage arable agriculture	Land conversion, settlement into pristine areas, use of wetland water resources, pollution, increase PAC	Barriers, PAC and poaching of declining wild populations particularly predators, loss of vulnerable plant species impact on aquatic biodiversity
Livestock Ranching and National Herd development	Expansion of livestock into WMAs and proposed WMAs, fencing, barriers and disease control, poaching, overgrazing and degradation	Barriers, PAC and poaching of declining wild populations particularly predators. Impact on small mammals, reptiles and amphibians
Animal disease control	Barriers and habitat fragmentation	Wildlife ungulate populations particularly migratory undulates affected

Sector Policy/Strategy/Programme	Implications on Environment	Impact on Biodiversity
Land allocation and zoning / Land use map of Botswana	Habitat fragmentation, land conversion, barriers	Wildlife ungulate populations
Settlement patterns – Land Board	Spread of settlement and arable lands along linear feature creating barriers and high impact on certain habitats	Affects species requiring riparian habitat such as bats, creates barriers to wildlife movement
Settlement Policy – DTRP	Establishment of settlements in sensitive and wetland areas such as in the Okavango Delta	PAC and poaching of declining wild populations particularly predators, impact on aquatic biodiversity
Energy and power development and supply	Increase in air pollution, groundwater pollution, transmission lines	Reduced habitat quality (water and air). Vultures and flamingo impacts particularly near IBAs
Mines and Minerals	Exploration within protected areas, potential development of mines, increase pollution. Pressure on water resources and increase demand for power and transmission lines to supply power	Increase poaching in protected areas. Impact on aquatic biodiversity and avifauna
Tourism Development – Mixed cost mixed level	Pressure on wilderness areas and unique biodiversity such as heronries, reduced water and overall environmental quality around tourism facilities	Disturbance of key bird breeding sites, impact on aquatic biodiversity
DWNP – Professional Hunting Ban	Increased poaching, financial ruin of marginal CBNRM lease areas, loss of CBNRM support for biodiversity protection, reduced value of wildlife areas with low photographic tourism appeal.	Loss of WMA areas, increased poaching on bush meat species
Wildlife Management Policy	Increased barriers to in managing and hunting wildlife on game farms; arbitrary stopping of export permit.	Conversion of game farms to livestock, loss of confidence in the wildlife industry
CBNRM Policy and changes in financial arrangements	Reduced support for CBNRM amongst communities	Loss of wildlife management within community areas, increased poaching and reduced tolerance for HWC
Forestry Policy	Communities to manage forestry areas in CBNRM manner	Plant resource of lower priority, forest plant species conservation limited
Water Supply Development	Increase in dams in eastern Botswana, reduced river flows and reduced flow duration	Biota of ephemeral rivers of eastern Botswana affected.

7.6 Expected Trends over the Next 10 Years Based on the Present Situation and Policy Direction

Key sector policies (Section 21) and their implications on Biodiversity are outlined in (Table 25). This section assesses the expected biodiversity trends based on present knowledge and policy direction.

There are some general observations applicable to all ecoregions:

- Taxonomic inventories are limited particularly for small mammals and invertebrates;
- Some of the inventories are regional (Southern African) rather than national such as butterflies, reptiles and amphibians;

- There are a number of *ex situ* collections of genetic material such as for indigenous breeds of livestock and local strains of arable plants (FAO/DAR), plants (RBG Kew/NPGRC);
- Since 2008 funding for taxonomic biodiversity studies and inventories has been drastically reduced;
- Monitoring of biodiversity status and trends is limited to indirect pressure, state and response indicators which are based on national data sets.
- National wildlife population surveys have re-commenced after a break of four years in which only area specific surveys were undertaken with the help of NGOs.

7.6.1 Kalahari Acacia Baikiaea woodlands

This ecoregion is under serious threat from policies and programmes promoting livestock development, allocation of commercial fenced ranches and thus high levels of PAC, habitat fragmentation and loss of connectivity. Figure 20 indicates the high levels of threat to biodiversity throughout the region outside of the formally protected areas. The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 185521.80 km² and 32.03%
- Global conservation status: Vulnerable
- Percentage protected area: 38.45%

Table 26: Area under protection in the Kalahari Acacia Baikiaea woodlands

Ecoregion	PA Type	Area (km²)	%
Kalahari Acacia-Baikiaea savanna			
	Forest Reserve	0.0	0.0
	Game Reserve	28489.20	35.6
	Legislated WMAs	26587.30	33.2
	National Park	3564.86	4.5
	WMAs not legislated	12674.61	15.8
	WHS	85.34	0.1
	Game Farm	8613.79	10.8
	Total	80025.95	

Within a decade all areas outside of legislated protected areas will have been converted to either communal or semi-private livestock ranching areas. Connectivity for wildlife movement will have been severed particularly in the more arid areas and wildlife populations will decline to low levels unless supplemented by artificial watering points.

In the north where the zone falls within protected areas, connectivity will remain high but is being undermined by the establishment of artificial watering points as they are creating permanent high densities of elephant. Habitat conversion by elephant appears to be threatening populations of more sensitive species such as tsessebe, roan, sable and giraffe.

7.6.2 Southern African bushveld

This ecoregion is one of the most important areas in Botswana for plant diversity (BSAP Stocktake Report, 2004). The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 76650 km² and 13.23%
- Global conservation status: Vulnerable
- Percentage protected area: 3.5 % all in private or community nature reserves such as Mokolodi Nature Reserve

Table 27: Area under protection in the Southern African bushveld

Ecoregion	PA Type	Area (km²)	%
Southern Africa bushveld			
	Forest Reserve	0.00	0.0
	Game Reserve	0.00	0.0
	Legislated WMAs	0.00	0.0
	National Park	0.00	0.0
	WMAs not legislated	0.00	0.0
	Game Farm	2759.36	100.0
	Total	2759.36	

Although there are no formally protected areas in the Botswana portion of the ecoregion, there are still large areas of continuous habitat remaining. The zone contains most of the largest urban centres in Botswana such as Gaborone and Francistown, and a number of smaller urbanised villages. The major threat in this ecoregion is overharvesting of resources. Plants are heavily exploited for medicinal use in this region. Examples are the orchid *Ansellia Africana, Colophospermum mopane* for poles and firewood and the harvesting of mopane worms (*Imbrasia belina)*.

Arable clearing and wood cutting together with bush encroachment; associated with overgrazing, occur throughout the region. There is extensive mineral exploration particularly for coal, coal bed methane, copper and uranium. It is likely that within the decade the ecoregion will increase the number of mines and (in the case of coal and CBM) power stations by a factor of five.

The large raptors such as the Cape vulture and the whitebacked vulture are expected to decline. The importance of private sanctuaries and game farms in maintaining biodiversity in the region is expected to increase.

7.6.3 Zambezian Baikiaea woodlands

This ecoregion is a mosaic of dry deciduous Baikiaea plurijuga-dominated forest, thicket, and secondary grassland. The area falls within the Zambezian centre of endemism and coincides largely with Zambezian dry deciduous forest and scrub forest. The hot, semi-arid climate and nutrient-poor soils mean that this region is not suitable for farming, and thus it has retained some of its natural vegetation. The area is important for Botswana's indigenous forest reserves.

The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 21598.01 km² and 3.73%

- Global conservation status: Vulnerable
- Percentage protected area: 47.4%

Table 28: Area under protection in the Zambezian Baikiaea woodlands

Ecoregion	PA Type	Area (km^2)	%
Zambezian Baikiaea woodlands			
	Forest Reserve	3656.68	28.1
	Game Reserve	0.00	0.0
	Legislated WMAs	2281.97	17.5
	National Park	4307.33	33.1
	WMAs not legislated	2771.39	21.3
	Game Farm	0.00	0.0
	Total	13017.37	

The region has overall high levels of threat to biodiversity from expansion of cattle into the areas west of the Okavango Delta, high frequency of fire and the presence of veterinary disease control fences which limit movement within the ecoregion. The rapid increase in elephant, together with fire and possibly climate change has resulted in a thinning out of the woodlands and a net loss in woody biomass (Botswana Statistics, 2013). The change in the woodlands is thought to affect diversity of small mammals such as bats.

7.6.4 Zambezian halophytics

This ecoregion covers the Makgadikgadi Pan Complex in Botswana, which consists of two major saline pans, Ntwetwe Pan (106 x 96 km) and Sua Pan (112 x 72 km), surrounded by a number of smaller pans. There are a number of rivers that are important to the Makgadikgadi Pans complex. To the west is the Boteti River, which flows sporadically out of the Okavango Delta and empties into the southern portion of Ntwetwe Pan. The Nata River, a seasonal river which originates in Zimbabwe, is the most important river in the complex and flows into the north of Sua Pan while the Mosetse provides seasonal water into the southern and central sections of Sua Pan.

This system was integrally linked to the Kalahari Acacia Baikiaea woodlands but has become isolated due to changes in land tenure and expansion of the livestock sector. The saline pans have been further isolated from the adjacent saline grasslands through a complex set of veterinary disease control fencing. The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 25087.76 km² and 4.33%
- Global conservation status: Vulnerable
- Percentage protected area: 24.8%

Table 29: Area under protection in the Zambezian halophytics

Ecoregion	PA Type	Area (km^2)	%
Zambezian halophytics			
	Forest Reserve	0.00	0.0
	Game Reserve	547.00	5.3
	Legislated WMAs	150.21	1.4
	National Park	5253.56	50.7
	WMAs not legislated	4136.49	39.9
	Game Farm/Sanctuary	283.90	2.7
	Total	10371.17	

The ecoregion is an important bird area (IBA) which is one of the most important breeding areas of greater flamingo in Southern Africa.

There is major soda ash and salt extraction mine and process facility on the edges of Sua Pan. The abstraction area covers the northern third of Sua Pan and there are plans to extend the abstraction wellfield south into the rest of the pan. Water extraction for the mining activities in the area is affecting hydrological levels and allowing for grasses to establish on the pan surface.

Plans to dam the Mosetse River have been temporarily shelved but pose a serious threat to surface hydrology and survival of the flamingo breeding colony on Sua Pan. Similarly water abstraction upstream of the Boteti River (proposed irrigation developments on the Thamalakane and upper Boteti) and changes to Okavango Delta inflows will increase the rate of hydrological change in the Makgadikgadi.

Uncontrolled tourism, particularly motorbike tours, is a threat to the fauna of the Makgadikgadi Pans. Sightseeing parties and vehicles disturb breeding waterbirds, particularly flamingos and pelicans.

The establishment of a management programme by DEA to prepare the Makgadikgadi for Ramsar status and the preparation of a framework management plan has enhanced the conservation status of the area. In 2010 a flamingo sanctuary in Sua Pan was gazetted.

7.6.5 Zambezian and Mopane woodlands

The Zambezian and Mopane woodlands are split into the areas surrounding the Okavango Delta and the smaller units to the east adjacent to Zimbabwe. The ecozone has a healthy conservation status. The poor agricultural potential means that the majority of habitats are still relatively intact although, due to the potential supply of irrigation water, the eastern areas with their black cotton soils are being developed for arable agriculture (commercial arable agriculture is set to increase from 35,000 ha to about 90,000 ha in the foreseeable future). The large attendant mammal populations have encouraged the establishment of an extensive protected area network in the ecoregion. The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 29912.54 km² and 5.16%
- Global conservation status: Stable
- Percentage protected area: 49.8%

Table 30: Area under protection in the Zambezian and Mopane woodlands

Ecoregion	PA Type	Area (km^2)	%
Zambezian and Mopane woodlands			
	Forest Reserve	519.20	3.5
	Game Reserve	743.51	5.0
	Legislated WMAs	8036.49	54.0
	National Park	5040.36	33.8
	WMAs not legislated	0.00	0.0
	Game Farm	550.72	3.7
	Total	14890.28	

The ecoregion though has relatively high threats to biodiversity particularly in the area surrounding the Okavango Delta. The threats are largely due to settlement patterns, high levels of poaching, PAC and HWC. The settlement patterns around the Delta are isolating the flooded grasslands from the surrounding Kalahari Acacia-Baikiaea savanna. The expansion of arable agriculture and livestock farming into the ecoregion adjacent to Zimbabwe is creating a barrier and, due to the surrounding wildlife populations, very high PAC levels specifically of predators.

Another concern is the potential habitat destruction caused by uncontrolled elephant populations in some parts of the ecoregion. The large elephant population impacts heavily on mopane woodland which is habitat for other species, which include birds. Elephant population in northern Botswana currently stands at 207,545 (DWNP, 2013).

7.6.6 Zambezian flooded grasslands

This ecoregion is a mosaic of dry deciduous Baikiaea plurijuga-dominated forest, thicket, mopane and riverine woodlands and secondary grassland. The area falls within the Zambezian centre of endemism and coincide largely with Zambezian dry deciduous forest and scrub forest. The flooded grasslands are the biodiversity hotspot of Botswana. This has been supported by the DWNP/EU taxonomic surveys of the protected areas and the studies of the Okavango Research Institute. The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 22744.70 km² and 3.93 %
- Global conservation status: Relatively Stable
- Percentage protected area: 70.6 %

Table 31: Area under protection in the Zambezian flooded grasslands

Ecoregion	PA Type	Area (km^2)	%
Zambezian flooded grasslands			
	Forest Reserve	4.43	0.0
	Game Reserve	4156.49	25.6
	Legislated WMAs	11899.54	73.3
	National Park	0.00	0.0
	WMAs not legislated	180.08	1.1
	Game Farm	0.00	0.0
	Total	16240.54	

The Okavango is one of the few remaining large wetland systems in the world without notable man-made developments and that has so far remained relatively pristine. The rivers which feed the wetland are unregulated and therefore its natural hydrological regime remains intact. The Delta provides important habitat for a variety of resident wildlife and a number of migratory species especially avifauna.

The flooded grasslands are totally dependent on inflows from the upper basin which fall outside the management control of Botswana. Planned developments in the upper basin will potentially affect the hydrology, sediment dynamics and water quality of the ecoregion (OKACOM 2011). Tourism is important to the ecoregion allowing a flourishing tourism sector to develop and the base of the Ngamiland economy. It is also one of the threats in terms of disturbance (mainly to birds), a polluter and a pathway for alien invasive plant species to establish. Invasive aquatic plant and fish species remain a significant threat to biodiversity in this ecoregion.

7.6.7 Kalahari xeric savanna

The Kalahari xeric savanna ecoregion stretches in the south western region of Botswana and is the largest in the country. The Kalahari sands are generally nutrient poor and temperature fluctuations are extreme. These harsh conditions perhaps explain the reason why plant species richness per unit area in the xeric savanna is among the lowest of all in Southern Africa. The extent of this ecoregion and its protected area status can be summarised as follows:

- Area (and % of total): 216946.72 km² and 37.46%
- Global conservation status: Relatively Stable
- Percentage protected area: 53.8 %

Table 32: Area under protection in the Kalahari xeric savanna

Ecoregion	PA Type	Area (km²)	%
Kalahari xeric savanna			
	Forest Reserve	0.00	0.0
	Game Reserve	26314.57	21.4
	Legislated WMAs	62859.87	51.1
	National Park	26208.60	21.3
	WMAs not legislated	6457.68	5.2
	Game Farm	1284.36	1.0
	Total	123125.08	

This ecoregion is under severe threat from programmes to expand livestock into and across the wildlife corridors linking the CKGR to the Kalahari Gemsbok National Park. Other policies such as the promotion of livestock husbandry to people inhabiting the wildlife management area and the banning of hunting are seriously undermining the conservation status of the area.

Poaching and habitat fragmentation is leading to the collapse of springbok populations with a (non-significant) decline of 71% over the last two decades (DWNP 2013).

Although Conservation International provided significant support to maintaining and enhancing the Western Kgalagadi Conservation Corridor (WKCC) over a four year period between 2008 and 2011, the threats to biodiversity in the area have not reduced.

7.7 GAP ANALYSIS ON TRENDS IN BIODIVERSITY

Greater understanding of species dynamics and biology required for those species subject to offtake. This will require substantial increase in research funding and a shift to information based management or adaptive management.

There is a need for systematic monitoring based on a well-structured system using species and ecosystem indicators identified by experts.

Large landscape-level assessments of populations are required to eliminate the possibility that localised fluctuations are not due to large-scale migration.

8. ECONOMIC VALUATION OF BIODIVERSITY IN DRYLAND ECOSYSTEMS

The discussion in this chapter covers the four ecoregions that comprise the dryland ecosystems in Botswana: Kalahari xeric savanna, the Kalahari Acacia-Baikiaea woodlands, Southern African bushveld and the Zambezian halophylics (Makgadikgadi) (Figure 1). Economic valuation tends to be based on human use, which means that data tend to be collected according to socio-political units (i.e. districts) which are not aligned with ecological boundaries, but instead tend to contain more than one ecoregion, and share such ecoregions with neighbouring districts. The approach in this section has therefore been to pool the data for the districts that are mainly dryland areas, and then, where data are available for the individual ecoregions in the drylands, to present these for discussion in separate subsections.

As shown earlier, the economic value of ecosystems comprises use values (direct and indirect), option values and existence values. The direct use values can be further sub-divided into subsistence and commercial use. The former support livelihoods (in kind and in cash); the latter refer to the sale of natural resources for commercial purposes (for livelihoods or profit). The main direct uses include:

1) Livestock production throughout the ecoregion;
2) Tourism (hunting and ecotourism), mostly in the western parts;
3) Crop production, mostly in the eastern parts of the country;
4) Harvesting of natural resources/ veld products throughout the ecoregion; and
5) Mining.

No comprehensive economic valuation has been made for Botswana's dryland ecosystems, with the exception of the Zambezian halophylics (done as part of the Makgadikgadi wetlands assessment. To-date, no updated (since the previous NBSAP) data have been obtained for harvesting of, or trade and export of, specific veld products from these dry parts of the country.

The ecoregions do not fully correspond with administrative districts or other spatial classifications (e.g. agricultural districts and controlled hunting areas). For the implementation of the Revised NBDSAP, it is important that available data for administrative, agricultural and other districts can be transformed into ecosystem figures. Short of collecting ecoregion specific data, the best way to do this is by, for example, overlaying the administrative districts with the ecoregions, calculating the part that is overlapping and assigning this proportion of the administrative district figure to the ecoregion concerned[6]. This method has been previously applied in water accounting projects from DEA and DWA and in the FAO-OKACOM Okavango water audit project.

8.1 VALUATION OF THE DRYLAND ECOSYSTEMS – AN OVERVIEW

The dryland ecosystems are discussed together in this section where data do not exist at the level of the specific ecoregions. To best approximate the overall dryland ecosystems, the section below pulls together data for all districts except Chobe and Ngamiland. These districts (Central, Ghanzi, Kgalagadi, Kgatleng, Kweneng, North-east, South-east and Southern) are comprised only of the ecoregions associated with dryland ecosystems.

[6] This assumes that the attribute concerned (e.g. population) is evenly divided over the administrative district.

8.1.1 The value of game stock in Botswana's dryland systems

The Rio +20 Summit and the resulting *The Future we Want* statement as well as the preparatory *Gaborone Declaration on Sustainability in Africa* emphasise that natural resources and biodiversity constitute natural capital. In Botswana, a large part of this natural capital is found in its wildlife. Therefore, an attempt has been made to value wildlife resources for the country as a whole and for the main ecoregions. The valuation is based on game counts from 2012 aerial survey and species values. Actual game values are difficult to establish as Botswana has no regular operational game market. Some studies using recent local game prices are used by El Mondo (2013) and Farrington (2013), together with South African (SA) auction prices, converted into Botswana Pula and expressed in constant 2006 BWP to eliminate the impact of inflation. Obviously, the use of SA auction prices overvalues the game as the capture and transport costs are not taken into account. These could account for 40% (or more) of the animal's value and therefore only 60% of the auction has been taken as the animals' value. The auction value of buffalo[7] is very high (over Rand 400 000) as it probably refers mainly to disease-free buffalo, which Botswana does not have. Instead we have used the domestic buffalo price (BWP 3 250; El Mondo, 2013) as well as a much lower part (10%) of the South African auction price.

Based on the above, the value of the game[8] stock in the dryland ecosystems is estimated at P0.9 and P1 billion respectively using domestic buffalo prices and 10% of SA auction prices respectively (see also Appendix 4). The stock value is high and reflects the importance as well as potential of wildlife resources outside the wet ecoregions (Ngamiland and Chobe). The comparison of the 2001 and 2012 game stock values show a significant increase in the value of the country's wildlife resources (Appendix 4). The comparison in time could not be made by ecoregion.

Problem animals adversely affect livelihoods through predation, crop damage and damage to household assets. Compensation is provided for damage caused by nine species[9]. However, this is usually below the replacement value and no compensation is provided for other species. Countrywide, problem animal conflicts are increasing. Three species (elephant, lion and leopard) together cause 90% of the problem animal incidents. Elephant and lion damage occurs mostly in northern Botswana (Ngamiland, Chobe and northern parts of Central District) while leopards cause problems throughout the country, including in south-western Botswana. Species such as cheetah and wild dog cause mostly problems in south-western Botswana (Kgalagadi and Ghanzi). CAR (2011) has prepared a Green Paper on Human Wildlife Co-existence, which government intends to convert into a White Paper.

8.1.2 CBO revenues in districts associated with dryland ecosystems

Community based organisations (CBOs) use natural resources mostly for hunting and tourism purposes. Some CBOS also gather and process veld products (e.g. Morula fruits and products from Gabane and Tswapong Hills). Two data sources were made available. Firstly, DWNP supplied CBO revenues figures for the period 1997 – 2012, which covered 22 CBOs. Secondly, Kalahari Conservation Society (KCS) provided the 2011-12 CBNRM Status report, which covered 45 CBOs. Mbaiwa (2013) states that 106 CBOS were registered in 2012.

[7] Buffalo are common in the northern ecoregions, and only occur in the northern parts of the Kalahari Acacia-Baikiaea Woodlands (parts of Central District).

[8] This is an underestimate as it only includes blue wildebeest blue, Cape buffalo, eland, gemsbok, impala, kudu, lechwe, elephant, ostrich, hartebeest, roan, sable, zebra, springbok, tsessebe and waterbuck.

[9] Lion, leopard, hippo, rhinoceros elephant, buffalo, crocodile, wild dog and cheetah.

Both data sources show that CBO revenues in the districts containing the four dry ecoregions are very low: P5.2 million reported in 2011, over P4 million of which was generated by the Khama Rhino Sanctuary alone. In addition, it is noteworthy that Ngamiland and Chobe have fewer CBOs than the districts containing the dryland ecosystems, but generate much more income (combined revenues of P19 million). This reflects the lower income-generating potential of the dryland ecosystems in terms of hunting and ecotourism. It is important to note that some CBOs also generate in-kind revenues, particularly game meat. However, the quantity and value are unknown, and its ongoing contribution is subject to removal of the current hunting ban.

8.1.3 Game ranching in the dryland ecosystems

The Botswana Wildlife Producers Association (BWPA) represents the game ranching sector and has recently produced a status report for the sector (Farrington, 2013). The Botswana Wildlife Management Association (BWMA) represents the hunting sector. Unfortunately, no recent data were made available for this study, and therefore the coverage in this section is restricted to the game ranches.

The ecoregions encompassing the dryland ecosystems are the home of game ranching. The drylands account for over 80% of the number of game ranches (total of 107 – similar to the number of CBOs) and area held under game ranching (9 612 km^2) and an estimated 99% of the game animals (Farrington, 2013). The number of animals is rapidly increasing (164 346 in 2010; 252 198 in 2012). In terms of game animals, Ghanzi, Tuli block and North-East District hold the largest number of game animals. The sector generates between P19.3 and P55.9 million gross revenues per annum or P20.25 to P58.80 per hectare (ha). Almost all is generated in the dryland areas of Botswana.

Hunting is generally the main source of income, but game ranches have a diverse revenue base: photographic safaris, meats sales and sales of live animals are also important sources of revenues (Figure 21).

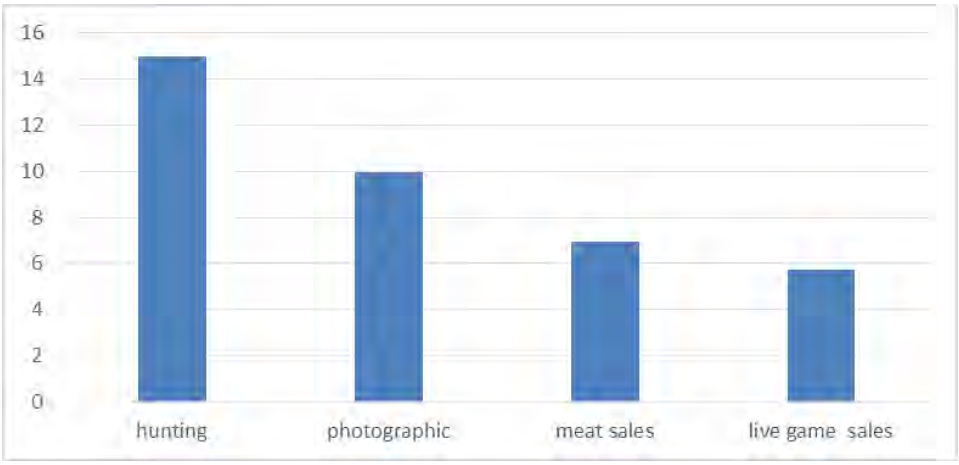

Figure 21: Revenue sources of game ranches (2012; BWP million). Source: Farrington, 2013.

8.1.4 Dryland veld products

Data from DFRR show that the country's harvesting and trade in veld products is mostly concentrated in the dryland ecosystems. Around three quarters of the harvesting and dealers permits are issued in the districts associated with these systems, particularly in Central and North-East Districts. All exports originate from the dryland ecosystems, mostly eastern

Botswana. For the period 2010-2013, on average 788 harvesting permits were issued per annum, 216 dealers permits and 23 export permits. More detailed information is provided in Appendix 4.

8.2 KALAHARI XERIC SAVANNA

This ecoregion is characterised by naturally low species diversity (Sallu, 2007) and includes the Kalahari and Ghanzi districts. In spite of this natural deficiency, biodiversity remains an important component of livelihoods (Hitchcock, 1985; Twyman, 2000; Sporton & Thomas, 2002) and for cultural identity (Twyman, 2000).

Limited attempts have been made to value the Kgalagadi dryland ecosystem that falls within the Kalahari xeric savanna ecoregion. Madzwamuze *et al*. (2007) assessed the value of the system in two dryland communities in Kgalagadi south (Khawa and Struizendam). There are diverse ethnic groups found in the area, and the major (natural resource-based) livelihood strategies are pastoralism, hunting and gathering. Other sources of livelihoods include government drought relief and social welfare programmes, wildlife use through CBNRM and tourism activities. A wide range of ecosystem goods and services are provided, including wild foods, timber, fuel and medicinal plants, forage for livestock, wildlife refuge, groundwater recharge, carbon sequestration, cultural values, etc.

8.2.1 Tourism

This ecoregion has three DWNP managed Protected Areas: Central Kalahari Game Reserve (CKGR), Khutse Game Reserve (KGR) and the Kalahari Transfrontier Park (KTP). The revenues from park / reserve entrance constitute part of the tourism use value. Clearly, it excludes the value generated by tourism operators in the area (mobile or fixed). Figure 22[10] shows a steady increase in visitors to the three parks/ reserves, the majority of which are private visitors, who spend several days in the parks and camp. Mobile operators and lodges generate few little visitors (unlike in Chobe). Southern parks are mostly frequented by private visitors who spend the night inside the parks (Appendix 4).

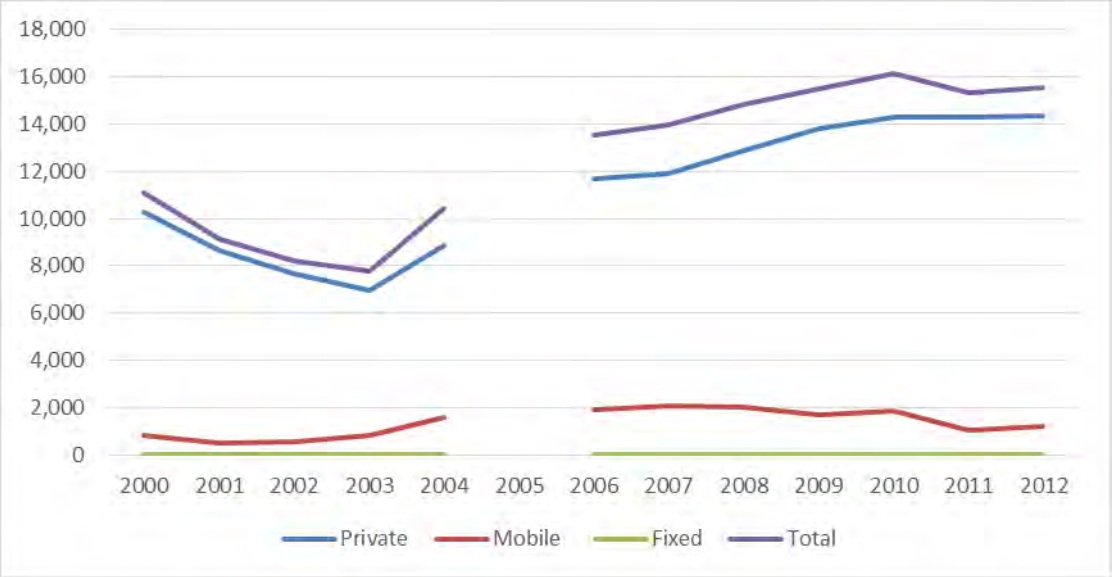

Figure 22: Trends in visitors to CKGR, KGR and KTP (2000-2012), based on DWNP data

[10] In this section, several of the graphs are based on DWNP datasets, from which 2005 was missing.

The parks generate little revenues for DWNP and in fact public funds are necessary to maintain and manage the parks (El Mondo, 2013). In real terms (2006), annual revenues range between P 2-3 million (Figure 23).

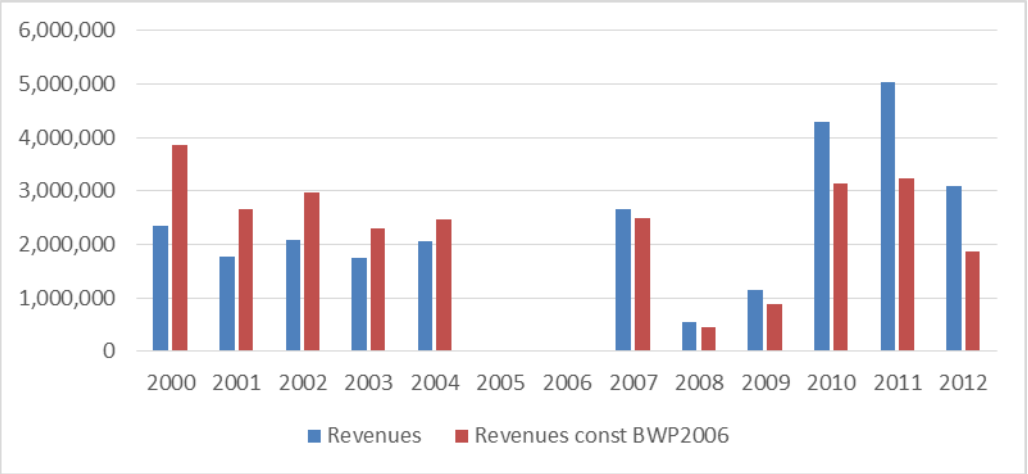

Figure 23: Trend in revenues from CKGR, KGR and KTP (BWP; 2000-2012), based on DWNP data.

The figures show that the tourism pressure in the parks is low and with adequate management the park biodiversity should not be adversely affected by tourists at the moment. Overall tourist densities are very low at less than 2 tourists/km^2/annum (Appendix 4). The direct use value generated by these parks is limited, bearing in mind that the private tourism sector is very small in this area. Public funding is needed to support their maintenance, which is an important biodiversity concern given current public funding constraints. There are opportunities to expand mobile operators and fixed tourism facilities to increase tourism and economic benefits.

8.2.2 CBNRM

Community-based tourism in the Kalahari xeric savanna is less attractive compared to the northern ecoregions because of limited wildlife species and limited scenic features other than the vast wilderness experience. Around 10% of people in Kgalagadi District hunt animals for subsistence such as gemsbok, eland, springbok, steenbok, hartebeest, duiker and ostrich (Amusa, 2000; Velempini, 2006). Table 33 shows that there has been a rapid decrease in the community hunting quotas between 2009 and 2011 and communities have struggled to attract buyers for their quota. Where buyers are sourced, they offered less favourable terms.

While almost 90% of all CBNRM revenues are generated in the Okavango ecoregion (Mbaiwa, 2013), there is evidence that districts in the 'dry' ecoregions also have some potential to derive economic benefits from the wildlife-based tourism sector. In 2005 four communities in Kgalagadi District earned altogether US$48,000 through auctioning of wildlife quota and land leases. These revenues significantly contributed to the direct use value of US$0.08/ha for hunting activities in this district (Amusa, 2000). Such benefits can only be generated if wildlife resources are adequately managed and do not decline.

In the south-western parts of the country, hunting is mostly carried out in the Kgalagadi area where there is an abundance of CHAs (27 but only 10 were allocated quota for 2011). The majority of these CHAs were community managed areas (see above) while the rest were citizen hunting areas. There are CBNRM activities in the community areas where the proceeds from hunting accrue to the CBOs. There are no high value species on the quota (Table 33 and Table 34), which limits the income generating potential from hunting. This sentiment was

echoed by the Nqwaa Khobe Xeya Conservation Trust in their reporting to DWNP (DWNP hunting review report, 2011 – unpublished). There are only a few CHAs in the Southern and Kweneng areas and therefore community-based hunting is minimal. The northern drylands cover a large portion of Central district and south west of Ngamiland. Their allocation accounts for about 68% of the entire animal allocations for the dryland areas.

Table 33: Kgalagadi District community managed areas hunting quotas, 2009-2011

Species	2009	2010	2011
Duiker	40	40	30
Eland	5	5	0
Gemsbok	50	20	0
Hartebeest	12	12	0
Hyena, spotted	4	4	0
Black backed jackal	5	5	9
Kudu	10	10	5
Leopard	4	3	0
Lion	0	0	0
Ostrich	74	59	0
Porcupine	6	6	0
Springbok	40	30	21
Steenbok	30	30	20
Blue wildebeest	8	4	20
Total	288	228	105

Source: DWNP

Table 34: Hunting quota for districts covering the dryland ecosystems (2011)

	Ghanzi	Kgalagadi	Kweneng	Southern	Ngamiland	Central	Total
Baboon	0	0	0	2	12	17	31
Buffalo	0	0	0		13	13	26
Duiker	20	30	24	0	0	0	74
Gemsbok	0	0	5	0	0	0	5
Jackal (Black-backed)	4	6	0	0	0	0	10
Kudu	4	6	3	3	0	0	16
Ostrich	0	0	0	0	0	0	0
Springbok	9	19	2	0	0	0	30
Steenbok	10	20	0	0	0	0	30
Wildebeest, blue	0	20	0	0	0	0	20
Side striped Jackal	2	0	0	0	0	0	2
Hare, Cape	0	0	0	0	6	10	16
Hare, Scrub	0	0	0	0	6	10	16
Hyena_ Spotted	0	0	0	0	0	2	2
Impala	0	0	0	0	15	90	105
Kudu	0	0	0	0	5	12	17
Warthog	0	0	0	0	3	0	3
Elephant	0	0	0	0	89	103	192
Zebra	0	0	0	0	8	0	8
Total	**49**	**101**	**34**	**5**	**157**	**257**	**603**

8.2.3 Game ranching

Another direct use value component is game ranching, which is associated with ecotourism, hunting and the sale of live animals and meat. Farrington's (2013) review of the game ranching sector indicates that Ghanzi is the district with the largest area under game ranching (313 063 ha; Kgalagadi 69 905 ha). The ranches in Ghanzi are almost 50% larger (average of 13 611 ha) than the average ranch size (8 974 ha). The ranch in Ghanzi and Kgalagadi hold 67 138 game animals or 27% of the total game held on game ranch. Employment is estimated to be around 350 jobs and gross annual revenues between P 8-22 million (based on Farrington, 2013).

8.2.4 Livestock

The South-western ecosystems provide rangeland for livestock farming (mainly cattle and small stock), representing around 70% of the bulk use value (Arntzen, 1998). Milk production for subsistence purposes, provision of manure and draught power, and meat are some of the benefits accrued from livestock farming. Ironically, livestock sales, slaughter and milk production accounted for only roughly 30% of the direct use value in Kgalagadi North sub-district, while non-livestock related land uses, namely gathering and hunting activities made up two thirds of the direct use value (Amusa, 2000). While there has been a reduction in livestock numbers, cattle production still supports 50% of the population in Kgalagadi North and 90% of the cattle are owned by only 12% of the people living in the area (Chanda and Totolo, 2001). Furthermore, 90% of cattle are owned by males. Unfortunately, the productivity and value of rangelands appear to be gradually declining as a consequence of land degradation and bush encroachment around boreholes and settlements; a process exacerbated by global climate change (CAR, 2006).

8.2.5 Crop production

Arable farming is highly insignificant in this ecoregion, with arable land covering only 0.1% of the Kgalagadi District. However, more than 50% of all families were engaged in this livelihood strategy in Kgalagadi North sub district, which differs from the Kgalagadi southern region. The main crops in this area comprise maize, watermelon, cowpeas and sorghum (Chanda and Totolo, 2001).

8.2.6 Veld products

A wide range of products such as fire wood, veld foods and medicinal plants are provided by the drylands of Botswana and some plants like Devil's Claw (*Harpagophytum procumbens*), are endemic to this ecosystem (Madzwamuze *et.al.,* 2007). Almost all people in Kgalagadi District harvest different veld products for home consumption (Amusa, 2000; Chanda and Totolo, 2001; Velempini, 2006). About one quarter of the people also generate cash income from harvesting veld products. Devil's Claw is the most important commercially exploited medicinal plant and is rated as having the highest priority for the livelihoods of rural communities in Kgalagadi South (Velempini, 2006). Nationally, approximately 20 tonnes of dried material with a value of US$20,700 to US$27,000 were harvested and marketed in 2005 (DFRR 2006). Sales in Kgalagadi District have been estimated at between 5 and 10 tonnes with returns of US$7,000 to 13,000. Likewise, *Hoodia gordonii,* a succulent plant with appetite suppressant qualities, growing only in the driest parts of the country in Kgalagadi South, provides an opportunity for livelihood diversification in rural communities.

Wild fruits and vegetables, particularly truffles *(Terfezia pseilii)*, wild melons (*Citrullus lanatus*), bush raisins (*Grewia flava* fruits) as well as honey, represent regular supplementary sources of food for rural people in Botswana's dryland areas. However, watermelons were rated as most important for livelihoods by rural communities in Kgalagadi South, followed by truffles and bush raisins, though only found occasionally (Velempini, 2006).Veld product gathering accounted for US$0.10/ha mainly due to the high use value of firewood (Amusa, 2000). However, data on most veld products are lacking; there is need to gain a better understanding of the commercial market for veld products and to develop appropriate markets and access channels (IVP 2006).

Fuel wood represents a key resource for 89% of the households in Kgalagadi District and contributes significantly to the high use value of veld products gathered in the area. However, overexploitation, overstocking and overgrazing continues to put pressure on available fuel wood resources and fuel wood shortages around villages in Kgalagadi have been reported (Geoflux, 2002).

8.2.7 Valuation summary for Kalahari Xeric Savanna

The ecoregion derives direct use values from livestock, crop, tourism and game ranching. Tourism largely depends on the three national parks. Several valuable veld products such as hoodia, grapple plant and Kalahari truffle occur in the region, but insufficient data are available on the harvesting (no species specific data are kept). The region is the back bone of the country's game ranching industry. In contrast, existing CBNRM projects generate very limited income and are an unimportant livelihood source. Very little is known about the indirect use values, option and existence values.

8.3 KALAHARI ACACIA-BAIKIAEA WOODLANDS

No comprehensive valuation studies have been undertaken in this ecoregion. Livestock and crop production are the dominant resource uses, particularly in eastern Botswana. Commercial wildlife use is mostly restricted to mobile tour operators and hunting in communal areas. Harvesting of veld products is an important source of livelihood for the rural population but few quantitative assessments have been made. Some CBOs exists and generate limited revenues and only Khama Rhino Sanctuary manages to accrue significant revenues.

Subsistence use covers fuelwood, and veld products for food and medicines.

There are game and livestock ranches in this ecoregion, notably in the Hainaveld, as well as farms to the east of CKGR. However, it is difficult to extract data on the basis of this ecoregion, and revenue figures are therefore included in the overall analysis in Section 8.1.

8.4 SOUTHERN AFRICAN BUSHVELD

As with the Kalahari Acacia-Baikiaea Woodlands, not valuation studies specific to this region have been done. There is some hunting and ecotourism in the freehold Tuli block, and CBOs such as Kgetsi ya Tsie, which is a women's CBO that harvests and processes morula products, generate limited income. Kgetsi ya Tsie collects and processes morula nuts into oil, soap and jams (CAR, 2003). Harvesting of mopane worms is probably the most significant economic activity, but no recent harvesting, trade and/or export data could be obtained.

The Tuli block has 32 game ranches with an average size of 9 329 ha, accounting for 31% of the area under game farming in Botswana (Farrington, 2013). The value of the game stock is around P100 million; the Tuli block farms are estimated to generate around 260 jobs and between P6 to 17 million annual gross revenues, of which 40% is generated by hunting (based on Farrington, 2013).

8.5 ZAMBEZIAN HALOPHYLICS

A comprehensive valuation of use values was undertaken as part of the Makgadikgadi Framework Management Plan (MFMP). In addition, partial information on use values exists for tourism (park revenues), CBNRM and the game ranching industry.

The Makgadikgadi system generates a wide range of ecosystem goods and services that have values to the society. For livelihoods, these goods and services range from agriculture to use of natural resources (veld products and wildlife utilization). The most commonly used natural resources are firewood, grass and wild fruits/berries as they are widely available within the area. CAR and DEA (2010) estimated that about 86.5% of all households in the MFMP area use wood for cooking and lighting, while it is also used extensively in the winter season for warming. With the exception of Nata, where 'only' 57.8% households use firewood, in other villages, firewood usage ranges from 88 to 100% of the households. Grass is utilized by about 70% of the households in the Makgadikgadi. Grass is easily accessible and often sold to buyers from outside the area as opposed to the local communities. Local communities also collect wild fruits such as moseme, moretlwa, and morula as well as mophane worms. The latter is the most valuable resource as it is used for both subsistence and commercial purposes. The main issue identified with regards to sale of mophane worms is finding a reliable market and selling at a good price (CAR and DEA, 2010). Another important activity for the communities in the area is CBNRM. However, only three CBOs are active: Gaing 'O Community Trust, the Nata Sanctuary Community Trust and Xhwauxhatubi Trust.

8.5.1 Direct use values

The direct use values of the Makgadikgadi system are confined to livestock and crop production, harvesting of natural resources, tourism and mining activities. Livestock is the most important agricultural activity as it provides cash income, meat, milk, draught power and is also a source of social status. The overall value of cattle is estimated to be about P15.4 million in terms of net private income and has a gross value added of about P10.7 million. However, the study did not measure the grazing value of the Makgadikgadi. With regards to crop farming, it is estimated that this generates a net private value of about P19 million and a direct economic value of about P15 million. The importance of natural resources to the local communities in the Makgadikgadi system cannot be overemphasized. It is estimated that natural resources generate a net private value of P73.6 million of which 43% is accrued from the utilization of grass. On the other hand, the direct value added from natural resource use is estimated at about P83.7 million.

Tourism is another important direct use of the Makgadikgadi system and it occurs largely through nature-based activities based in accommodation facilities. Tourism generates some P55 million annually in gross value added to the national income. 65% of this is contributed by game lodges and camps, and 42% is generated by the up-market establishments in the area such as Meno-a-Kwena. The total impact of tourism to the economy was also measured (lateral and backward linkages) and this amounts to P 227 million. Interestingly, the value of tourism within the protected areas of the Makgadikgadi is estimated to be P 18 million in net

value added and P 22 million in gross value added (Turpie *et al*., 2011) while the total contribution towards the gross national income is about 41% of the total tourism contribution for the entire Makgadikgadi system. This indicates the high importance of protected areas in the Makgadikgadi in relation to tourism. In terms of employment opportunities, it is estimated that about 350 full time jobs and annual salaries and wages payments of some P 22 million are realized from tourism related activities in the MFMP area while park facilities on the one hand generate about 170 jobs.

In terms of mining, it is estimated that BotAsh mine generates an estimated direct value added of some P 190 million to the national income and about 440 job opportunities. When considering the multiplier effect and backward linkages, mining generates a total gross value added of about P 467 million to the national economy.

The overall direct use value for the MFMP area is given in Table 35. Interestingly, gathering is the most valuable source of livelihoods together with mining benefits. It is more important than livestock and crop production combined. The commercial tourism and mining sectors, however, contribute most significantly to the national income especially when considering the lateral and backward linkages. There is need to enhance tourism investments and enterprises that largely benefit the communities particularly through CBNRM. This would enhance the tourism value of the Makgadikgadi system to local livelihoods as well as management of the natural resource base.

Table 35: Direct use value of the MFMP area (BWP)

Category	Contribution to local livelihoods	Direct gross value added
Agriculture	-	
Livestock	15 380 537	10 656 741
Crops	19 209 452	14 707 613
Sub-total	***34 589 989***	***25364 354***
Natural resource gathering		
Grasses	31 953 922	33 565 717
Wild Fruits	29 075 714	35 659 475
Firewood	2 689 926	3 558 990
Mophane worms	9 851 101	10 993 389
Subtotal	***73 570 663***	***83 777 571***
Tourism	-	-
Serviced hotels/motels	Not measured	7 087 700
Game lodges/camps	Not measured	36 362 900
Safari hunting	Not measured	5 807 700
Campsites	Not measured	82 800
Mobile operators	Not measured	5 999 900
Subtotal	***14 732 000***	***55 341 000***
Mining[11]	-	-
Soda ash and salt	***74 250 000***	***190 000 000***
Total	**197 142 653**	**354 482 926**

Note: contributions to livelihoods = direct benefits to households; direct gross value added = direct contribution to gross national income.

Source: CAR and DEA, 2010.

[11] Although not part of biodiversity, mineral resources represent part of the direct use value and such use can influence biodiversity. The value of mining is therefore included in the total.

The Makgadikgadi and Nxai Pans National Park (MNPNP) is integral part of the MFMP area. Entrance fees are part of the tourism use value. Figure 24 shows a doubling of the number of tourists since 2000 in the MNPNP, i.e. the main government operated Protected Area[12]. While most of them are private visitors, mobile operators also generate park visits. It can be reasonably assumed that the direct use value of tourism in the area has also doubled.

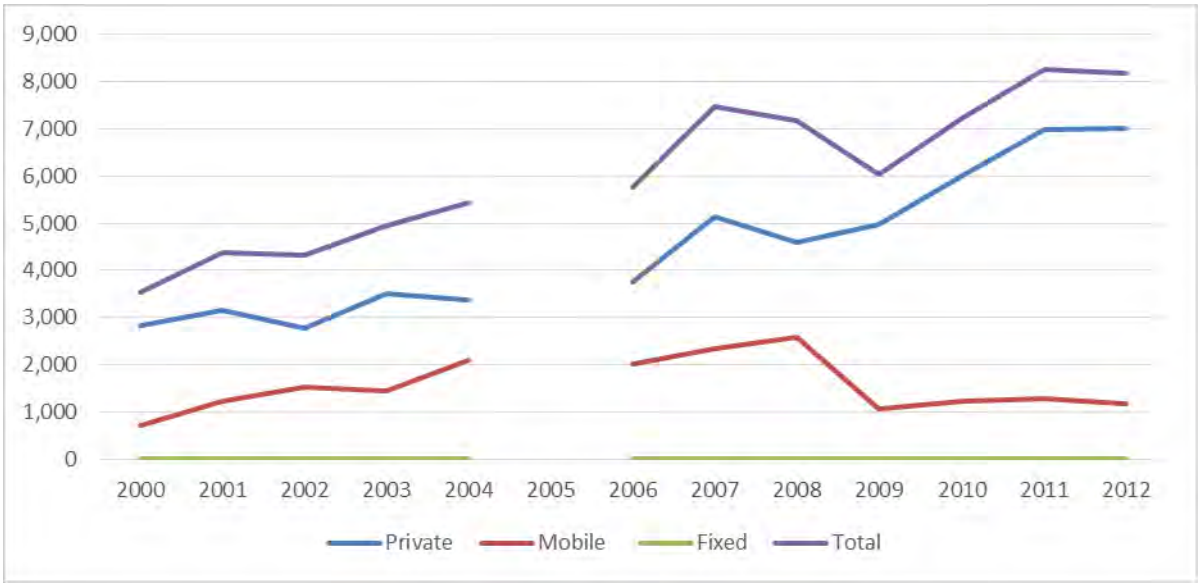

Figure 24: Trend in visitors to the MNPNP (2000-2012), based on DWNP data

Park revenues have more than doubled and reached P1.6 million in 2012. In real terms (2006), annual revenues have been stable around P1 million (Figure 25).

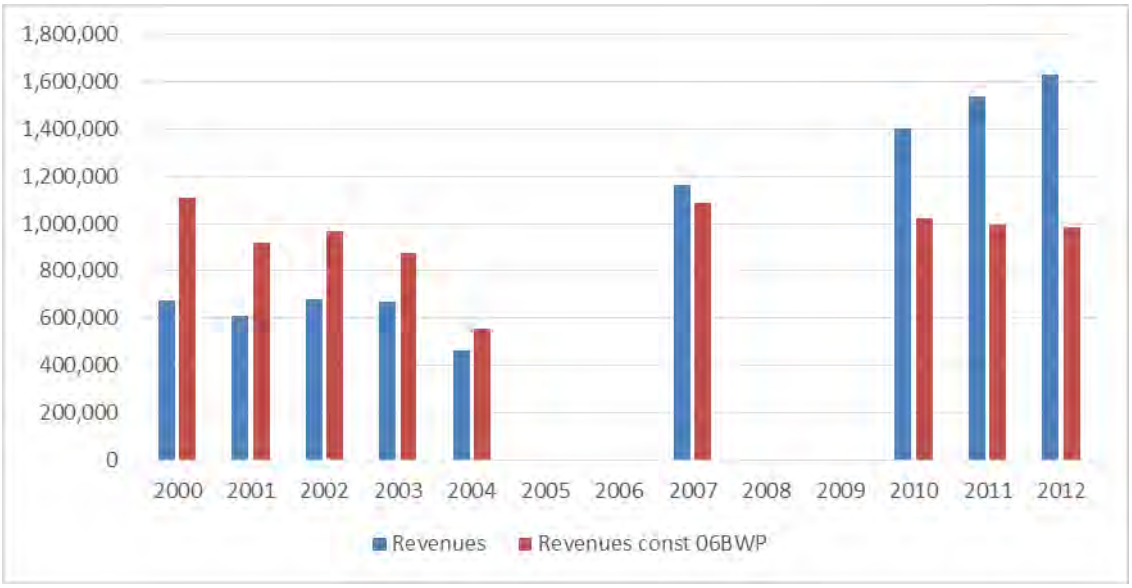

Figure 25: Trend in MNPNP revenues (BWP; 2000-2012), based on DWNP data.

[12] A new Flamingo Sanctuary in the southern Sua Pan was proclaimed in 2009. The Nata Sanctuary in the northern Sua Pan is managed by communities.

Tourism pressure in the park is still low, but increasing. With adequate management the park biodiversity is unlikely to be adversely affected by tourists in the near future. The revenues generated are low and public funding is needed to support its maintenance. The latter is an important biodiversity concern. There are opportunities to expand mobile operators and fixed tourism facilities to increase tourism and economic benefits. The other challenge is to ensure that livelihood benefits from tourism increase in order to get greater support for park management and biodiversity conservation. Co-management and integration of the park management and development in the MFMP area is necessary to achieve this.

8.5.2 Indirect use values

The Makgadikgadi provides significant services such as carbon sequestration, wildlife refuge, groundwater recharge and water purification. In total the annual indirect use value is estimated to be P 55.4 million ranging from P74 million to P253 million. Carbon sequestration contributes over 85% of the indirect use value followed by groundwater recharge and wildlife refuge (Table 36). Turpie *et al.*, (2011) note the importance of protected areas in the Makgadikgadi in terms of their carbon sequestration value. They argue that conserved natural systems have higher value as carbon sinks compared to degraded areas outside parks. Further investigations on the actual carbon sequestration value need to be undertaken in the future.

Table 36: Indirect use values of the MFMP area (BWP million)

	Category	Best estimate	Low estimate	High estimate
1	Wildlife refuge			
	a) hunting	3.1	1.5	4.6
	b) ecotourism	2.8	0.7	6.4
2	Carbon sequestration	136.5	60.0	229.4
3	Science & education	2.3	2.3	2.3
4	Water purification	0	0	0
5	Groundwater recharge	10.8	9.1	10.8
	Total	**155.4**	**73.6**	**253.4**
	Total /ha	**43.17**	**20.44**	**70.39**

Source: based on CAR and DEA, 2010.

8.5.3 Non-use value

Option value is linked to the use value as it represents the willingness to pay for preservation of the resource with the option of using it at a later period. The option value of the Makgadikgadi system could not be measured as there are no data on the extent of non-use values in the area. However, considering the significant amounts of investments made by government in the protected areas within the Makgadikgadi, it shows that the objective of preserving the natural resources and biodiversity in the parks is essential. Therefore the option value is considered to be substantial.

8.5.4 Valuation summary for Zambezian Halophylics

The Makgadikgadi is a relatively small but valuable ecoregion used for mining (soda ash and diamonds), livestock production, tourism and limited crop production. Indirect use values are important as compared to the direct use values, which form a strong justification for integrated management of the area (through the MFMP) to ensure that indirect uses are

maintained. Tourism is valuable but currently provides limited livelihood benefits (even less than crop production). The MNPNP operations need to be better integrated into the areas overall development (e.g. trough co-management with communities and the private sector), and tourism diversification and community-based tourism need to be encouraged to improve local livelihoods and further develop the area.

8.6 GAP ANALYSIS FOR ECONOMIC VALUATION OF BIODIVERSITY IN DRYLAND ECOSYSTEMS

No comprehensive valuation studies have been done for the dryland ecosystems, either singly for the different ecoregion types presented here, or as a whole. An economic valuation was carried out for the Makgadikgadi halophylics only. The other regions appear to have been neglected in terms of resource use studies and data collection. More work needs to be done in these ecoregions to conserve and utilise biodiversity better.

Knowledge about and the understanding of most ecosystem services other than the provision function is very limited, making it impossible to estimate the indirect use values in detail. The estimate of such values for the Makgadikgadi (and Okavango) was based on assumptions that need further investigation and verification.

The option and existence values of all four of the ecoregions are unknown.

The Botswana Core Welfare Indicator Survey does not analyse the link between natural resource dependencies and use on the one hand and income and livelihoods on the other hand. If this is done, the relationship between poverty and natural resource use could be quantified and inform poverty eradication initiatives.

There are a large number of data inadequacies and data capturing and availability appears to have worsen. The gaps in recent data include:

1) Actual hunting data or success rates of available hunting quota;
2) Harvesting, trade and export of veld products;
3) Identification and quantification of ecosystem services in the four ecoregions;

Biodiversity conservation and utilisation is the shared responsibility of many stakeholders in government (e.g. DEA, DFRR and DWNP), the private sector (e.g. game ranchers, tourist operators and farmers) and individuals and communities (e.g. CBOs). There is a lack in a comprehensive institutional approach towards biodiversity conservation, making it difficult to adopt an ecoregion-wide approach. Moreover, it makes it more difficult to establish a comprehensive data base. The significant game ranching sector is not yet fully integrated with DWNP-park management and yet they should contribute together towards wildlife biodiversity conservation and utilisation.

One of the biggest gaps, and a major challenge to implementing the ecosystem approach, is that district level data are not broken down according to ecosystem or ecoregion type. For proper ecosystems-level planning, conditions for the different ecoregions need to be assessed separately, so that the dynamics and processes at that level can be identified.

A further gap relates to indigenous knowledge (IK) and its role in economic valuation. There are many traditional uses and values of many plant (and animal) species in Botswana. However, the contribution to both local livelihoods, particularly with regard to indirect uses such as spiritual and aesthetic values, and the national economy has yet to be quantified. IK contains a wealth of information on the uses of many medicinal plants, which is being actively

quantified by organisations such as CESRIKI. However, the value of these resources is unknown, and there is a risk that traditional knowledge, unless documented and validated, may be usurped by outsider scientific knowledge, and the benefits of both the IK and the species being externalised to the local community and the country.

9. ECONOMIC VALUATION OF BIODIVERSITY IN OTHER KEY ECOREGIONS

This section covers the economic value of three key ecoregions of both ecological and economic importance to Botswana. These are the Zambezian flooded grasslands (essentially the Okavango Delta) the Zambezian Baikiaea woodlands of Chobe; and the Zambezian and Mopane woodlands which form a link between the two (Figure 1).

9.1 ZAMBEZIAN FLOODED GRASSLANDS

This ecoregion largely comprises the Okavango Delta. As part of the Okavango Delta Management Plan (ODMP), the use values of the Delta and Ramsar site were assessed (Turpie *et. Al*., 2006). The ecoregion generally hosts the greatest diversity (wetland and dryland species) and largest numbers of wildlife. Below, we discuss the results of the reviewed literature and analysis of available statistics.

The game stock of the Okavango was valued in the same way as the dryland ecosystems. Game figures were used from the 2012 aerial survey (Ngamiland) together with adjusted South African auction figures. This reflects the importance as well as potential of wildlife resources outside the wet ecoregions. The value of the game stock is P0.6 billion (using domestic buffalo price) and P1.8 billion (using 10 % of the South African auction buffalo price). The large difference is due to the large numbers of buffalo in the Okavango and the higher prices in South Africa. It clearly shows the economic opportunities of breeding disease free buffalos.

The ODMP was developed to integrate the management of land, water and living resources in the Ramsar area and to serve as a guide for all environmental management related activities that take place in and around the Delta. This included an economic valuation exercise to determine the direct and indirect use values. In addition, reference to non-use values was made. The Ramsar site was divided into five zones taking into consideration the natural resources and land use characteristics as well as settlement patterns. According to the ODMP, the Ramsar site covers a total of 55 374 km^2, and the Okavango Delta (the wetland area) covers some 13 000 km^2 within this.

The resources within the Ramsar site were valued using a value added approach, where budget and cost-benefit enterprise models were developed for each activity that produces a direct use value in the area. These generated private returns to investors individually and in aggregate and therefore provided an indication of the contribution of the Delta's natural resources to livelihoods in the area. Additionally, the contribution of the Delta's resources to the national income was measured hence indicating the economic value of the resource.

9.1.1 Direct use values

These are generated through consumptive (hunting) and non-consumptive (wildlife viewing) tourism, household use of natural resource products as well as crop and livestock production. The direct use values for livelihoods and the national economy are summarised in Table 37. The table shows that tourism generates the highest benefits to the national economy. Livestock and natural resource use provide the highest benefits to the local livelihoods. Note that much of the value comes from the surrounding woodlands and not from the Okavango (Zambezian flooded grasslands ecoregion) itself.

Table 37: Direct use value of the Okavango Delta and Ramsar site (BWP)

Category	Contribution to local livelihoods	Direct gross value added
Okavango Ramsar site		
Agriculture		
Livestock	61 165 831	39 757 628
Crops	6 389 500	2 768 533
Natural resource gathering	27 864 257	29 183 420
Tourism	Not estimated	400 970 000
Total	**At least 95 49 588**	**472 679 581**
Okavango Delta		
Agriculture		
Livestock	1 205 482	869 980
Crops	942 410	588 568
Natural resource use	14 199 610	15 052 296
Tourism	Not estimated	362 760 000
Total	**At least 16 347 502**	**379 270 844**

Source: CAR and DEA, 2010. Note: contributions to livelihoods = direct benefits to households; direct gross value added = direct contribution to gross national income.

Agriculture

Livestock generates the highest benefits to livelihoods in the Okavango Ramsar site; much of his is in the Zambezian and Mopane woodlands, and in the Kalahari Acacia-Baikiaea woodlands. It is minimal in the Delta where natural resource use and tourism are more important. In the Delta, the agricultural sector is being overshadowed by tourism and wildlife, together. Cattle ownership had declined to 29% of the households in 1999 compared to 70% before the cattle lung disease outbreak. However, communities continue to benefit from both arable and livestock farming. According to Agricultural Statistics, 48 900 ha of Ngamiland District is cleared for arable farming, of which 75% is for dry land and 25% for molapo farming. About 85% of the households are involved in arable farming. In 2001, the estimated arable land was 10 200 ha, of which 7 900 ha was planted. Maize is the main crop for molapo farming; sorghum and millet for dry land farming. Small irrigation schemes exist south of Shakawe totalling 137 ha. These are the only forms of commercial arable farming around the Delta.

Livestock plays a critical role contributing to cash income for households. It is also a source of meat, milk, hides, draught power, status and wealth among others. A net value of P29 million and a direct economic value of some P34 million per annum are generated by cattle. Cattle post areas play a significant role in the Ramsar area. This accounts for about 88% of the net income and 83% of the economic value. Crop farming generates a net income of P 9.1 million to households in the Ramsar site and an economic value of P6 million. The total net private values of agricultural activities amount to P68 million while only 3% of these are attributable to the wetland. Their contribution to the gross national product is about P 43 million and 3.5% accrues to the wetland.

Conflicts with wildlife come mainly through crop and livestock damage. In a study in northern Botswana, Bowie (2009) found that crop damage by elephants per crop producing household was estimated at P 220 (2006 prices) and for livestock losses P 225/per livestock producing household with the highest damage around the Kwando and Chobe Rivers.

Tourism

Tourism is a major economic activity in the Okavango, especially wildlife viewing in the Delta and Moremi Game Reserve (MGR). According to the valuation study (Turpie *et al.,* 2006),

tourism generates a significant value to the national economy (the highest of all direct use values). It accrues a gross income of about P1.1 billion and a substantial direct value added to the gross national product (P401 million). The bulk of the tourism valued added (Table 37) is captured by photographic tourism operators (81%) while 15.5 and 3.5% accrues to hunting safari companies and CBOs respectively. CBOs engage in tourism activities particularly through joint venture partnerships with private companies.

Additional tourism data were obtained for visitors to the MGR. The reserve is visited by around 30 000 people per annum (Figure 26). Interestingly, unlike in the other parks, there is no increase in tourist numbers, particularly due to the decline in visitors from fixed accommodation (from 15 000 in 2000 to 5 000 in 2012). Private visitors increased and visitors from mobile operators remained fairly stable. While the overall tourism density in MGR is modest (8 tourists / km^2 in 2006) and has slightly decreased (7.4 tourists / km^2 in 2012), there is nevertheless some localised impact in areas of intensive use such as the Khwai area. .

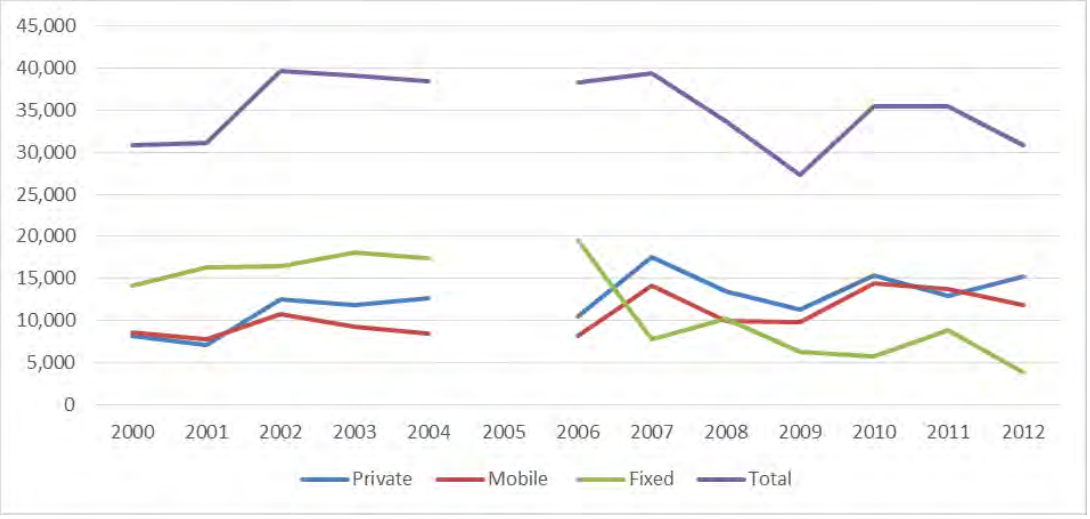

Figure 26: Trends in annual MGR visitors (2000-2012), based on DWNP data.

Figure 27[13] shows that reserve revenues increased to over P 10 million in 2012, but declined in real terms (2006) to P6 million.

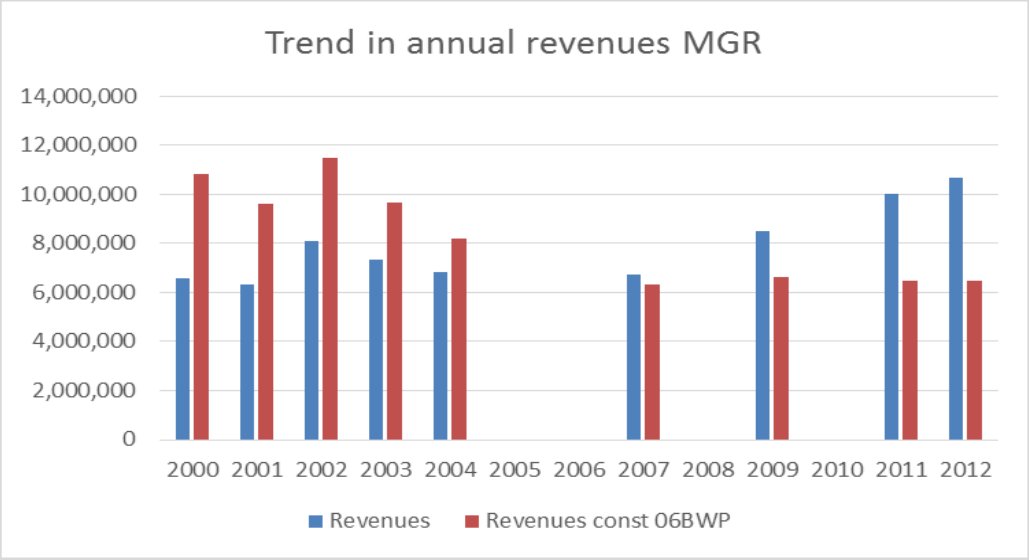

Figure 27: Trends in annual MGR revenues (BWP; 2000-2012), based on DWNP data.

[13] Note that i data for 2008 and 2010 were incomplete and therefore excluded from the graph.

Tourism pressure in the park has been modest, with the exception of localised areas of very high pressure. With adequate management the park, particularly in the more popular areas, biodiversity is unlikely to be adversely affected by tourists in the near future. Spatial spreading of tourists and protection of wildlife sensitive areas are impotent management components. The revenues generated are significant, but have declined in real terms. There is need to regularly review park fees. The decline in tourist from fixed hotels & lodges needs further investigation.

The Okavango ecoregion has the largest number and most successful CBOs in the country. DWNP data suggest that CBOs in the Okavango ecoregion generated P 8.9 million in 2012 while Mbaiwa (2013) estimated revenues at P 13.7 million, most of which is generated by a limited number of CBOs. Communities and CBOs involved in consumptive tourism have sub-leased out their CHAs to trophy hunting companies. Communities are able to obtain the land rentals and hunting quota fees and enjoy short term employment opportunities. Over 80% of CBNRM revenue is generated by CBOs located in Ngamiland and Chobe Districts. For the period 2011/12, a total of 19 CBOs in both Ngamiland and Chobe Districts generated a total of P35 517 534. Out of that, CBOs located in Ngamiland District generated P20 104 669.00, Chobe District generated P9 845 217 and other CBOs raised P5 567 648 (Mbaiwa, 2013).

The Zambezian Flooded Grasslands, the Zambezian Baikiaea Woodlands and the Zambezian and Mopane Woodlands ecoregions together cover a large part of the Ngamiland and Chobe districts. These areas are mostly wet and climatic conditions are more favourable particularly for wildlife species among others. As such, there is an abundance of a variety of wildlife species in all CHAs as suggested by the 2011 hunting quota (Table 38). Ngamiland has a large share of the animal allocation compared to Chobe largely because the latter is much smaller spatially. Community hunting areas received the highest allocations as compared to concessions and citizen hunting areas. In an effort to reduce the number of elephants in the country, elephants got a large portion of the hunting allocations followed by impalas and this is the case in the upper parts of the central district where elephants are problematic as a result of their high numbers.

Table 38: Hunting quota for Ngamiland and Chobe districts, covering the 3 wetter ecoregions to the north of Botswana (2011)

Species	Ngamiland	Chobe
Baboon	20	3
Buffalo	19	11
Elephant	100	76
Hare, Cape	0	4
Hare, Scrub	0	4
Impala	70	20
Kudu	14	3
Lechwe	15	5
Warthog	11	7
Zebra	10	2
Total	**259**	**135**

Source: DWNP data.

Natural resource uses

The collection and processing of natural resources are important for the Ramsar site communities. Some of these products include grasses, clay, reeds, papyrus, medicinal plants, firewood wild foods, fish, honey and timber among others and they are processed into crafts,

wood products, food products, building materials and others. Firewood is the most commonly utilised resource, followed by wild foods. The overall use of these resources generates a direct net value of P 27 million and gross value added of P 29 million.

DFRR data (2010-2013) shows that on average per annum 149 harvesting permits are issued and 30 dealer permits. No export permits are issued from this ecoregion. Communities residing in northern Botswana benefit from a wider range of veld products for their own consumption or for sale due to richness of natural resources such as reeds, papyrus or tswii (water lily bulbs) (ARDC, 2001). The use of grass, river reed and the mokola palm is most common (Table 39) whereas wild fruits are commonly used but less frequent in the panhandle. Notwithstanding, the use of forest resources especially within the protected areas (forest reserves) has been very minimal after the imposition of the moratorium on timber harvesting. Currently, communities residing in and near the forest reserves (Kasane, Kazungula and Lesoma) are allowed to gather fuel wood, grass and berries on a subsistence basis.

Table 39: Proportion of households using common veld products in Ngamiland, covering both the Zambezian Flooded Grasslands, and the Zambezian and Mopane Woodlands (% of households)

Resource	Maun	Range in other villages around the Delta	
Papyrus	9.8	1.9 (Ngarange)	-61.1 (Xaxaba)
Wild fruits	36.8	3.3 (Sepopa)	-61.1 (Khwai)
River reeds	61.3	48.4	-96 (Ditshiping)
Palm tree	58.0	27.8 (Gudigwa)	- 87% (Etsha 6)
Grass	62.3	58.0 (Xakao)	- 100 (e.g. Khwai)

Source: Arntzen, 2005

The Okavango Delta, with more than 70 fish species, is an important ecosystem for subsistence and commercial fishing. The tilapia, sharp tooth and blunt tooth catfish are mostly for subsistence use while catfish, silver robber and dashtail barb are for commercial use. Tiger fish and tilapia are normally for recreational fishing. Fishing is concentrated in the panhandle where there is permanent water. The number of fishermen in 1989/90 was estimated at 750 full-time and up to 4000 part time, mostly Bayei and Bambukushu (Scudder et al, p. 202). About 65% of the population in the northern part (Shakawe, Etsha and Xhahaba) benefits from fishing (Mosepele, 2001) and the number of fishers was estimated at 3289, of which 44% are females.

Catch data from the Fisheries Unit are summarised in Table 40. The figures are much lower and show a decline from 152 tonnes in 2000/01 to 92 tonnes in 2003/04. While the off-take figures differ greatly, there is agreement that most of the total catch goes directly towards livelihood support (Arntzen, 2005).

Table 40: Fish catch in and around the Delta (tonnes)

Species	2000	2001	2002	2003
Bream	87.2	85	89.8	61.1
Barbel	51.6	18.2	19.1	23.7
S barbel	1.7	1.6	0.9	1
Tiger fish	9.4	5.4	3.8	4.2
Others	2.1	0.9	0.8	1.8
Total catch	**152**	**111.1**	**114.4**	**91.8**

Source: Arntzen, 2005

9.1.2 Indirect use values

The valuation study also captured the economic importance of the ecosystem services of the Okavango Delta. These included carbon sequestration, wildlife habitat, groundwater recharge,

water purification and scientific and educational values (Table 41). Carbon sequestration and wildlife refuge account for the largest share of the indirect use values of the Ramsar site (P 158 million and 77 million respectively). Scientific and educational value is also substantial indicating the importance of the Delta as a significant area for research and education.

Table 41: Estimated indirect use values of the Okavango Ramsar site and the Delta (BWP million; 2005)

Service	Wetland	Ramsar site
Groundwater recharge	16	16
Carbon sequestration	86	158
Wildlife Refuge	77	77
Water Purification	2.2	2.2
Scientific and educational value	18	24
Total	199.2	230.2
Average per ha in BWP	**69**	**41**

Source: Turpie *et al.* (2006)

The indirect use value / ha is highest in the Delta due to its unique nature. The per ha value of the Ramsar site, which include the dryland surroundings of the Delta, is comparable to the best estimate of the Makgadikgadi wetland system (Table 36).

9.1.3 Valuation summary for Zambezian Flooded Grasslands

The TEV of the Okavango Delta enhances support for the sustainable utilisation and protection of the resources in and around the Delta. Considering the various uses and stakeholders involved in the use and management of the Delta, it is important to consider how these values differ at different temporal and spatial scales. Most obviously from a sustainable development perspective, it is critical to balance the needs of the current users (short time scale) with those of the future generations (long time scale), and the proportional contributions to local livelihoods (small spatial scale) with the relative contribution of the resources to the economy at large (large spatial scale). There is also need to balance the direct uses against indirect uses. The indirect uses values are high and warrant strong, integrated management of the area through ODMP. The indirect use values and the non-use values require attention in the future so that the entire value of the resources is captured. Mining could pose a major management challenge in future if viable mineral reserves are discovered in the area, especially inside the Delta.

9.2 Zambezian Baikiaea Woodlands and Zambezian and Mopane Woodlands

As economic data do not exist at ecoregion level, the two woodland zones in the north of Botswana are treated together here. Both of these zones are found for the most part in Chobe district.

El Mondo (2013) prepared a rapid (partial) valuation assessment of the Chobe National Park (CNP) and the forest reserves. For the CNP, part of the direct use value was estimated through the entrance fees generated by tourists (estimated at P 20 million). In addition, the value added of tourism in CNP was estimated at P 5.4 billion. The value of the wildlife stock in the CNP was estimated at P 1 billion. Finally, the willingness to pay (WTP) for improved park

management was assessed at the individual tourist level. The average WTP for local and international tourists was P 36.8 and 76.42 respectively. No attempt was made to estimate the aggregate WTP.

Since the suspension of timber logging in 1993, the direct use value of forest reserves is limited to small scale subsistence use by neighbouring communities. Communities collect thatching grass and fuel wood. El Mondo (2013) estimates the annual value to be P660 350 (based on the DFRR permit system). The value of carbon sequestration is estimated to be much higher at P 763 million.

The rapid valuation study used crude methods and data and a more detailed and elaborate study is necessary as part of the BioChobe project to generate more detailed and reliable results.

9.2.1 The estimated value of game stock

The game stock of the Chobe was valued in the same way as the dryland ecoregion. Game figures were used from the 2012 aerial surveys (Chobe) together with adjusted South African auction figures. The value of the game[14] stock is estimated at P 0.9 and P 1 billion respectively. This reflects the importance as well as potential of wildlife resources outside the wet ecoregions. The value of the game stock is P 179 million (using domestic buffalo price) and P 200 million (using 10 % of the South African auction buffalo price). The stock value is lower than that of the dryland ecosystems and the Okavango, but this is mainly due to the small size of Chobe District. These values are very revealing about the economic opportunities of breeding disease free buffalos.

9.2.2 Tourism revenues

The CNP attracts more visitors than all other parks combined (Figure 28). Numbers have tripled since 2000 to over 211 000 in 2012 (580 visitors/day), mostly driven by tourists from hotels, chalets etc. CNP faces the fastest tourism increase of all parks, causing serious overcrowding along the Chobe River. As is the case in Moremi, it is important to note that the distribution of tourist usage is not spread evenly across the park. When offsetting income against impacts on biodiversity, studies need to consider the localised scale as well as the overall scale of the total area of CNP.

Private visitors increased and visitors from mobile operators remained fairly stable. CNP is mostly visited by day tourists through tour operators or through their hotels/ lodges. Tourist densities have increased to 20 tourists/km^2/annum from 14 in 2006. Tourism pressure is particularly high along the river front, where most tourists converge. For biodiversity conservation, it urgently needs to be established whether the Limits of Acceptable Change are exceeded both on the land and on the river.

[14] This is an underestimate as it only includes blue wildebeest, Cape buffalo, eland, gemsbok, impala, kudu, lechwe, elephant, ostrich, hartebeest, roan, sable, zebra, springbok, tsessebe and waterbuck.

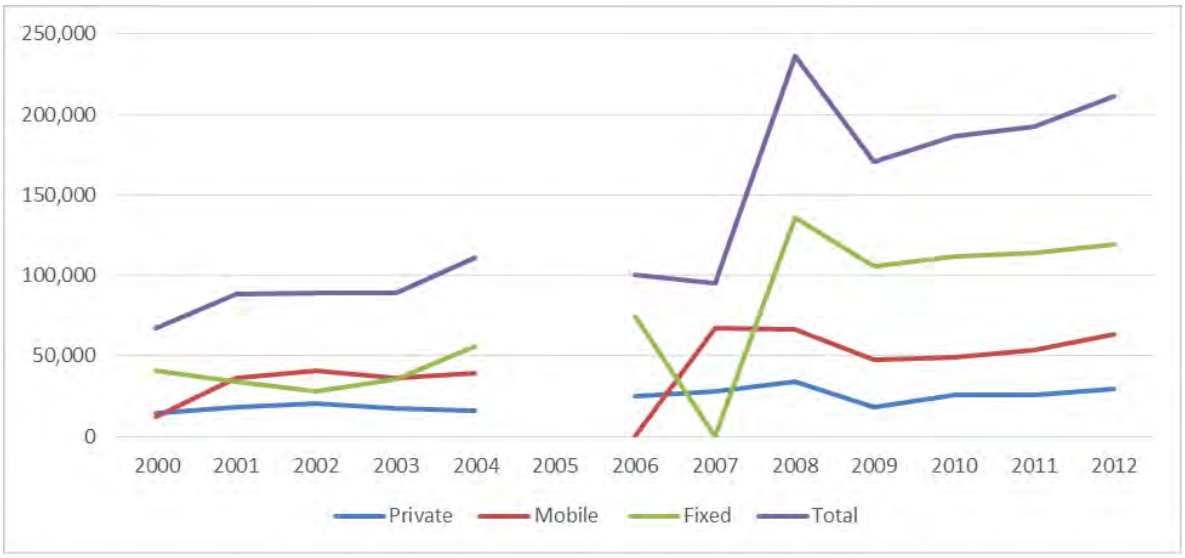

Figure 28: Trend in CNP visitors (2000-2012), based on DWNP data.

Figure 29 shows that CNP revenues increased to over P 20 million in 2012 but remained fairly stable in real terms between P 10 – 15 million. CNP is unique in that park revenues currently exceed management expenditures (El Mondo, 2013).

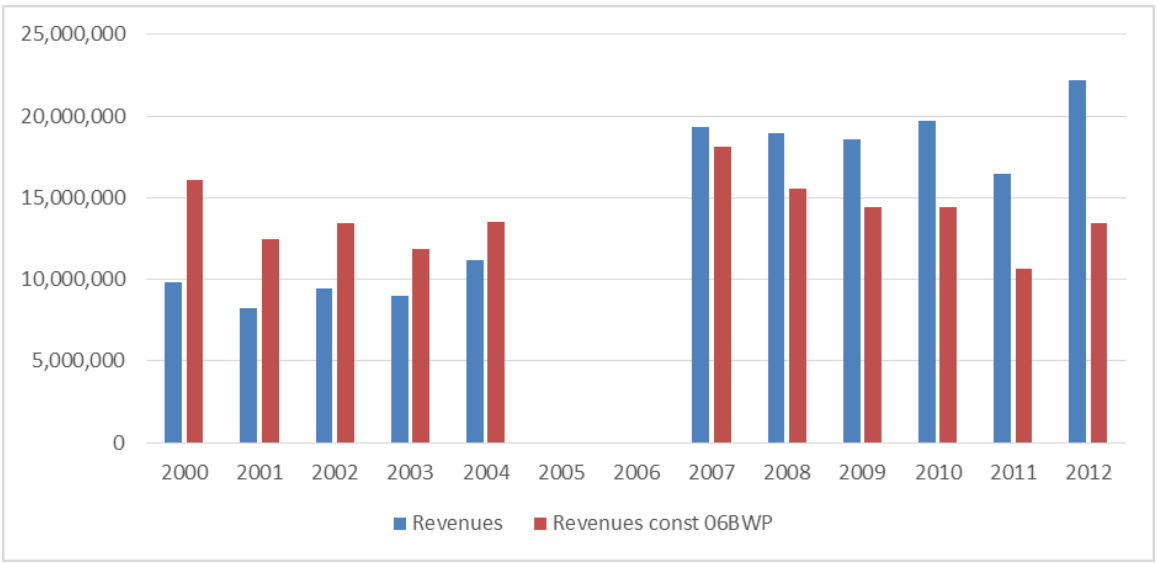

Figure 29: Trend in CNP revenues (BWP; 2000-2012), based on DWNP data.

In conclusion, tourism pressure in the park is high and increasing. Adverse impacts on biodiversity are likely to occur. There is an urgent need to reduce tourism pressure around the Chobe River and to increase utilisation of other parts of the CNP. Moreover, wildlife sensitive areas need protection. There is also need to redirect tourism to forest reserves within the ecoregion.

There are two CBOs in the Chobe District, namely Chobe Enclave Conservation Trust (CECT) and KALEPA. CECT raised P 5 245 217 and P 4 600 000 in 2011 and 2012, respectively (Table 42). Some data was not available for KALEPA especially for 2011/12 because the CBO was not in business during this period.

Table 42: Revenues generated by CBOs in Chobe District (BWP)

Year	CECT	KALEPA
1997	464 000	
1998	464 000	2 930
1999	930 000	No data
2000	995 000	270 000
2001	963 250	910 000
2002	981 515	900 000
2003	1 001 120	No data
2004	No data	1 500 000
2005	2 106 000	1 500 000
2006	2 176 630	No data
2007	2 375 243	No data
2008	3 844 954	1 543 155
2009	2 205 069	No data
2010	3 461 000	No data
2011	5 245 217	No data
2012	4 600 000	No data

Source: Mbaiwa, 2013.

9.3 Gap Analysis for Economic Valuation of Biodiversity in Other Key Ecoregions

There is no comprehensive valuation study for the woodland ecoregions in the north of the country. An economic valuation was carried out for the Okavango Delta and RAMSAR site. The preliminary work on valuation in Chobe needs to be expanded as part of the BioChobe and possibly the WAVES project.

Knowledge about, and the quantitative understanding of, most ecosystem services other than the provision function is limited, making it difficult to estimate the indirect use values in detail. The estimate of such values for the Okavango (and Makgadikgadi) was based on assumptions that need further investigation and verification.

The option and existence values of the ecoregions are largely unknown but expected to be high given their high international profile and unique characteristics. Some information exists regarding tourists' willingness to make a voluntary extra payment and expenditures of donors in the area, which could be interpreted as part of the existence and option value.

The Botswana Core Welfare Indicator Survey does not analyse the links between natural resource dependencies and use on the one hand and income and livelihoods on the other hand. As a result, the commonly held perception that the poor depend more on (free) natural resource use cannot be verified and its implications integrated into the poverty and environment initiative programme. This perspective nevertheless underpins It is also hoped that the recently started Poverty-Environment Initiative (PEI), which notes that poverty tends to be highest in rural areas. Kgathi et al (2012) show that resource dependency, especially of the poor remains high but that it has decreased in time due to the growth in formal employment and government support and welfare programmes.

The best performing community based organisations are found in those ecoregions in the proximity of national parks and the Okavango Delta. Detailed information about their

performance (and that of other CBOs) is lacking. This makes it difficult to predict how they will survive external shocks such as the impending hunting ban. As earlier studies (e.g. CAR, 2007) have suggested that CBO-held rangelands are richer in biodiversity than livestock rangelands, CBOs are important for biodiversity maintenance. Regular collection of CBO statistics is imperative to offer the required support.

There are a large number of data inadequacies and data capturing and availability appears to have worsened. The major gaps in recent data include:

1) Actual hunting data or success rates of available hunting quota;
2) Harvesting, trade and export of veld products; and
3) Detailed quantification of ecosystem services in the ecoregions.

Biodiversity conservation and utilisation is the shared responsibility of many stakeholders in government (e.g. DEA, DFRR and DWNP), the private sector (e.g. game ranchers, tourist operators and farmers) and individuals and communities (e.g. CBOs). There is a lack in a comprehensive institutional approach towards biodiversity conservation, making it difficult to adopt an ecoregion-wide approach. Moreover, it makes it more difficult to establish a comprehensive data base. For example, DFRR manages the forest resources and DWNP the national parks, both of which represent virtually identical ecosystems. A significant part of the Delta is not a formally protected area and is managed by the Land Board and tourist operators while DWNP manages the MGR.

As with the dryland ecosystems, the fact that district level data are not broken down according to ecosystem or ecoregion type is a key impediment to adopting the ecosystem approach – a core concept in the CBD. As noted above, conditions for the different ecoregions need to be assessed separately and the dynamics and processes at that level must be identified if proper ecosystems-level planning is to take place.

10. ECONOMIC VALUE OF BIODIVERSITY IN NATIONAL ACCOUNTS

In most countries, national accounts do not adequately deal with resource use and biodiversity issues. For this reason, natural capital accounting is advocated as a tool to fill this gap. Using the internationally agreed UN System of Environment-Economic Accounting (SEEA), resource accounts (e.g. water, land, forests and wildlife) could record the trends in resource stocks and their use by economic sectors. Ecosystem accounts (still at pilot phase stage) could be developed to record trends in biodiversity and resource use for specific, valuable, ecosystems in countries. Ecosystem accounts could be developed for ecoregions used in the revised NBSAP. The advantage of ecosystem accounts would be that the benefits and value of biodiversity will be explicitly measured (Hamilton, 2013). Such accounts can also be linked to regular reviews of user fees (e.g. Parks) and payment for ecosystem services (to internalise the externalities of biodiversity benefits).

In the past, Botswana's National Accounts subdivided the agricultural sector in livestock production, crop production and other agriculture. Other agriculture included fishing, forestry/ wood collection, and use of selected veld products (e.g. mophane). Unfortunately, the break-down of the 'other agricultural' sub-sector is no longer published and could also not be obtained from Statistics Botswana. Given the livelihood importance of the natural resource use sector, a separate natural resource use sub-sector should be re-introduced in the National Accounts.

Another limitation of the National Accounts is that the economic classification does not include a comprehensive tourism sector. Instead, a sector 'hotel and restaurants' is included, making it difficult to link existing national accounts with the tourist sector as a whole. To remedy the latter, satellite tourism accounts (WTTC, 2010) have been developed, which show that tourism has become the second most important sector to the national economy (after mining). The WTTC study estimates that the tourism sector accounts for 3.2% of GDP and provide 2.8% of the formal employment opportunities.

Based on the available information, a major gap is that the present national accounts do not provide any relevant insights in Botswana's biodiversity situation. Consequently, it is recommended that the sector of natural resource use (i.e. other agriculture) is captured more thoroughly in the National Accounts and that ecosystem accounts be developed for some of the ecoregions (for example, Chobe linked to the BioChobe and WAVES projects).

In Sections 8 and 0, wildlife resources were valued, based on a modified market price (adjusted South African game auction prices) and 2012 game counts. The results showed the significant values that wildlife represent, not only in the key ecoregions associated with Okavango and Chobe – the prime tourism destinations, but also in those associated with the dryland ecosystems. As indicated, the values obtained are underestimates as insufficient data were available for some valuable species.

11. ECONOMIC INCENTIVES AND DIS-INCENTIVES FOR BIODIVERSITY CONSERVATION

The provision of economic incentives for biodiversity conservation is an important part of an enabling environment. Globally, the Economics of Ecosystems and Biodiversity programme (www.teebweb.org) has reviewed a large amount of evidence in developed and developing countries regarding the value of biodiversity and ecosystems. They recommended a step wise approach towards valuation:

1. Recognising and identifying ecosystem services;
2. Demonstration of the value of ecosystem services;
3. Capturing the value of ecosystem services through an appropriate incentive structure and policy environment for maintenance of ecosystem services and biodiversity.

TEEB has identified 11 critical issues for follow ups, ranging from making the value visible, to natural capital accounting, investment in ecological infrastructure and Protected Areas and poverty reduction. Interestingly, TEEB has agendas for government and the private sector, in particular large companies. Table 43 shows the main issues, conclusions, recommendations and situation in Botswana. Several recent valuation studies have made the value of the Okavango Delta and the Makgadikgadi wetland visible. Botswana has also embarked on a natural capital accounting programme in partnership with the World Bank. Water accounts have been prepared, and mineral, land and possibly ecosystem accounts may follow soon. While there is a Botswana poverty and environment initiative, natural resources have not been integrated into poverty eradication programmes. Several large companies have taken resource conservation and sustainable development initiatives (e.g. Debswana and KBL). The 2007 CBNRM policy offers incentives for biodiversity conservation and improving livelihoods through the award of (conditional) resource use rights. Livestock subsidies have long been regarded as biodiversity perverse subsidies (associated with bush encroachment and loss of biodiversity). While there have been efforts to phase out and target livestock subsidies, the current extent of livestock subsidies is unknown. Botswana does not provide payment for ecosystem services. For example, CBOs that manage wildlife could also be rewarded for maintaining biodiversity (as several South American countries for tropical rainforests). Finally, investments in ecological infrastructure are limited and mostly concentrated on public expenditures for protected areas. Environmental rehabilitation and investments only occur on a small scale and rarely involve the private sector. The TEEB conclusions raise at least two distributional questions. Firstly, the assertions that the costs of establishing and maintaining PAs are generally lower that the benefits ignore the facts that governments tend to pay the costs and that the private sector captures a significant part of the value. Secondly, what should be the funding source of PES? Should it be public national funds, international funds or private sector funding? Ideally, this should be determined by the location of the benefits, but in reality also government capability of funding is important.

There are several issues that need to be noted with respect to valuation of ecosystem services and biodiversity. Ecosystems are complex and the understanding of the functioning of many ecosystems is still limited. Valuation of ecosystem services refers to the outputs of the ecosystem, but does not provide information about its functioning. Critical thresholds or tipping points of ecosystems, beyond which the system crashes or irreversible changes, are often unknown and the understanding of the resilience of ecosystems is also limited. Resilience is considered as 'natural insurance' (TEEB, 2011, chapter 5). Valuation studies often have limitations that need to be spelled out clearly. Limitations may refer to limited logistical

means, data limitations etc. The results of valuation studies are often location, culture and context specific, and benefit transfer valuation must be handled carefully to ensure that the results are meaningful in the 'transferred' context.

Table 43: Summary of the TEEB findings and recommendations

TEEB key issues	Conclusions	Recommendations	Botswana context
1.Make nature's value visible	Invisibility of natural capital leads to degradation of ecosystem services & biodiversity	Assess role of biodiversity & ecosystem services in economic activities	Progress through valuation studies and natural capital accounting (NCA). Part of the Aichi target 2.
2.Pricing the priceless	Monetary valuation can be complex and controversial; natural science, i.e. the starting point of valuation, remains poorly understood	Ecosystem services should inform economic valuation with a focus on the costs & benefits of biodiversity conservation	Valuations done for the Okavango Delta, the Makgadikgadi wetland & Chobe Aichi target 2
3.Accounting for risks & uncertainties	Ecosystem services do not explain the functioning of the ecosystem, but are the result. Biodiversity determines the functioning and its resilience	Economic valuation is less useful under radical uncertainty and ignorance about tipping points. Use pre cautionary principle and safe minim standards in those instances	
4.Valuing the future	No simple rule exists for the use of a single discount rate	Use of a range of discount rates and conduct sensitivity analysis	Range of 8 – 12% prescribed by MFDP
5.Measuring better to manage better	Present NA fail to reflect natural capital stocks and flows of ecosystem services	Value of changes in natural capital stocks and ecosystem services should be reflected through natural capital accounting	WAVES: NCA for water, minerals and livestock
6.Natural capital and poverty reduction	Poverty – biodiversity relationships is complex; generally, poorer households depend for a larger part of their livelihoods on natural capital & are less able to cope with loss of ecosystem services	Human dependency on natural capital need to be fully integrated in policies and poverty reduction strategies Investment is needed in ecological infrastructure to reduce poverty	PEI programme in place However, no natural resource management prominent in poverty eradiation strategy Limited investments in ecological infrastructure (mostly public in PAs); opportunities for private investments
7.Disclosure and compensation	Better accounting of business impacts on biodiversity & ecosystem services is needed to change business investments & operations	Business annual reports should disclose all major environmental externalities, environmental liabilities and changes in environmental assets	Some companies such as the brewery and a diamond company account for resource use, energy, carbon footprint, pollution etc.
8.Changing the incentives	Economic incentives influence the use of natural capital and do not reflect the full value of ecosystem services; Some incentives are environmentally harmful	Reform of incentive structures based on polluter-pays principle & the user pays principle Reform of property rights, liability regimes and e.g. consumer information Payment/ rewards for ecosystem services	Not yet implemented CBNRM is a change of resource use rights, but 65% goes into NEF, discouraging local CBOs. NEF can support future pro-biodiversity activities (details to be announced). Aichi target area 3.

TEEB key issues	Conclusions	Recommendations	Botswana context
9.PAs offer value for money	Evidence exists that the costs of setting up & managing a network of PAs, including the opportunity costs are lower than the benefits generated by the ecosystem services	Establish systems of national and regional PAs. Economic valuation can justify PA policy, assist with funding & investment opportunities and inform conservation policies.	Not implemented. CBOs could be rewarded for maintaining biodiversity rich rangelands (as compared to livestock rangelands). Issue is where would the funding come from (e.g. tourists, international community, and government?)
10. Ecological infrastructure (who invests??)	Economically attractive when all benefits are considered	Ecosystem conservation & restoration should be considered as a viable investment opportunity	Not yet. Bush encroachment control and dune stabilisation could be examples.
11.Mainstreaming economics of nature	Failure to include values of biodiversity and ecosystem services has led to degradation of natural capital	Mainstreaming of biodiversity & ecosystem services values in policies on: Trade, development Transport, energy & mining Agriculture Corporate strategies	Very limited at this stage Aichi target 2

Source: TEEB (2010)

Several countries, including South Africa, have prepared or are in the process of preparing national TEEB reports. Norway appointed a special working commission to investigate the merits of valuation of ecosystem services (Official Norwegian Report NOU 2013). The commission concludes that greater use of economic instruments would be a useful supplement to the mostly legislative instruments that the country currently uses. The Commission endorses the use of the ecosystem services approach provided is *''seen in a broader social and management context that takes account of Norwegian management traditions and environmental policy instruments, and that strengthens the basis for better cooperation between sectors and more coherent (ecosystem-based) management" (*Official Norwegian Report NOU 2013, p. 11). This conclusion also applies to Botswana.

In May 2012, The Botswana Government hosted a summit on Sustainability in Africa in preparation of the June 2012 Rio+20 Summit in Brazil. The summit resulted in the Gaborone Declaration, which emphasises the need to conserve and sustainably utilise biodiversity and natural capital. The summit endorses the system of natural capital accounting as an important tool to monitor the natural capital stock and its use in relation to economic development and poverty eradication. Botswana is one of the global countries that partnered with the World Bank in its Wealth Accounting and the Valuation of Ecosystem Services (WAVES). To-date, water and mineral accounts have been prepared under this programme. The WAVES work programme envisages the development of other accounts, including ecosystem accounts, which would be important for biodiversity conservation and utilisation. Currently, countries are piloting ecosystems accounts to develop and agree on international standards (as exists for water). It is recommended that Botswana pilots ecosystem accounts under the WAVES programme.

11.1 CURRENT INCENTIVES, DIS-INCENTIVES AND SUBSIDIES

Aichi target 3 refers to incentives for biodiversity conservation and utilisation. The target is to eliminate by 2020 subsidies that adversely affect biodiversity (so-called perverse subsidies) and to provide positive incentives for biodiversity conservation and its sustainable use.

Botswana is in a strong position to conserve and sustainably use biodiversity through the large amounts of land set aside as protected areas (e.g. parks, reserves and sanctuaries), wildlife management area, game ranches and other private conservation areas. However, management of such large amounts of lands is challenging, particularly because it is currently mostly government led, and therefore suffers from public funding constraints, particularly experiences after 2008. Most park expenditures are too low for adequate biodiversity conservation. There is a need to provide incentives for greater investments of the private sector and communities to relieve the government burden.

The incentive structure has been reviewed several times (e.g. Arntzen and Fidzani, 1998; and reviews for the existing NBSAP). The comparison shows that the economic incentive/ disincentive structure has changed little over the last decades. New elements are the 2007 CBNRM policy that grants user rights to recognised community organisations and the establishment of the National Environmental Fund (NEF) and several other funds such as the community conservation fund and the Funds administered by the Forest Conservation Board Botswana.

The Environmental Management Act (EMA) was meant, among others, to enshrine the environmental economic principles of the user-pays and the polluter-pays in the legislative environment so that both principles could be systematically implemented, if not for subsistence users at least for commercial actors. The EMA has not been finalised for approval, and it)is unclear whether this will happen in future.

Government uses a mixture of resource use charges, property rights, deposit-and-refund schemes to contribute to sustainable development and biodiversity conservation. Livestock tax advantages and agricultural subsidies are likely to be disincentives for biodiversity conservation through rangeland degradation and land clearing for cultivation.

11.1.1 Resource use charges

Government uses a wide variety of user charges, including the following:

1) Charges for land and land rentals for irrigated land, leasehold ranches, tourism concessions, for commercial plots etc.
2) Charges for water use by the parastatal Water Utilities Corporation (subject to Ministerial approval);
3) Charges for wildlife resources: park entrance fees, hunting fees;
4) Charges for tourism concessions: a percentage of gross revenues.
5) Charges for pollution: e.g. charges for waste disposal at landfills, levy on plastic shopping bags etc.

Generally, charges are low and not regularly reviewed an adjusted. There is no systematic basis for resource use charges, such as guiding environmental economic principle, and charges are not regularly reviewed and adjusted. As a result, for example water charges and park fees that were among the highest in southern Africa at one stage have declined in real terms. Hunting fees differ for citizens and non-citizens. While the non-citizen hunting fees are reasonably close to the economic value (defined as 60% of South African auction prices), citizen fees are on average only 16.7% of the value, leading to loss of capital.

11.1.2 Property rights

The CBNRM policy provides for the granting of conditional exclusive resource use rights to recognised community organisations. These rights refer to wildlife resources, veld products, fish, forest products etc. Sub-leasing of resource rights is possible through joint ventures with private companies or individuals. The conditions include the establishment of a representative, accountable and legal community entity, the preparation (and approval by government) of a resource management plan, and the annual submission of audited accounts.

The community user rights have limitations. Details of the user rights are annually determined by government (e.g. hunting quota) to avoid over utilisation. Communities do not own the resources and do not invest in them. Moreover, up to 65% of community revenues have to go to government for distribution to other communities. This reduces the incentives of communities to raise revenues and to increase the CBO performance. BTO advertise subleasing of resource rights, and in the end decides on the joint venture partners for communities. These limitations and the lack of support for CBOs may explain why CBNRM is stagnating in Botswana, and the hunting ban could further discourage CBOs, unless they are able to swiftly move into ecotourism or adventure tourism. However, ecotourism opportunities are limited, particularly in western Botswana, and adventure tourism needs to be carefully managed to avoid adverse impacts on biodiversity.

11.1.3 Deposit-and-refund schemes

Deposit-and-refund schemes exist for returnable bottles. However, no such D&R schemes apply to PET bottles, cans or durable consumer goods.

11.1.4 Biodiversity subsidies

Management of national parks, game reserves and forest reserves is largely paid for from public funds, which can be viewed as a subsidy for biodiversity conservation. Cost recovery is generally low with the exception of CNP. No biodiversity subsidies are granted to the private sector or communities, for example in the form of payment for ecosystem services. The National Environmental Fund (NEF) may become a vehicle for financial incentive for biodiversity conservation and sustainable use. Although biodiversity is not explicitly mentioned in the NEF Order 2010, most areas eligible for funding are important to biodiversity (see Box 1). The NEF sources include part of the CBO revenues that government is taken as per CBNRM policy and most environmental levies, fines etc. Direct budget funding is also listed as a source of NEF income. It is therefore expected that the NEF will become a major instrument in providing incentives for biodiversity conservation and sustainable use.

Box 2: Funding sources and destinations of the National Environmental Fund

Intended destination of NEF funding:

a. Sustainable development, and sustainable use of natural resources
b. CBNRM activities
c. Support for eco-tourism and national heritage sites
d. Rehabilitation of degraded ecosystems
e. Activities related to urban environment, climate change mitigation & adaptation, water management & pollution control, environmental awareness / education and environmental research & monitoring

Financial sources:

i. General government budget though National Assembly allocation;
ii. Revenues of sale of hunting quota and concessions by CBOs;
iii. Resource royalties
iv. Levies, fines & licenses for environmental pollution and management, as determined by the Minister
v. Environmental conservation and management grants (as determined by the Minister) and grants & donation from other sources

The NEF will be administered by the NEF Board.

Source: NEF Order, 2010.

11.1.5 Biodiversity-perverse subsidies

Financial incentives for the livestock sector may have adverse impacts on biodiversity where they contribute to over expansion of the livestock industry in marginal areas and consequent rangeland degradation and loss of biodiversity. Subsidies and farming tax advantages have been the main financial incentives. Tax advantages have been reduced but have not yet been fully phased out. It was stated in the 2004 Budget Speech (page 21/22) that:

> *''there is a continuing and significant drain on revenue from tax payers engaged in farming and other pursuits. This arises from the current policy of allowing offsets of farming losses against other income. I wish to restrict this offset facility such that the amount of farming losses which may be claimed against other income will be subject to a limit of 50 percent of the non-farming income. This change will reduce the revenue loss caused by the need to make refunds to those claiming farming losses against other income".*

Farming implements such as ploughs, planter and harvesters are exempted from VAT (12%) to encourage arable farming (Budget speech 2011/2).

Livestock subsidies have continued through the LIMID programme, drought relief subsidies and provision of free public services (e.g. tags, vaccinations, fences).

11.2 Gap Analysis for Economic Incentives and Dis-incentives

The following gaps have been identified in the current incentives/ disincentive structure for biodiversity.

Natural resource management is still dominated by regulatory instruments (e.g. orders, licenses, land use planning etc.). The use of environmental economic instruments is limited and irregular, hampering biodiversity conservation and utilisation.

There is no regular review (e.g. every 3-5 years) of the incentive and disincentive structure in order to up-date the policy environment in line with international commitments and expectations, new insights as well as with domestic factors (e.g. inflation). Part of this should be:

1) The identification and biodiversity impact assessment of perverse subsidies;
2) The review of the incentives for CBOs to manage biodiversity resources in their areas; and
3) Review of the performance of current resource use charges on natural resource management and biodiversity.

The applicability of the internationally fashionable concepts of 'payment for Ecosystem Services' to Botswana has not been assessed. This could be an important tool to enhance biodiversity in Botswana, but its feasibility (e.g. sources of funding and applications) needs to be further reviewed.

Greater involvement (and funding) of the private sector in biodiversity conservation and sustainable use is important.

12. RAPID ASSESSMENT OF STATUS OF INTEGRATING SUSTAINABLE DEVELOPMENT AND BIODIVERSITY MANAGEMENT

The most basic definition of sustainable development is that of "development which meets the needs of the present without compromising the ability of future generations to meet their needs" (from the 1987 Brundtland Commission report, "Our Common Future"). As laid out in Agenda 21, sustainable development affects most aspects of life, and needs to take into consideration the so-called "3-Es": environment, economy and equity.

Securing the needs of future generations lies primarily in environmental protection and environmental management. In Botswana, while there are many policies and guidelines that support or even actively promote sustainable development, there are only two actual mechanisms for doing so – both enshrined in the Environmental Assessment Act of 2011. These are the Strategic Environmental Assessment (SEA) and the Environmental Impact Assessment (EIA). The Act is supported by the (draft) Environmental Assessment Guidelines of 2012.

The Act defines a SEA as 'a process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure that they are fully included and appropriately addressed at the earliest stage of decision making, on par with economic and social considerations'; whereas an EIA is the 'process and procedure for evaluating and predicting the likely environmental impact of a proposed activity'.

The division between SEA and EIA is principally a hierarchical one: SEA addresses the framework for development, while EIA addresses the physical developments themselves. While the EIA is typically a local-level response to a planned development activity, the SEA is more proactive, extending the assessment process into strategic decision-making at higher levels. Examples of these hierarchical levels are shown in Table 44 below.

Table 44: The use of SEA and EIA as sustainable development tools in Botswana's development framework

Development Framework Level	Sustainable Development Tool	Example
1. MEA	SEA	SEA for the Okavango Delta Ramsar Site (2012)
2. Policy / Strategy	SEA	SEA of the Veterinary Fences Policy in Ngamiland (2000) Botswana Environmental and Climate Change Analysis (2008)
3. Plans / Programmes	SEA	Regional environmental and social assessment of coal-based energy projects along the Botswana – South Africa border (2012)
4. Projects	EIA / EMP	EIAs for pipeline and dams for the North-South Water Carrier (1994 onwards)

12.1 INCORPORATION OF SUSTAINABLE DEVELOPMENT TOOLS (SEA AND EIA) INTO THE EXISTING NBSAP

The sustainable tools of SEA and EIA are well represented in the existing (2007) NBSAP. Their importance is first acknowledged in the introduction, where such assessments are listed as key actions to prevent biodiversity loss. In the section on Mainstreaming Biodiversity for Future Generations, where habitat destruction and degradation are discussed as some of the main threats to biodiversity, the management of EIAs is put forward as a solution and mitigation, not only for activities in terrestrial systems, but also acknowledging their role for water management.

Critically, SEAs and EIAs are identified as specific activities to achieve the NBSAP's strategic targets. Details of these activities are presented below.

Strategic Target 3.1: Biodiversity concerns and essential ecological processes adequately incorporated into national land use and resource planning processes.

- Activity 3.1.2: Integrate biodiversity concerns into Strategic Environmental Assessment (SEA) guidelines and carry out SEAs for major policies and programmes
- Outputs/Products: Strategic Environmental Assessment (SEA) for all policies and strategies affecting the management of biodiversity
- Status: Biodiversity is not explicitly mentioned in guidelines; SEAs for policies are not yet being done.

Strategic Target 4.2: Comprehensive legal framework for the protection of biodiversity with appropriate mechanisms in place for implementation and enforcement.

- Activity 4.2.3: Empower all law enforcement organisations and departments to implement the biodiversity legal framework, including related laws, policies and byelaws (Ref 5.4.3 – enforcement of EIA).
- This section also notes that the EIA Act will improve the current situation, but there is still a need to pull in existing laws and regulations addressing components of biodiversity under one umbrella, and where necessary amend or complement existing laws.
- Outputs/Products: Environmental umbrella act.
- Status: The EIA Act is in place, but this is not the umbrella Environmental Management Act that is required.

Strategic Target 4.3: Enhanced institutional biodiversity capacity at all levels according to BSAP needs.

- Activity 4.3.5: Strengthen Ministry of Environment, Wildlife and Tourism (MEWT) capacity for effective management of Environmental Impact Assessments (EIAs), including preparation of national EIA guidelines and quality control of EIAs (Ref. 5.4.1-EIA guidelines)
- Outputs/Products: National EIA guidelines; Mechanisms for efficient EIA quality control institutionalized
- Status: Draft guidelines are in place; mechanisms are being strengthened but capacity is limited and must still be strengthened; mechanisms for enforcing compliance by other government departments are weak.

Strategic Target 4.5: Financial mechanisms and finance in place for biodiversity related activities.

- Outputs/Products: Environmental Impact Assessment charges for biodiversity conservation and research use.

- Status: In some cases of environmental damage and pollution, polluters have been fined, so this appears operational.

Strategic Target 5.4: Reduced levels of habitat destruction and degradation.

- Activity 5.4.1: Develop national EIA guidelines to cover all sectors and incorporate EIA into the sub district development plans.
- Activity 5.4.2: Develop and set standards for EIAs, including biodiversity and habitat considerations, for all sectors.
- Activity 5.4.3: Enforce EIA and mitigation measures through appropriate penalty scheme for non-compliance (4.3.3 – Enforcement capacity, 7.2.2 – EIA follow-up).
- Outputs/Products: National EIA guidelines and standards published; EIA procedures and requirements incorporated into sub district development plans; Mitigation activities as identified by EIAs enforced.
- Status: Guidelines are available, EIA procedures are increasingly being built into development plans; inspections on compliance with mitigation activities takes place, but staffing is limited.

Strategic Target 5.5: Sustainable water use and management with the objective to maintain biodiversity levels.

- Activity 5.5.4: Implement water release calculations as stated in dam Environmental Impact Assessments
- Activity 5.5.6: Enforce EIAs in connection with ground water exploration and borehole schemes
- Outputs/Products: Enforced EIAs
- Status: EIAs are enforced for the private sector; other government departments do not always comply.

Strategic Target 7.2: Access to biodiversity linked to responsibility for sustainable management.

- Activity 7.2.2: Active follow-up on EIAs to ensure that mitigation activities are carried out satisfactorily (Ref 5.4.3 enforcement).
- Outputs/Products: Mechanisms for enforcing implementation of EIA mitigation activities.
- Status: While in theory mechanisms are in place, capacity is limited; institutional arrangements limit DEA's ability to enforce compliance by other government departments.

It is therefore clear that the NBSAP is set up to take advantage of the available sustainable tools; the extent to which implementation has been possible will be covered in Section 13 below.

12.2 Incorporation of Biodiversity Management into the SEA and EIA Processes

Neither the Environmental Assessment Act nor the accompanying draft guidelines refer explicitly to biodiversity directly. However, the documents can be *interpreted* to be including the concept of biodiversity in their references to 'environmentally sensitive areas', 'important

breeding grounds for fauna', and 'areas containing rare and endangered flora and fauna'. It is useful, too, that the Act and guidelines specifically refer to wetlands, as such areas tend to be hotspots of biodiversity, and in Botswana this is certainly the case.

Recent SEAs that have been conducted in Botswana have explicitly evaluated threats to biodiversity, and put forward management activities to maintain and protect biodiversity. For example, in the SEA for the ODRS, the potential threat of change to the hydrology (such as through irrigation projects) in the upper Okavango basin is evaluated for its impact on the biodiversity of the Okavango Delta's wetlands. Indeed, the first Environmental Quality Objective is the 'prevention of biodiversity loss and restoration of ecosystem function'. However, it would be useful if the SEA guidelines could specifically require an analysis of the potential impacts on biodiversity.

Often, with regard to EIAs, particularly those for larger projects, the inclusion of biodiversity as a point for impact assessment will depend on the requirements of the funding agency; larger international bodies tend to require this. Nevertheless, most EIA statements will at least include a section reporting on the presence or absence of rare and endangered species, or habitats of ecological importance. Again, the guidelines could be strengthened to make a biodiversity analysis a required component of the EIA.

Ultimately, the test of the utility of SEA and EIA as sustainable development tools that support biodiversity maintenance will lie in the degree to which they are implemented and enforced.

While it is heartening to note the extent to which the NBSAP has acknowledged the importance and utility of SEAs and EIAs as potential sustainable development tools, their utility in supporting biodiversity conservation and maintenance will remain limited unless these tools are set up to explicitly take on this role. That is, it is much more important for the Environmental Assessment Act to acknowledge the importance of biodiversity. Any guidelines or regulations arising from the act should therefore make explicit reference to biodiversity, and the need for assessments to evaluate impacts not only on rare and endangered species, but on the ecological and biological assemblage as a whole.

13. REVIEW / EVALUATION OF 2007 NBSAP

The 2007 NBSAP was guided by the following vision:

> "A nation in balance with nature, with fair access to biological resources, where the benefits deriving from the use of these resources are shared equitably for the benefit and livelihoods of current and future generations, and where all citizens recognise and understand the importance of maintaining Botswana's biological heritage and related knowledge and their role in the conservation and sustainable use of Botswana's biodiversity".

Eleven strategic objectives, designed to help achieve this vision were drawn up, comprising the 'strategy' of the NBSAP. For each strategic objective, a series of strategic targets and activities was then prepared, forming the 'action plan'.

The status of implementing each strategic objective is each addressed here. Not all of the objectives are directly related to conservation and management; several of them were set up to establish the necessary enabling environment for biodiversity conservation. It is therefore useful to assess in which of these areas the greatest successes have been, and where the greatest barriers to implementation lie. Most of the discussions on each of the objectives includes a table showing *departmental*-level activities; these are not exhaustive, but the gaps are informative as they show which departments are unaware, or under-resourced, to be able to submit their responses.

It is also important to assess how far the existing objectives match up to the Aichi targets which are to form the basis of the revised NBSAP, to see where the greatest redirection will be needed, and to see how much alignment already exists so that any reorientation can take these initiatives into consideration.

13.1 OBJECTIVE 1 – BETTER UNDERSTANDING OF BIODIVERSITY AND ECOLOGICAL PROCESSES

13.1.1 Status of activities – Objective 1

Objective 1 is about research and monitoring, providing and compiling a continuous set of data that allow the sustainability of development to be measured, particularly in terms of the impact of development on biodiversity. The table below summarises the extent to which different Government departments report having been able to accomplish the activities set forth under this objective.

Table 45: Summary of Status of Reported-on Activities under Strategic Objective 1

Activity	Sources of verification	Status:	Comment
Develop a detailed national vegetation map based on most effective technologies, including satellite information and make it easily available through the biodiversity CHM (Ref.9.3.1 – CHM)	Vegetation map	Ongoing	[No comments received]
With the vegetation map as a base, establish national criteria and guidelines for ecosystems classification and delineation through consultation and peer reviewed process	Ecosystems criteria	No action	Awaiting completion of vegetation map.
Classify and map ecosystems at district level according to established national classification criteria and standards.	District ecosystems map	Not yet	Each area of operation – district coordinators do have extensive knowledge of info available
Produce a national ecosystems map based on the district maps and make the map easily accessible through the biodiversity CHM (Ref 9.3 1– CHM)	National ecosystems map	To be verified	[No comments received]
Include birds, fish, reptiles, amphibians and rare and endangered animal species in wildlife counts to monitor species levels and thus provide an indication of trends of biodiversity levels	Published inventories	Ongoing, reptiles and amphibians not yet	[No comments received]
Clarify and establish government institutional responsibilities and focal organisations (wildlife, flora, birds, fish, insects, fungi etc.) for collection and maintenance of national biodiversity data (Ref Obj 9 – Access to data), and establish mechanisms to facilitate and encourage deposit of biodiversity data collected by other data collectors and researchers at these focal organisations (Ref 9.4.2).	Organogram; Named institutions; TORs	Ongoing	Departments have been assigned to deal with specific focal areas and most of these are already reflected in their mandates and Acts. The EIS is a mechanism that has been established to also assist in the depositing of biodiversity data
Set up national survey programmes for under-surveyed biodiversity groups, with priority given to the rare and endangered species, and implement programme (Ref 1.2.1 – target taxa)	Checklists and distribution maps	No Action	The DEA has not initiated any programmes in this regard but the DWNP has been carrying out surveys on wildlife species; and the DFRR has just started a national programme aimed at inventorying forest species.
Identify and prioritise target taxa and areas according to established criteria for vertebrates and plants.	Priority list for various groups of biodiversity	No Action	[No comments received]

Activity	Sources of verification	Status:	Comment
Establish biodiversity priority research topics, including under-represented taxa, species with genetic centres in Botswana, understanding of ecological processes and ecosystems management including carrying capacities, to guide allocation of funds.		No Action	[No comments received]
Move towards setting of indicators for biodiversity and ecosystem functioning taking cognisance of regional and international standards. , and establish carrying capacity levels for livestock and larger wildlife.	List of standards Carrying capacities	No Action	A set of Biodiversity indicators have been developed but they need to be expanded to cater for other aspects. Carrying capacities have not been established.
Design compatible national and district level monitoring systems of biodiversity and ecosystem function, and assign responsibility for monitoring, including user based monitoring where relevant	Monitoring programme	No Action	Through the ODMP, such monitoring systems are in place but being undertaken by the ORI.
Develop training packages for monitoring by communities and other biodiversity users	Training package	No Action	[No comments received]
Analyse monitoring data at spatial and temporal scales, establish trends, and use to establish national conservation priorities.	Progress reports	No Action	[No comments received]
Disseminate status and trends to planners, managers and decision makers through progress reports and link with the State Of the Environment reporting	Distribution lists	Ongoing	Planners are continuously engaged on the status with the view of integrating biodiversity into planning processes.
Evaluate the impact of demographic change on future biodiversity management, preservation of traditional methods, varieties and indigenous knowledge.	Research report	No Action	[No comments received]

13.1.2 Barriers to implementing Objective 1

It is clear from the table above that achievements under this objective have been low. This fact is borne out by the lack of new data available for both biodiversity and economic assessments since the preparation of the 2007 NBSAP. The reasons are not obvious; one suggestion is that with the strong economic down-turn starting in 2008, activities not directly related to implementation of departmental mandates were put on a back-burner, and then forgotten about. However, the NBSAP is clear: without data, there can be no tangible measuring of the degree of success in meeting the objectives of the CBD.

However, from the focus group consultation meetings which reiterated concerns about resource availability, it is also clear that the following are also challenges:

- Not all departmental mandates overlap with the thematic areas of the CBD
- Human capacity, both in terms of available manpower, and necessary skills is low
- The coordinating role of DEA is hampered by its status as just another department in a line ministry
- Fears over sharing data (data as responsibility / status)
- With high staff turnover and relocation, there is limited institutional memory, and variation in individual priorities
- Science tends to be pushed aside by politics

13.2 Objective 2 – Long-Term Conservation and Management of Botswana's Biological and Genetic Resources

13.2.1 Status of activities – Objective 2

This second objective focuses on the actual management and conservation activities, in order to ensure their availability for future generations. Key activities are very much tied to district level, with the focus on implementation.

Table 46: Summary of Status of Reported-on Activities under Strategic Objective 2

Activity	Sources of verification	Status:	Comment
Review current national and regional land management systems (including rangeland and fire management practices) and land uses in terms of effectiveness in biodiversity conservation, identifying weaknesses, strengths and best practices (Ref 10.3.6 – learning from regional experiences; 3.5 – Sustainable rangeland management)	Report with land-use systems prioritised for conservation	Ongoing	Collaboration with IUCN will lead to some activities on sustainable rangeland management
Develop and implement management and recovery plans for priority taxa, including RDL species (Ref 5.2.2 – early warning)	Recovery plans; RDL statistics; *Ex situ* and *in situ* collections	No action	[No comments received]
Support and promote *in situ* and *ex situ* conservation activities for rare, threatened and endemic species (Ref 5.2.2 – conservation of RDL)	Facilities	Ongoing	Establishment of botanical Garden and National Tree seed centre
Identify potential gaps in protected area network through district BSAPs and national inventories	Map and list of habitats	Not yet	DBSAPS are not there (only Ngamiland (LB)), establishment of Park Management Committees will start this

Activity	Sources of verification	Status:	Comment
Identify and fill potential gaps and strengthen existing institutions including the extension service to enhance ecosystem management capacity	Organogram; No. of staff trained in ecosystems management	Implemented through environmental clubs	Environmental education is well supported, DWNP extension service does well, even in the most remote areas they are there
Seek and secure funding for effective long-term ecosystems management (Ref 4.6 – financial mechanisms)	Accounts	Ongoing, e.g. WB HW coexistence	Conservation Trust Fund (from elephant sales) – but now hunting stopped
Encourage conservation measures in designated Wildlife Management Areas (WMA) and areas bordering the protected areas through incentives and education		Ongoing	In some cases, there are some disincentives (e.g. lion is SW) 35/65 has not worked as an incentive How it is reported is a challenge, not sent to centralised place
Develop cost calculations for restoration and rehabilitation of destroyed habitats and include in EIA cost benefit analysis (Ref. 6.4 – economic valuation)	List of costs	No action	[No comments received]
Intensify measures to rehabilitate degraded rangelands. District authorities to set targets.	BRIMP data	Ongoing	Mosu Rehabilitation Project
Establish conservation status and develop National Red Data Lists for all major animal and plant taxa in Botswana and develop mechanisms for biannual updating processes	RDLs	No Action*	[No comments received]

13.2.2 Barriers to implementing Objective 2

For this objective section, what is of concern is that several activities are not reported on. This appears to be because no clear departmental level responsibility was given for the task(s). Where activities were assigned either to a Ministerial level, or to NGOs or research institutions, actual responsibility is unclear. In addition, for those activities assigned to NGOs or research institutions, there does not appear to be a clear channel of communication regarding the delegation of the tasks, nor is it clear that the NGO/institute had the necessary financial and human resources to take on the tasks. Again, the issue of the level at which tasks are coordinated (even within Government) appears to be unclear, creating a challenge to implementation. The issue of capacity is also relevant under this objective, particularly in terms of available technical skills are available in all departments, and ensuring adequate training is given.

Of critical importance is that there also does not appear to have been any clear line of reporting between Government and other organisations. This challenge goes beyond the delegation and coordination of tasks. It also includes the collation and sharing of data. Researchers feel that they each have information to contribute, but that there is no systematic way for compiling and analysing it at broader levels.

Another key area of concern is the ability of DEA to ensure that infrastructural developments do not threaten biodiversity, particularly at the policy level. This means going beyond enforcing EIAs for specific developments, to ensuring that SEAs are done for different sectors, so that the large-scale, ecosystem-level, cumulative impacts of *types* of development can be managed for. For example, SEAs should be done for powerlines in general (e.g., their impact on migratory waterbirds such as flamingos), as well as fencing and fencing alignments, particularly in the dryland ecosystems. As is noted in Section 12, biodiversity should be mainstreamed into the SEA and EIA processes, such as by making it explicit in the EIA guidelines or regulations.

13.3 Objective 3 – Efficient and Sustainable Utilisation of all Components of Biodiversity in Botswana through Appropriate Land and Resource Use Practices and Management

13.3.1 Status of activities – Objective 3

Sustainability and sustainable development are the foundations of long-term prosperity for any nation. The principle is that future generations have access to the same resources that the current one has. The targets of this objective are all focused on sustainable use – either of key resources, or of critical ecosystems.

Table 47: Summary of Status of Reported-on Activities under Strategic Objective 3

Activity	Sources of verification	Status:	Comment
Include biodiversity consideration into national audits and accounts (Ref 5.7.1 – cost of pollution; 6.4.1 – environmental costs).	Protected area network	Ongoing	Serious capacity constraints, DWNP scaled down. DEA coordinating sectors to do audits, but only Water Sector pushing the accounts
Diversify (geographically and natural resource use) and strengthen support to CBNRM (Ref. 6.7.1 – role of communities and NGOs)	CBNRM policy approved; Number and location of non-wildlife based CBNRM activities	Done	[No comments received]
Re-establish effective Common Property Resources (CPR) regimes, including access to communal resources, and develop a plan for implementation of Community Based Strategies	CPR guidelines	Ongoing	Wildlife in community areas is considered common property No formal document or guidelines, some traditional practices still observed
Promote and establish network of fuel wood plantations and community woodlots using indigenous species in all 10 districts	No of woodlots	Ongoing	
Develop Forest Reserve Management Plans		No info	[No comments received]

Activity	Sources of verification	Status:	Comment
Survey rangeland biodiversity (ref Indigenous Vegetation Project and BRIMP) and continue rangeland monitoring, including bush encroachment, allocation and use of water points, stocking and grazing levels, donkey population, fire etc.	BRIMP reports	Ongoing	[No comments received]
Develop and approve veld product policy	Veld product policy	No action	[No comments received]
Decentralise harvest allocations of non-threatened species to a multidisciplinary team chaired by the Tribal Authority (Chiefs) and provide them with the necessary tools and guidelines to ensure sustainable use and transparency and accountability in the allocation process. National control should be maintained over the RDL species and species threatened by overexploitation.	Annual reports	No action	[No comments received]
Extend the Agricultural Resources Board (ARB) veld product monitoring system to include models for quota setting, carrying capacity guidelines, monitoring and enforcement capacity in local and national resource users, organisations and regulatory agencies	Monitoring system	No action	[No comments received]
Implement wetland management strategy making provisions for increased community participation in wetlands management and planning, and give special consideration to issues of access	Wetland Management Strategy	Still draft after 10 years	At ministerial level, no contentious issues raised
Continue implementation of the Ramsar Convention on Wetlands and wetland management plans	Ramsar reports	Ongoing	[No comments received]
Assess current intervention strategies for community livelihood loss due to wildlife conflict and promote farming systems which minimise wildlife conflict through the extension services, and strengthen the effectiveness of these programmes in consultation with affected communities (Ref 2.3.6 – Reduction of land-use conflicts; 2.7.1 and 3.8.2 – faming systems).	Compensation regulations; Compensation paid	Ongoing	Two reviews (proposal for 100% compensation for elephant & lion)
Improve availability of traditional and improved seed varieties and breeding materials to smallholder and other farmers.	Agricultural statistics	Ongoing	Improve availability of traditional and improved seed varieties and breeding materials to smallholder and other farmers.
Investigate tourism potential in support of biodiversity and landscape conservation and promote set up conservation partnerships where relevant.	Tourism statistics	Ongoing	Development of a TSA in progress. Statistical reports will inform among other things on tourists arrivals, their origins, expenditures, areas visited . Other specific surveys will be undertaken in future as and when required and resources permitting.

13.3.2 Barriers to implementing Objective 3

One of the biggest challenges appears to be awareness and recognition of biodiversity and its contribution to human wellbeing. This is across the board, from rural community members, to policy makers. This point was brought up a few times during the consultative process. A large effort regarding awareness needs to be made, because in fact everyone does already benefit from biodiversity – people need to be shown how this happens, such as showing the links about how wildlife and tourism fund schools and clinics.

13.4 Objective 4 – An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation, Sustainable Use and Management

13.4.1 Status of activities – Objective 4

Objective 4 focuses on those doing the implementing. Without the necessary institutions and resources, biodiversity cannot be managed effectively.

Table 48: Summary of Status of Reported-on Activities under Strategic Objective 4

Activity	Sources of verification	Status:	Comment
Strengthen Ministry of Environment, Wildlife and Tourism (MEWT) capacity for effective management of Environmental Impact Assessments (EIAs), including preparation of national EIA guidelines and quality control of EIAs (Ref. 5.4.1- EIA guidelines)	No. of approved EIAs	Ongoing	The Environmental Assessment Act has been reviewed as part of the strengthening process; Regulations have been developed and are being implemented; Senior officers within the EIA Division perform quality control duties; and Reviewers have been accredited by the BEAPA. The process of strengthening the EIA is ongoing as there is a project that is focussed on ensuring that the time it takes to review the EIA is reduced by putting in measures that will lead to a single review methodology. However, capacity for effective management of EIAs is affected by the fewer number of officers interacting with the process.
Strengthen the Agricultural Resources Board (ARB) for effective veld product management and monitoring	Species monitoring systems in place	No information	[No comments received]

Activity	Sources of verification	Status:	Comment
Based on the above appoint and establish national or regional, if relevant) centres of excellence for biodiversity key groups (invertebrates, flora, birds fungi, micro-organisms etc. Responsibility for wildlife has already been established through DWNP), clarifying institutional responsibilities and draw up TORs to include establishment and curation of national biodiversity collections. Mechanisms for depository of data, and hosting of data etc. (Ref. 9.3.1 – Access to data; 1.2.2. – Housing of data and reference collections).	Established focal centres	No action	Different research seems to be focusing on large mammals, never on the other levels that drive them. Maybe we need to explore it more. Global taxonomy initiative, in Botswana we have designated the museums, idea is to strengthen them. (also academic institutions)
Review and evaluate existing taxonomic and biosystematics capacity and infrastructure and provide adequate funding for strengthening national ability to identify organisms of major groups (plants, mammals, birds, fish, pests)	Biology expertise database	Not yet	No database, no plans to develop it
Strengthen human capacity and infrastructure in existing herbaria, museums, national parks and gene banks	Status and health of collections	Ongoing	Shortage of funds is a barrier
Develop a living collection of medicinal plants at National Botanical Gardens, and duplicate in other botanical gardens as appropriate	Living collection	Ongoing	Shortage of funds is an obstacle in implementing this

13.4.2 Barriers to implementing Objective 4

Once again, the three most common obstacles appear to be:

- Resources – it is noted that the placing of the Global Taxonomy Initiative in DNMM is a risk since this department receives very little funding
- Coordination
- Capacity – both in terms of available manpower and skills.

13.5 Objective 5 – Coping With Environmental Change and Threats to Biodiversity

13.5.1 Status of activities – Objective 5

To some extent, this is the focus for adaptive management and the ecosystem approach. Threats can be both external (e.g., climate change) and internal (e.g., unmanaged fires). Identifying – and of course, monitoring – the threats is a critical part of directing management efforts.

Table 49: Summary of Status of Reported-on Activities under Strategic Objective 5

Activity	Sources of verification	Status:	Comment
Research effects of climate change on biodiversity, focusing on impacts on vulnerable species and areas (Ref. 10.3.3 – regional cooperation)	Research reports	Completed 2001	Vulnerability assessment and identification of adaptation measure. Sectors considered are forests water, crops, livestock, health, Energy. Policy will be ready by late 2014
Research the effects of large elephant populations on biodiversity and long-term elephant population trends in Botswana	Research reports	Done, ongoing	2010 report of impact on Chobe – but does not separate out other factors
Stop government distribution of known IAS through government nurseries		Ongoing	[No comments received]
Establish database on IAS, including indigenous invasive species and desirable alien organisms, and research the effects of introduction	Database	Completed & ongoing	Housed in gene bank. Access is not online, but shared with SADC, Annual meeting to share what has been updated (and sharing of seeds)
Research the effects of bushfires on different components of biodiversity and identify and implement strategies and training to minimise the negative effects of bushfires and include in fire land management plans	Fire statistics; Research reports	Ongoing	[No comments received]
Promote wise use of water through: a) awareness campaigns; b) support of Department of Water Affairs' Water Demand Management (WDM) programme; c) improved allocation of water resources; d) up-dated water accounts; e) increase in direct re-use of wastewater	Water use statistics	Ongoing	Public Education and awareness is done throughout the country to promote water conservation. Have demonstration projects on waste water reuse, rain water and storm water harvesting.
Include monitoring of aquatic species, including IAS, in water monitoring programmes (Ref 5.6.2 – Invasive and Alien Species survey)	Reports	Ongoing	[No comments received]
Implement water release calculations as stated in dam Environmental Impact Assessments	Water release reports	Still to verify	[No comments received]

Activity	Sources of verification	Status:	Comment
If necessary undertake programmes to control IAS, as per 5.6.4	IAS control programmes	Ongoing	Physical removal of IAS in Limpopo and Boteti river Ongoing. Okavango and Kwando Chobe Linyanti the aquatic weeds are under control
Monitor hydrological change and water quality, especially around urban centres and around industries	Pollution statistics	Ongoing	Quarterly monitoring of wastewater generating facilities

13.5.2 Barriers to implementing Objective 5

Although not many Objective 5 activities are reported on above, it does appear that this objective has received considerable attention. This could be because threats are immediate and tangible, and are often more closely related to departmental mandates for different aspects of environmental management.

A large part of addressing threats comes through understanding them; however, many government departments do not have sufficient research capacity. Furthermore, the ability to ensure that non-governmental institutions take on the research needs is challenged by the availability of funding, and proper channels of communication and reporting.

13.6 Objective 6 – Appropriate Valuation/Appreciation of Biological Diversity, and Raised Public Awareness on the Role of Biodiversity in Sustainable Development and Public Participation in Biodiversity-Related Activities and Decision-Making

13.6.1 Status of activities – Objective 6

The issue awareness and appreciation has already arisen as a constraint to implementing some of the previous strategic objectives. It is clear that the role of communication is vital to achieving broad-based support for biodiversity conservation. It is interesting to note that most of the activities under this objective are set at ministerial level, with only a few being assigned at implementing (departmental) level. The level of response in regard to these activities is indicative of the importance of matching actions to mandates.

Table 50: Summary of Status of Reported-on Activities under Strategic Objective 6

Activity	Sources of verification	Status:	Comment
Review existing biodiversity programme and identify current and potential role of communities and NGOs in biodiversity conservation (Ref 3.3.1 – Diversification of CBNRM)	Biodiversity guidelines for CBNRM; Report	Ongoing	Done indirectly through the MOMS, though does not focus explicitly on biodiversity
Establish biodiversity/environmental information centres in each district, linking with museums and NGOs as appropriate	Biodiversity information centres	No action	[No comments received]
Encourage regular community skill transfer workshops on indigenous knowledge and traditional practices	Workshop proceedings	No action	[No comments received]
Within the botanical gardens establish medicinal plant gardens to encourage further development of knowledge and skills associated with the local use of medicinal plants	Medicinal display	No action	[No comments received]
Establish smaller botanical gardens in urban areas other than Gaborone, for recreation and education and link with school market gardens and urban and village vegetable plots	No of botanical gardens	No action	[No comments received]

13.6.2 Barriers to implementing Objective 6

One of the bigger barriers to implementing this objective is the level to which responsibility is assigned. Ministerial levels tend to focus more on policy decisions, and not on undertaking specific activities. In addition, some of the activities identified have been given to departments whose mandate is far removed from biodiversity – such as initiating a youth programme on biodiversity – tasked to the Department of Culture and Youth. Without proper support from DEA, it is unlikely that the DCY would be in a position to take on such a programme.

In the table above, the activities to which there has been no action are all housed by DNMM. Although DNMM is now under MEWT, it requires further support in order to bring as much attention to natural resources as it does to cultural ones. Until DNMM is strengthened, DEA could play a strong collaborative role.

Importantly, the activities under this objective include several that are hard to measure: such as “Strengthen the link..” or “Encourage development of parks”. The activities need to be much more clearly defined around tangible outputs.

13.7 OBJECTIVE 7 – FAIR ACCESS TO BIOLOGICAL RESOURCES AND EQUITABLE SHARING OF BENEFITS ARISING FROM THE USE OF BIOLOGICAL RESOURCES

13.7.1 Status of activities – Objective 7

To a large extent, Objective 7 speaks to the implementation of the Nagoya Protocol. Although that document is primarily about genetic resources, it is a critical part of ensuring support for biodiversity conservation. Beyond this, in Botswana the CBNRM programme allows rural communities access to natural resources, with those whose lives are most impacted by biological resources seen as being those who should most benefit from their sustainable use.

All but one of the activities under this objective are pitched at ministerial level, inferring a focus on policy development. The single departmental activity is presented in the table below.

Table 51: Summary of Status of Reported-on Activities under Strategic Objective 7

Activity	Sources of verification	Status:	Comment
Ensure access to resources and responsibility for sustainable development is covered in Veld Product Policy (to be developed – Ref. 3.9.1)	Veld product policy	No action	[No comments received]

13.7.2 Barriers to implementing Objective 7

Much of the focus under this objective is on policy development, which is typically a slow process. There is competition over priorities, and sectors must agree that their mandates are not challenged by new policies. However, as is discussed above, actual implementation of activities outside of policy is usually done at the departmental level, and since no department was given a clear lead here, it is not surprising that this objective has not really been pushed forward.

13.8 OBJECTIVE 8 – SAFE INDUSTRIAL AND TECHNOLOGICAL DEVELOPMENT AND OTHER SERVICES BASED ON NATIONAL BIODIVERSITY RESOURCES FOR FUTURE PROSPERITY

13.8.1 Status of activities – Objective 8

Although Botswana is not strictly a developed country, biotechnology and biosafety remain important issues as the country is heavily dependent on trade to meet its consumption needs. Importantly, Botswana has taken a precautionary approach, and is actively pursuing implementation of

the Cartagena Protocol on Biosafety primarily through the Department of Agricultural Research in the Ministry of Agriculture. Key activities are summarised in the table below.

Table 52: Summary of Status of Reported-on Activities under Strategic Objective 8

Activity	Sources of verification	Status:	Comment
Develop institutional structures, ensuring regional harmonization, which will assure safe use of biotechnology in Botswana, including physical containment facilities, and institutionalising regulation approach, i.e. implementation of the Biosafety Framework	Organogram	Ongoing	Biosafety Policy has been adopted 2013 After legislation is adopted, an Institutional Biosafety Committee will be established – have identified 4 – 5 institutions (DCP, DEA, DPH, BURS, DAR) – linked by a Biosafety Clearing House to share info. (e.g. verifying GMO use, following of phyto-sanitary laws, etc.) Physical containment: not yet, next steps
Assess government training needs for implementation of the National Biosafety Framework and develop strategy to address needs assessment results	Consultancy report		Funding by GEF to train 6 people from above-listed departments. Long-term training needs still to be assessed and established
Expand present information technology use in Government institutions to assure the regulatory personnel have access to the latest information on emerging biotechnology use and risks	Internet access in government; computers	Completed	All departments listed above had computers bought for them.
Estimate and develop capacity in biotechnology related fields, including legal issues, and implement training programme accordingly	MOE training statistics		Training programme not in place yet under biosafety, but NGOs do assist (e.g. from Norway, and RAEIN Africa) (In govt, training plans are developed annually, but currently such plans are not informed by needs assessments or consultative enough)
Establish Biotechnology and Biosafety Expert Reference Group to provide technical backstopping for regulatory staff in Risk Analysis and Management activities, with membership reviewed biannually and adjusted as necessary	Biosafety reference group	Planned	Expert reference group not yet established – RAEIN Africa has provided funding for its establishment (not sure why)
Carry out training programmes on biosafety for Customs officials, the police and other stakeholders	No. courses and participants		BURS and police not specifically targeted, but 8.3.1 below done [need to engage with e.g. BCA to develop short course on biosafety, course can be developed & sold to BCA]
Finalise and implement biosafety framework	National Biosafety Framework	Completed	[No comments received]

Activity	Sources of verification	Status:	Comment
Develop and adopt the policy and legal instruments to support the biosafety framework	Legal and policy framework	Policy adopted 2013	Legal instrument development ongoing
Develop and implement technical guidelines and procedures to control handling and the transboundary movement of genetically modified organisms (GMOs) and their products	Technical guidelines and procedures; Customs reports	Planned, once act is in place	The framework lays out the different stages for development of these
Develop public and political awareness programmes on biosafety and biotechnology for various sectors	Campaign programmes and feedback	~ 10 since 2009, but still need more	workshops for broad base of stakeholders have been held (funded by UNEP / RAEIN Africa)
Integrate biosafety and biotechnology studies into curricula both at secondary and tertiary centres of learning	Curricula; Textbooks	In place	Start In Std 5, all the way through high school BCA has new Dept of Food Sci & Tech, Dept of Ag Eng, they must; at UB they do
Assess national training needs in the field of biotechnology and biosafety and establish specialist capacity	Report		Skills needs assessment not yet done
Ensure that the standards, regulatory processes and legal framework are compatible with regional and international biosafety regulations	Regional and national regulatory frameworks		Was checked by SADC, UNEP and Dpt MLA. It is in alignment with regional and international regulations

13.8.2 Barriers to implementing Objective 8

The relative success in implementing this objective's activities can be linked to the clear allocation of responsibilities, the overlap between departmental mandate and the Cartagena Protocol, as well as active interest by implementing staff. Some of the challenges appear to be related to issues of centralised bureaucracy – particularly with regard to training and capacity building, and the alignment of departmental training needs with the staff roster for personal development through training.

In addition, the challenge of matching appropriate training to appropriate personnel highlights barriers to cross-departmental collaboration, where funding tends to be vertical down sectoral silos. As noted during consultations, if a staff member in one ministry is responsible for activities that fall under the mandate of a different ministry, then funding for that person's training and support is unlikely to come from either the host ministry or the one bearing the mandate.

13.9 Objective 9 – Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information

13.9.1 Status of activities – Objective 9

Essentially, this objective is about establishing a Clearing House Mechanism for environmental and biodiversity information, which is housed in the Department of Environmental Affairs. Although the project has faced some challenges, progress has been made as is shown in the table below.

Table 53: Summary of Status of Reported-on Activities under Strategic Objective 9

Activity	Sources of verification	Status:	Comment
Computerise selected national inventories to be included in Biodiversity CHM (Ref 9.3.2)	Databases	Ongoing	The EIS continues to capture national inventories and other studies/research undertaken in Botswana
Establish institutional responsibilities for maintenance of data and databases	Date of update	Ongoing	At present, only selected members of the DEA can manage the Data. However, there is lack of institutional capacity in maintaining the EIS.
Link biodiversity focal point institutions with the responsibility for hosting relevant data collections.	Agreements	Ongoing	The DWNP hosts wildlife and fisheries related data; DNMM hosts taxonomic data; DFRR hosts flora data; and these are all easily accessible and shared with other institutions.
Establish biodiversity CHM in accordance with recommendations made by the CHM working group, and acquire the necessary hardware and software	CHM	Completed	The EIS has been established as an overall CHM for all environmental information (including biodiversity), and it is fully functional.
Establish links between national data sets and the CHM through agreements with the data provider.	Agreements	No information	[No comments received]
Establish a database of literature on biodiversity including "grey literature" and with keywords to facilitate searches in NCSA. (Ref 1.1.4)	Literature database; Reference library	Ongoing	The EIS has a number of literature databases on biodiversity. However, most of the information/literature has not been captured as it is still in with other institutions and not being shared.
Publish national checklists for all biodiversity key groups, including Red Data Lists (Ref 2.4.1 – RDL)	Checklists	No Action	The Botswana Environment Outlook was supposed to assist in this regard but it was developed without focus on biodiversity. Biodiversity Indicators have been developed.
Establish a biodiversity website		Completed	It has been completed in the form of an overall environmental information website.

13.9.2 Barriers to implementing Objective 9

The challenges hampering implementation of this objective are the same as those noted before: lack of institutional capacity, in terms of trained staff with a continuous input; and information sharing. However, it should be noted that in spite of these barriers, steady progress is being made in terms of developing the CHM.

13.10 OBJECTIVE 10 – RECOGNITION OF BOTSWANA'S AND THE SOUTHERN AFRICAN REGION'S ROLES WITH REGARDS TO BIODIVERSITY

13.10.1 Status of activities – Objective 10

This objective speaks to integration of national-level strategies into the broader level regional and global contexts. In southern Africa's drier savanna systems, such integration is critical in for biodiversity conservation because many of the ecoregions cross national borders, and several species of global biodiversity concern are migratory, and need to move across these larger systems. While Botswana has made much progress in creating an enable environment for such cross-border collaborations (Signatory to various SADC environmental protocols, development of TFCAs, OKACOM, among others), not much has been added in the 6 years since the preparation of the 2007 NBSAP, and it is not clear how active the SADC protocols, - including the Regional Biodiversity Strategy – are active. At the same time, many of the activities relate to diplomatic and political targets, which tend to move at a slower pace.

However, the recent Gaborone Declaration is a critical step in renewing regional-level interactions and commitments, and will likely revitalise cross-border commitments. Botswana's participation in its global commitments through various UN MEAs appears to be strong, with regular participation in COPs and meetings, and the inclusion of MEA targets in its policy documents. However, the fact that the UN Convention on Migratory Species has yet to be signed is puzzling.

Only those activities that have been tasked to specific departments are reported on in the table below.

Table 54: Summary of Status of Reported-on Activities under Strategic Objective 10

Activity	Sources of verification	Status:	Comment
Adopt the highest standards of biodiversity management	Regional standards	No action	[No comments received]
Provide direction and leadership in biodiversity management in the region	Regional standards; minutes	No action	[No comments received]
Encourage ABS partnerships through an enabling environment	ABS agreements	No action	[No comments received]

Activity	Sources of verification	Status:	Comment
Adopt the highest standards of biodiversity management	Regional standards	No action	[No comments received]
Participate actively in international biotechnology and bio-trade initiatives	Proceedings and reports	Ongoing	Attend RAIEN Africa meetings COP MOP for Cartagena Protocol

13.10.2 Barriers to implementing Objective 10

The table above may give the impression that this objective has not received much attention. However, ongoing support for the UN MEAs, and attempts at aligning the various MEAs, have been ongoing. Some of the challenges lie primarily in that this objective speaks to diplomatic processes more that direct actions, and political processes take longer to effect. Identifying focal points for the SADC protocols and including them in the MEA committee would perhaps help strengthen regional initiatives.

13.11 Objective 11 – Implementation of this Biodiversity Strategy and Action Plan

13.11.1 Status of activities – Objective 11

Essentially Objective 11 is about making sure the other 10 objectives are pursued and achieved. This requires political will and high level support. For this reason, all of the strategic targets are aimed at ministerial level activities. While there is therefore no table documenting reported-on departmental activities, some assessment of the status is still possible from an evaluation of the gaps identified as part of this stocktaking report.

One of the key concerns is the apparent decline in environmental monitoring activities that should underpin many of the preceding target's action plans. Very little new data subsequent to the 2007 NBSAP is available. This is true both in terms of data relating to biodiversity itself, and in terms of data relating to its use and economic value.

A second issue is that the challenge of taking on an ecosystem approach does not appear to have been met yet. Data still tend to be summarised according to political boundaries that do not correspond to ecological realities. This is problematic, because biodiversity can only be maintained in healthy, functioning landscapes. In addition, the environmental issues, changes, threats and responses vary widely across the different ecoregions. There cannot be a one-size-fits-all national response that does not accommodate the ecological variation across the country.

13.11.2 Barriers to implementing Objective 11

It is assumed that one of the biggest barriers to implementing the technical aspects of the NBSAP relates primarily to resources. 2008 saw the start of a strong global economic decline, which affected Botswana badly. In particular, Government spending was curtailed, and it is likely due to

this that less 'direct' activities, such as long-term monitoring and data collection have fallen by the way-side. However, this is the challenge of sustainable development, to be able to keep the focus on future needs even while attending to current issues.

In terms of adopting an ecosystem approach, this also relates in part to political issues. The current top-down, sector-based system of governance does not lend itself to the local-level decision-making that ecosystem management requires. Added to this, and given that much of the infrastructural development and land-use change is driven by Government, DEA's position in the government hierarchy is a barrier. As a department with no authority or mandate over other departments (which are currently at the same level), it does not have the necessary power to enforce sustainable development practices within Government.

13.12 STOCKTAKING THE IMPLEMENTATION OF THE NBSAP

13.12.1 Summary of completed tasks

It is difficult to compare the different NBSAP strategic objectives in terms of "success" based on the number of activities completed. This is because the objectives themselves differ qualitatively and in scope, as do the types of activities under each. However, by noting what has been achieved under each objective provides the opportunity to understand where these objectives either overlap well with the existing mandate of different sectors, and where immediate pressures exist. For example, strategic objectives 5 and 8 have been well implemented, and represent key areas of success for Botswana (see Table 55). Objective 5 represents clear, direct and immediate needs, while objective 8 contains a series of activities that correspond well to the mandate of the main responsible party – DAR.

Table 55: Table Showing the Tasks Successfully Completed for Each Strategic Objective.

Objective	Departmental Level Activities Completed
1. Better Understanding of Biodiversity and Ecological Processes	(none)
2. Long-Term Conservation and Management of Botswana's Biological and Genetic Resources	Identify and fill potential gaps and strengthen existing institutions including the extension service to enhance ecosystem management capacity
3. Efficient and Sustainable [Use of Biodiversity] through Appropriate Land and Resource Use Practices and Management	Diversify (geographically and natural resource use) and strengthen support to CBNRM (Ref. 6.7.1 – role of communities and NGOs)
4. An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation […] and Management	(none)
5. Coping With Environmental Change and Threats to Biodiversity	Research effects of climate change on biodiversity, focusing on impacts on vulnerable species and areas (Ref. 10.3.3 – regional cooperation)
	Research the effects of large elephant populations on biodiversity and long-term elephant population trends in Botswana
	Establish database on IAS, including indigenous invasive species and desirable alien organisms, and research the effects of introduction

Objective	Departmental Level Activities Completed
6. Appropriate Valuation/Appreciation of Biological Diversity, […] and Public Participation […]	(none)
7. Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources	(none)
8. Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity	Expand present information technology use in Government institutions to assure the regulatory personnel have access to the latest information on emerging biotechnology use and risks
	Finalise and implement biosafety framework
	Develop and adopt the policy and legal instruments to support the biosafety framework
	Integrate biosafety and biotechnology studies into curricula both at secondary and tertiary centres of learning
9. Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information	Establish biodiversity CHM in accordance with recommendations made by the CHM working group, and acquire the necessary hardware and software
	Establish a biodiversity website
10. Recognition of Botswana's and the Southern African Region's Roles with Regards to Biodiversity	Participate actively in international biotechnology and bio-trade initiatives
11. Implementation of this Biodiversity Strategy and Action Plan	(none)

13.12.2 Summary of ongoing tasks

Successes are not limited only to those activities that have been completed. Several other action items have been initiated, many of which take time to establish fully. The list of such activities is given for each strategic objective in Table 56 below. Although behind schedule, it is nevertheless important to note those activities that have been initiated, and which should be considered for ongoing implementation in the revised NBSAP. In this regard, the underlying research and monitoring necessary to understanding the status of biodiversity (objective 1) has been started, and will need to be continued in order for decisions to be properly informed. A critical gap that needs to be filled is the implementation of activities relating to the Nagoya Protocol (objective 7). The steady progress on objective 3, relating to sustainable use is important to note, as it opens a critical pathway to mainstreaming biodiversity into broader development initiatives.

Table 56: Summary of 2007 NBSAP Tasks Still Ongoing

Objective	Initiated and Ongoing Departmental Level Activities
1. Better Understanding of Biodiversity and Ecological Processes	Develop a detailed national vegetation map based on most effective technologies, including satellite information and make it easily available through the biodiversity CHM (Ref.9.3.1 – CHM)
	Classify and map ecosystems at district level according to established national classification criteria and standards.

Objective	Initiated and Ongoing Departmental Level Activities
	Produce a national ecosystems map based on the district maps and make the map easily accessible through the biodiversity CHM (Ref 9.3 1– CHM)
	Include birds, fish, reptiles, amphibians and rare and endangered animal species in wildlife counts to monitor species levels and thus provide an indication of trends of biodiversity levels
	Clarify and establish government institutional responsibilities and focal organisations (wildlife, flora, birds, fish, insects, fungi etc.) for collection and maintenance of national biodiversity data (Ref Obj 9 – Access to data), and establish mechanisms to facilitate and encourage deposit of biodiversity data collected by other data collectors and researchers at these focal organisations (Ref 9.4.2).
	Disseminate status and trends to planners, managers and decision makers through progress reports and link with the State Of the Environment reporting
2. Long-Term Conservation and Management of Botswana's Biological and Genetic Resources	Review current national and regional land management systems (including rangeland and fire management practices) and land uses in terms of effectiveness in biodiversity conservation, identifying weaknesses, strengths and best practices (Ref 10.3.6 – learning from regional experiences; 3.5 – Sustainable rangeland management)
	Support and promote *in situ* and *ex situ* conservation activities for rare, threatened and endemic species (Ref 5.2.2 – conservation of RDL)
	Seek and secure funding for effective long-term ecosystems management (Ref 4.6 – financial mechanisms)
	Encourage conservation measures in designated Wildlife Management Areas (WMA) and areas bordering the protected areas through incentives and education
	Intensify measures to rehabilitate degraded rangelands. District authorities to set targets.
3. Efficient and Sustainable [Use of Biodiversity] through Appropriate Land and Resource Use Practices and Management	Include biodiversity consideration into national audits and accounts (Ref 5.7.1 – cost of pollution; 6.4.1 – environmental costs).
	Re-establish effective Common Property Resources (CPR) regimes, including access to communal resources, and develop a plan for implementation of Community Based Strategies
	Promote and establish network of fuel wood plantations and community woodlots using indigenous species in all 10 districts
	Survey rangeland biodiversity (ref Indigenous Vegetation Project and BRIMP) and continue rangeland monitoring, including bush encroachment, allocation and use of water points, stocking and grazing levels, donkey population, fire etc.
	Continue implementation of the Ramsar Convention on Wetlands and wetland management plans
	Assess current intervention strategies for community livelihood loss due to wildlife conflict and promote farming systems which minimise wildlife conflict through the extension services, and strengthen the effectiveness of these programmes in consultation with affected communities (Ref 2.3.6 – Reduction of land-use conflicts; 2.7.1 and 3.8.2 – faming systems).
	Improve availability of traditional and improved seed varieties and breeding materials to smallholder and other farmers.
	Investigate tourism potential in support of biodiversity and landscape conservation and promote set up conservation partnerships where relevant.
4. An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation […] and Management	Strengthen Ministry of Environment, Wildlife and Tourism (MEWT) capacity for effective management of Environmental Impact Assessments (EIAs), including preparation of national EIA guidelines and quality control of EIAs (Ref. 5.4.1- EIA guidelines)
	Strengthen human capacity and infrastructure in existing herbaria, museums, national parks and gene banks
	Develop a living collection of medicinal plants at National Botanical Gardens, and duplicate in other botanical gardens as appropriate
5. Coping With Environmental	Stop government distribution of known IAS through government nurseries

Objective	Initiated and Ongoing Departmental Level Activities
Change and Threats to Biodiversity	Research the effects of bushfires on different components of biodiversity and identify and implement strategies and training to minimise the negative effects of bushfires and include in fire land management plans
	Promote wise use of water through: a) awareness campaigns; b) support of Department of Water Affairs' Water Demand Management (WDM) programme; c) improved allocation of water resources; d) up-dated water accounts; e) increase in direct re-use of wastewater
	Include monitoring of aquatic species, including IAS, in water monitoring programmes (Ref 5.6.2 – Invasive and Alien Species survey)
	If necessary undertake programmes to control IAS, as per 5.6.4
	Monitor hydrological change and water quality, especially around urban centres and around industries
6. Appropriate Valuation/Appreciation of Biological Diversity, […] and Public Participation […]	Review existing biodiversity programme and identify current and potential role of communities and NGOs in biodiversity conservation (Ref 3.3.1 – Diversification of CBNRM)
7. Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources	(none)
8. Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity	Develop institutional structures, ensuring regional harmonization, which will assure safe use of biotechnology in Botswana, including physical containment facilities, and institutionalising regulation approach, i.e. implementation of the Biosafety Framework
	Assess government training needs for implementation of the National Biosafety Framework and develop strategy to address needs assessment results
	Estimate and develop capacity in biotechnology related fields, including legal issues, and implement training programme accordingly
	Establish Biotechnology and Biosafety Expert Reference Group to provide technical backstopping for regulatory staff in Risk Analysis and Management activities, with membership reviewed biannually and adjusted as necessary
	Carry out training programmes on biosafety for Customs officials, the police and other stakeholders
	Develop and implement technical guidelines and procedures to control handling and the transboundary movement of genetically modified organisms (GMOs) and their products
	Develop public and political awareness programmes on biosafety and biotechnology for various sectors
	Ensure that the standards, regulatory processes and legal framework are compatible with regional and international biosafety regulations
9. Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information	Computerise selected national inventories to be included in Biodiversity CHM (Ref 9.3.2)
	Establish institutional responsibilities for maintenance of data and databases
	Link biodiversity focal point institutions with the responsibility for hosting relevant data collections.
	Ensure that the standards, regulatory processes and legal framework are compatible with regional and international biosafety regulations
	Ensure that the standards, regulatory processes and legal framework are compatible with regional and international biosafety regulations

Objective	Initiated and Ongoing Departmental Level Activities
10. Recognition of Botswana's and the Southern African Region's Roles with Regards to Biodiversity	(none)
11. Implementation of this Biodiversity Strategy and Action Plan	(none reported)

13.12.3 Summary of main resource constraints

For each of the objectives of the 2007 NBSAP, various barriers to implementation were identified. These have been summarised in Table 57 below. This table is not indicative of overall levels of success; instead it serves only to highlight what was not done, and the main reasons for this, as reported in survey responses and focus group discussions.

Table 57: Main Resource Constraints to Achieving the Objectives of the 2007 NBSAP, showing only those activities that were not initiated

Objective	Activities not yet initiated	Main resource constraint
1. Better Understanding of Biodiversity and Ecological Processes	With the vegetation map as a base, establish national criteria and guidelines for ecosystems classification and delineation through consultation and peer reviewed process	Human resources – both in terms of sufficient staff and appropriate skills
	Set up national survey programmes for under-surveyed biodiversity groups, with priority given to the rare and endangered species, and implement programme (Ref 1.2.1 – target taxa)	
	Identify and prioritise target taxa and areas according to established criteria for vertebrates and plants.	
	Establish biodiversity priority research topics, including under-represented taxa, species with genetic centres in Botswana, understanding of ecological processes and ecosystems management including carrying capacities, to guide allocation of funds.	
	Move towards setting of indicators for biodiversity and ecosystem functioning taking cognisance of regional and international standards. , and establish carrying capacity levels for livestock and larger wildlife.	
	Design compatible national and district level monitoring systems of biodiversity and ecosystem function, and assign responsibility for monitoring, including user based monitoring where relevant	
	Develop training packages for monitoring by communities and other biodiversity users	
	Analyse monitoring data at spatial and temporal scales, establish trends, and use to establish national conservation priorities.	
	Evaluate the impact of demographic change on future biodiversity management, preservation of traditional methods, varieties and indigenous knowledge.	
2. Long-Term Conservation and Management of	Develop and implement management and recovery plans for priority taxa, including RDL species (Ref 5.2.2 – early warning)	Coordination and communication
	Identify potential gaps in protected area network through district BSAPs and national inventories	

Objective	Activities not yet initiated	Main resource constraint
Botswana's Biological and Genetic Resources	Develop cost calculations for restoration and rehabilitation of destroyed habitats and include in EIA cost benefit analysis (Ref. 6.4 – economic valuation)	
	Establish conservation status and develop National Red Data Lists for all major animal and plant taxa in Botswana and develop mechanisms for biannual updating processes	
3. Efficient and Sustainable [Use of Biodiversity] through Appropriate Land and Resource Use Practices and Management	Develop Forest Reserve Management Plans	Awareness and political will
	Develop and approve veld product policy	
	Decentralise harvest allocations of non-threatened species to a multidisciplinary team chaired by the Tribal Authority (Chiefs) and provide them with the necessary tools and guidelines to ensure sustainable use and transparency and accountability in the allocation process. National control should be maintained over the RDL species and species threatened by overexploitation.	
	Extend the Agricultural Resources Board (ARB) veld product monitoring system to include models for quota setting, carrying capacity guidelines, monitoring and enforcement capacity in local and national resource users, organisations and regulatory agencies	
	Implement wetland management strategy making provisions for increased community participation in wetlands management and planning, and give special consideration to issues of access	
4. An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation […] and Management	Strengthen the Agricultural Resources Board (ARB) for effective veld product management and monitoring	Both financial and human resources are insufficient
	Based on the above appoint and establish national or regional, if relevant) centres of excellence for biodiversity key groups (invertebrates, flora, birds fungi, micro-organisms etc. Responsibility for wildlife has already been established through DWNP), clarifying institutional responsibilities and draw up TORs to include establishment and curation of national biodiversity collections. Mechanisms for depository of data, and hosting of data etc. (Ref. 9.3.1 – Access to data; 1.2.2. – Housing of data and reference collections).	
	Review and evaluate existing taxonomic and biosystematics capacity and infrastructure and provide adequate funding for strengthening national ability to identify organisms of major groups (plants, mammals, birds, fish, pests)	
5. Coping With Environmental Change and Threats to Biodiversity	Implement water release calculations as stated in dam Environmental Impact Assessments	Insufficient research capacity
6. Appropriate Valuation/Appreciation of Biological Diversity, […] and Public Participation […]	Establish biodiversity/environmental information centres in each district, linking with museums and NGOs as appropriate	Coordination and communication
	Encourage regular community skill transfer workshops on indigenous knowledge and traditional practices	
	Within the botanical gardens establish medicinal plant gardens to encourage further development of knowledge and skills associated with the local use of medicinal plants	
	Establish smaller botanical gardens in urban areas other than Gaborone, for recreation and education and link with school market gardens and urban and village vegetable plots	

Objective	Activities not yet initiated	Main resource constraint
7. Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources	Ensure access to resources and responsibility for sustainable development is covered in Veld Product Policy (to be developed – Ref. 3.9.1)	Awareness and political will
8. Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity	Assess national training needs in the field of biotechnology and biosafety and establish specialist capacity	Appropriate skills development
9. Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information	Establish links between national data sets and the CHM through agreements with the data provider.	Human resources – both in terms of sufficient staff and appropriate skills
	Publish national checklists for all biodiversity key groups, including Red Data Lists (Ref 2.4.1 – RDL)	
10. Recognition of Botswana's and the Southern African Region's Roles with Regards to Biodiversity	Adopt the highest standards of biodiversity management	Coordination and communication
	Provide direction and leadership in biodiversity management in the region	
	Encourage ABS partnerships through an enabling environment	
	Adopt the highest standards of biodiversity management	
11. Implementation of this Biodiversity Strategy and Action Plan	[most activities]	All of the above

13.13 LESSONS LEARNED

Key lessons learned are summarised below:

- Implementation works best when responsibilities are assigned at the departmental level. Where technical activities are set at the ministerial level, these tend not to be implemented.
- As may be expected, implementation and collaboration is best for those departments within MEWT, because of the clear environmental mandate. Departments whose mandate only marginally touches on conservation struggle to find the resources to implement their activities. Of particular concern is the delegation of responsibility for the Global Taxonomic Initiative to DNMM which is under-resourced even for its own mandate and core endeavours. Similarly, the DYC's youth programme on biodiversity may have been accomplished if it had been led by someone inside DEA.
- It is difficult to develop environmental accounting and integrate biodiversity values into the national accounts unless such accounts are tied to ecosystem services, and such services cannot be evaluated unless they are done at ecosystem or ecoregion level.
- Coordinating implementation is a full-time commitment for a team of two or three people for whom NBSAP implementation is their sole function. Without such a team, communication, awareness-raising, reporting, and ongoing support to other departments (especially those outside MEWT or with a non-environmental core mandate) will not be effective, and will continue to undermine biodiversity initiatives.
- Until DEA's status in the hierarchy of government is changed, it will always struggle to ensure other government departments adhere to the sustainable development approaches that are set up to safeguard biodiversity.
- The housing of the Cartagena Protocol with the Department of Agricultural Research is a key success story. The overlap between the objectives of the protocol with the mandate of DAR is strong, and good resources are in place.
- Key challenges repeatedly mentioned are available financial and human resources. Capacity is limited both in terms of available manpower, and in the equipping of staff with appropriate technical skills. If Botswana is to meet its CBD obligations, it will have to invest more in terms of these resources.

14. MODALITIES FOR THE IMPLEMENTATION OF THE CBD PROGRAMMES OF WORK AND PROTOCOLS

Reflecting on the lessons learned, and looking forward to the new strategy and action plan, it is important to explore the best options for ensuring that the revised NBSAP allows Botswana to meet its obligations and implement the CBD programmes of work, and the subsidiary protocols. This section first looks at how far the country is already progressing with activities that support the Aichi Targets, so that these can be incorporated into the revisions, and then the modalities (such as governance structures, policies, management approaches, and lines of reporting and communication) that might best frame the activities of the revised NBSAP.

14.1 IMPLEMENTING THE NEW CBD AICHI TARGETS

In order to assess existing alignment between ongoing activities and the Aichi Targets, consultations with relevant Government departments included a request for information on such activities. These are presented in the 5 tables below, where each table represents one of the Aichi goals across which the targets are distributed. It is noted that DWNP were not able to complete and return the questionnaire by submission of this date, but that it is likely that some of their current projects do relate to some of these targets.

Table 58: Existing initiatives supporting Aichi Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

No.	Target	Existing Activities
1	By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	DEA's Environmental Education Division is carrying out awareness raising activities on the economic importance of biodiversity and its conservation. Awareness is also raised through the implementation of the Okavango Delta Management Plan and Makgadikgadi Framework Management Plan. DFRR: National tree planting activities, woodland management and bushfire management DNMM: Participate in commemoration of WED, tree planting day. Inform communities in areas with monuments. Mount exhibitions to inform people DMS: Awareness and legislation enforcement DAR: Conservation of agricultural genetic plant and animal material
2	By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	DEA has been training economic planners on the integration of environment into national and district development plans. This is an ongoing process. The WAVES Project and the Poverty Environment are also assisting in this regard. DFRR: Development of national symbols e.g. national flower, tree, grass, bird and animal, Backyard gardens, woodlots and plantations establishment DNMM: Heritage tourism e.g. monument project DMS: Awareness raising

No.	Target	Existing Activities
3	By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	DEA provides environmentally sound advice to sectors as they develop their policies and strategies. The DEA has also managed to successfully ensure that the environment is a cross cutting issue in development of NDPs/DDPs and this has greatly helped in reducing / managing harmful incentives. DFRR: Intensified awareness creation and educational campaigns, value addition promotes conservation DAR: Establish sustainable grazing carrying capacity
4	By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	DFRR: Forest Policy advocates for polluter pays principle DNMM: World Heritage sites listing e.g. Okavango DAR: Awareness raising

Table 59: Existing initiatives supporting Aichi Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

No.	Target	Existing Activities
5	By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	DEA: There has been an increase in awareness raising among stakeholders on the importance of sustainable habitat utilization; the EIA is a tool which assists in reducing degradation and habitat fragmentation DFRR: Development and promotion of eco-tourism in forest reserves DAR: Should have a strategy to minimize degradation
6	By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	DEA has developed the Okavango Delta Management Plan, which has a component dealing with fisheries and this is mainly implemented by DWNP and DWA.
7	By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	DFRR: National Inventory and monitoring, management plans DAR: Conservation of agricultural genetic plant and animal material
8	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	DWA: Water quality monitoring in our rivers and wetlands, control of invasive aquatic weeds such as water hyacinth using public private partnership, Inspection of waste water generating facilities with an aim of protecting our receiving bodies (check compliance) DMS: Awareness, Development, promotion of legislation to control pollution. Promote clean power.

No.	Target	Existing Activities
9	By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	DFRR: Research and eradication activities undertaken DNMM: Identification of invasive alien species, communities sensitised about them DWA: Control of invasive aquatic weeds in our water bodies, water quality monitoring of our rivers and wetlands, registration of boats, issuance of import permits and boat spraying DAR: Investigating management strategies that could be used to control IAS
10	By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	DFRR: International and collaborative efforts e.g. KAZA and Makgadikgadi Management Plan, ODMP DMS: Awareness. Botswana is developing a climate change policy. The policy will also have an implementation strategy which will include adaptation among others

Table 60: Existing initiatives supporting Aichi Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

No.	Target	Existing Activities
11	By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	DEA continues to develop integrated management plans. Also, Botswana is a part of the Transfrontier conservation areas and this promotes the linkages and conservation goals DoT: Collaborating with stakeholders on marine tourism in respect of the licensing of house boats and other boats used for tourism purposes. Collaborating with stakeholders on the most visited tourist areas such as the Chobe River front to relieve pressure on various sites.
12	By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	DFRR: National Inventory ongoing DNMM: Inventories of plants and animals are prepared, classification according to status done, Conservation measures applied e.g. habitat restoration DAR: Rehabilitation / restoration of degraded rangelands
13	By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	DAR: National Genetic Resource Conservation both *in situ* and *ex situ* conservation of plant species. Conservation of animals in ranches and also their genetic material (embryos, semen)

Table 61: Existing initiatives supporting Aichi Goal D: Enhance the benefits to all from biodiversity and ecosystem services

No.	Target	Existing Activities
14	By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking	DEA is implementing change projects and also it is collaborating with other departments in the restoration and safeguarding of ecosystems that support livelihoods. Examples include the EIA process; and support to the CBNRM. Implementation of the MFMP and ODMP also

No.	Target	Existing Activities
	into account the needs of women, indigenous and local communities, and the poor and vulnerable.	assists in this regard. The Biochobe project will also contribute positively in this regard. DFRR: CBNRM plans being developed DNMM: Ecosystems of cultural value – Monument development and management in collaboration with community trusts e.g. Mogonye, Goo Moremi Trust DWA: Water quality monitoring in our rivers and wetlands, control of invasive aquatic weeds such as water hyacinth using public private partnership, Inspection of waste water generating facilities with an aim of protecting our receiving bodies (check compliance) DoT: Reserving of certain licences for citizens e.g. Mokoro (dugout canoe) trails. Communities in the Okavango Delta are beneficiaries CBOs and individuals have been licensed under the category.
15	By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	DFRR is focusing on this issue of restoration and the DEA is assisting in its delivery. Mosu Land Rehabilitation Project DWA: Water quality monitoring in our rivers and wetlands, control of invasive aquatic weeds such as water hyacinth using public private partnership, Inspection of waste water generating facilities with an aim of protecting our receiving bodies (check compliance) DMS: Botswana is promoting REDD and activities which include conserving forests DAR: Ecosystem restoration
16	By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	DEA: Botswana has acceded to the Nagoya Protocol and at the present domestication processes are ongoing.

Table 62: Existing initiatives supporting Aichi Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

No.	Target	Existing Activities
17	By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	DEA: The NBSAP is being reviewed and will be completed before 2015, and then implementation of the same will effect. DNMM: Provides information a flora and fauna DoT: A tourism policy is being finalised which caters among other things sustainable utilisation of resources.
18	By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	DEA: the domestication of the Nagoya Protocol will ensure the realisation of this target DFRR: Adoption of treaties and conventions is being undertaken DoT: Working with communities and other stakeholders on the production and sale of local arts and crafts. Relevant stakeholders focus on different stages relevant to their mandates e.g. collection of raw materials for production where producers will be taught on sustainable utilisation of the materials, production, pricing, access to markets, etc. Engagement of communities in ecotourism projects and the implementation of the National Eco Tourism Strategy and eco certification. BTO is the lead agency DAR: Implementing projects that get traditional knowledge from people
19	By 2020, knowledge, the science base and	DEA is not yet doing anything that will lead to the realisation of this

No.	Target	Existing Activities
	technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	target. DNMM: Implement global taxonomy initiatives programme of work
20	By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	DEA: The National Environment Fund has been established to assist in funding environmental projects and biodiversity is one of the thematic areas covered by the fund. Also, resources have been mobilised from the GEF and private companies to fund biodiversity related projects. DFRR: Already working with JICA

14.2 WAY FORWARD FOR CBD IMPLEMENTATION

There are several key aspects that will contribute towards Botswana's ability to continue to meet its CBD obligations and improve on its ability to implement the revised NBSAP. These are the modalities that lie beyond the NBSAP, and are part of the enabling environment for carrying out the CBD programme of works and associated protocols.

14.2.1 Governance structure

While the choice of responsible departments, and how are they arranged in terms of collaboration and communication, is vital to NBSAP implementation, this may not be enough to ensure compliance and buy-in by other government departments. Consideration must be given to enhancing the position of the competent authority (currently DEA). The maintenance of environmental integrity is critical to long-term sustainable development, options such as Angola's concept of an institute 'endowed with legal personality and administrative, financial and patrimonial autonomy' (Angola 2006 NBSAP), or Australia's Natural Resource Management Ministerial Council (Australia 2011 NBSAP) must be explored and evaluated for use in the Botswana context. The structure must be able to transcend ministerial lines, so that channels for delegating tasks and for reporting can be efficiently instituted.

14.2.2 MEA and policy alignment

Botswana is already making a concerted effort in this regard (noting in particular the excellent enabling environment in form of DMLA, as well as the MEA committee, though the latter should be strengthened and include SADC representation). At the same time, a harmonious political environment is so important that it must be explicitly mentioned as part of the modalities.

Pursuing the 'missing' MEAs referred to above, particularly the Convention on the Conservation of Migratory Species will strengthen the country's ability to implement its NBSAP. Currently, Angola, South Africa and Zimbabwe have signed the CMS (Namibia and Zambia have still to do so). The creation of transfrontier parks, which greatly enhance biodiversity conservation in savanna regions, will be strengthened when all SADC countries are CMS signatories.

Although it is important that Botswana continue developing and refining policies so that they take biodiversity into account, it is perhaps more important that greater attention is put into developing laws and regulations and the mechanisms to enforce them. Currently, the only existing sustainable tools are the Environmental Assessment Act and supporting guidelines. These need to be bolstered by other by-laws under existing legislation related to environmental management. The EIA guidelines must also be strengthened to include an explicit reference to biodiversity protection. National and district development plans should also commit to implementing biodiversity conservation activities, and when authorities prepare their plans for the up-coming development period, the NBSAP activities should be directly included.

14.2.3 Approaches to management

There is a need for more than the current lip-service to be given to the ecosystem approach. Biodiversity management is not just about preserving some of each species; it is about having dynamic, fluctuating and functional ecosystems that allow for variation in numbers. It is about managing for keystone species such as predators, or large migratory species. It is time to look beyond management at the level of individual protected areas to a focus at the landscape-level that includes planning of all contiguous areas together – PAs and surrounding WMAs, and in some cases even including communal grazing areas which are important migration routes for larger herbivores.

This means creating an institutional framework that allows decision-making at the district level. It means monitoring at the ecoregion level, and staffing and resourcing must be adjusted to accommodate an implementation focus at the district level.

14.2.4 Channels of communication

One of the most telling aspects of this stocktaking exercise has been the extent to which Government staff members have been unaware of their department's responsibilities with regard to the activities under the NBSAP. This is particularly the case for departments outside of MEWT. Setting up regular schedules for communications and interactions could help, as could the idea of always assigning a DEA person to each task even if it is just as a coordinator.

Mechanisms for communication also need to be strengthened with regard to data sharing. A much more systematic approach for feeding information into the CHM is required. There are reported to be several useful environmental datasets in the non-governmental sector, but there is a lack of awareness on whether Government would find it useful, or even how to get it to Government. Public awareness of Botswana's Environmental Information System could be strengthened, and the NGOs and researchers must be informed of their potential role in contributing to the EIS.

15. MAIN CONCLUSIONS

15.1 SYNERGIES WITH MEAS

Botswana is proceeding well with aligning its global-level MEAs. However, it may be missing an important bridging level by not including the regional environmental protocols to which it is party in the same forums for collaboration as the MEAs.

Currently, the greatest synergy is with the Ramsar Convention. Not only is there a memorandum of cooperation in place, but the implementation of both the Ramsar Convention and CBD is tasked to the same government department, and includes very similar concepts, approaches and objectives.

As noted above, synergies will be highest with those MEAs that set out to promote conservation rather than limit adverse effects. Those signed MEAs that also promote conservation, and which could share targets and activities, include:

- CITES
- World Heritage Convention
- IUCN (although not strictly a convention, opportunities for supporting biodiversity conservation exist)
- SADC Regional Biodiversity Strategy
- SADC Protocol on Wildlife Conservation and Law Enforcement
- SADC Protocol on Forestry

And to a lesser extent:

- Gaborone Declaration (very general)
- African Convention on the Conservation of Nature and Natural Resources (appears stagnant or forgotten).

Other MEAs that are related, but which, through their focus on limiting impacts (rather than managing biodiversity), are less likely to have common action plans and activities are:

- UNFCCC
- UNCCD

And to a lesser extent:

- Vienna Convention for the Protection of the Ozone Layer
- Basel Convention on Trans-boundary Movement of Hazardous Waste
- Rotterdam Convention on the International Trade in Hazardous Chemicals
- Stockholm Convention on Persistent Organic Pollutants

Finally, there are three MEAs to which Botswana is not yet a signatory, but which would strengthen the country's commitment to and ability to implement its obligations under the CBD and its subsidiary protocols. These would likely have shared targets and activities as well. These are:

- Convention on the Conservation of Migratory Species of Wild Animals

- International Treaty on Plant Genetic Resources for Food and Agriculture
- Agreement on the Conservation of African Eurasian Migratory Waterbirds

15.2 STATUS AND TRENDS OF BIODIVERSITY

The rapid assessment was based on the existing stocktake and updated using data, consultations and literature (see Appendix 3 for the metadata of the data used and available to both NBSAP implementation and the compilation of this report). There was surprisingly little new taxonomic information at the national or population level although there are species specific studies mainly from independent researches. Reductions in funding of surveys and research in both NGO and government and the absence of a biodiversity research and monitoring strategy are to blame for the limited amount of information.

The causes in biodiversity loss (underlying and direct) are of concern. Given the rapid change in land ownership and closure of ecosystems and use of upstream water by neighbouring countries. There will need to be a far higher investment into research and management to address the decline we will experience in biodiversity.

The protected area network covers a significant portion of Botswana and is responsible for much of the biodiversity conservation. There are a few important habitats which are essential for biodiversity yet not formally protected; these include the riparian woodlands of the Okavango Delta Pan Handle and the ephemeral lakes of Ngami and Xau which are important for bird diversity. Game farms and private sanctuaries are becoming increasingly significant in the conservation of biodiversity particularly in eastern Botswana in the South African bushveld ecoregion.

The Okavango Delta remains the national hotspot for biodiversity and is home to both high biodiversity and most of the national endangered species. Recent initiatives such as the update of the Okavango Delta Ramsar Site Management Plan and the drafting of a Strategic Assessment of the Ramsar site together with the activities of OKACOM has both highlighted conservation concerns in the Delta and management requirements. Continuing work with neighbouring countries on the upper basin and its development are important to the long term protection of Botswana's biodiversity.

In terms of threatened biodiversity, the Zambezian flooded grasslands are important (4 % of Botswana's land area). They hold 20% of the threatened plants, 71% of threatened bird species and 32% of threatened mammal species. The Zambezian mopane woodlands (5% of Botswana) are also important as they are home to 18% of threatened plant species, 18% of birds and 22% of mammal species.

While climate change remains a long term threat to biodiversity, it is the direct threats, driven largely by policy, which are impacting on species. There is a shift towards commercial development of arable and livestock resources which is leading to habitat fragmentation and closure of wildlife movement routes. Protected areas are becoming isolated and wildlife management areas converted to livestock areas. The Kalahari xeric savanna is under substantial pressure even though the Kgalagadi WMAs have been gazetted. Expansion in the mineral and power sector is of concern in eastern Botswana while the continuing increase in elephant numbers in northern Botswana is resulting in habitat modification with knock on effects on other species. Fire frequency is high in the Zambezian Baikiaea woodlands. Alien invasive species are an increasing threat to biodiversity.

This rapid assessment highlighted the importance of NGO and private sector support for biodiversity monitoring and protection. NGOs such as Birdlife Botswana are essential to taxa

specific management and monitoring. Collaboration between stakeholders, between regulators and interest groups will continue to grow in importance.

The underlying causes of the threats to biodiversity are, in most cases, accelerating. The combination of increasing human population and national wealth together with imbalances in incomes and high levels of poverty in remote area communities are leading to rapid habitat change as land is converted to agriculture. These changes are being accelerated by policies which are converting communal land to de facto private ownership and closure of the commons.

Similar economic development and land use changes are occurring in the river basins entering into Botswana which will affect the wetland ecosystems that are home to much of Botswana's biodiversity.

The direct threats to biodiversity are being driven by the underlying cases. Habitat destruction and land conversion, ecosystem collapse and loss of functional processes and unsustainable land uses are all actively occurring and will result in accelerated levels of biodiversity loss. The most obvious change is the loss of the open wildlife systems that sustain mobile ungulate populations. The present low cost of management will be replaced by a need to more intensively manage wildlife populations greatly increasing research and management costs to government.

15.2.1 Key gaps in biodiversity information

There are relatively few national taxonomic surveys and little biodiversity monitoring. Fortunately international collaboration in collecting and preserving ex situ plant genetic material (Millennium Seed Bank with the RBG Kew) and the FAO initiative with Agricultural research to collect indigenous strains of agricultural genetic material have been ongoing.

Botswana is reliant on regional taxonomic information for many of the taxa particularly the invertebrates, small mammals, reptiles and amphibians. As a result, location specific information is limited.

Apart from the DWNP aerial surveys, which recommenced in 2012, there is little systematic monitoring of biodiversity. The recent MEWT publication of biodiversity indicates based on a pressure state response approach highlights both the need for indicators and the limited amount of biodiversity information available for accurate monitoring. There is need for collaboration between stakeholders including non-biologists such as Statistics Botswana (MEWT 2012).

One of the bigger challenges facing the management of biodiversity information is the issue of scale. The mismatch between socio-political and ecological boundaries means that data are not collected at the ecosystem level, and it is therefore hard to develop accurate assessments of the health of each ecoregion. This has implications for both district level data collection, but also for aggregation to the national level, since some districts will need to combine information to cover the entire ecoregion.

Plant, mammal, and bird species richness data are not broken down according to ecoregion, so it is not possible to assess total richness for each category. This as a data concern that the next NBSAP should address.

15.2.2 Preliminary recommendations on biodiversity status and trends

The growth of ecotourism is a good example of the economic value of biodiversity and the need to incorporate biodiversity into national accounts. Until this is done, there will remain extensive policy conflicts between that of biodiversity protection and other sector development. These policy conflicts and subsequent programmes to implement strategies are an underlying cause of most of the direct threats to biodiversity.

The absence of taxonomic knowledge of many of the taxa and limited monitoring of biodiversity through species specific monitoring or indicators limits national understanding of threats to biodiversity and support for its protection.

Broader stakeholder support and funding is required to improve our understanding of biodiversity and allow for the monitoring of this important resource.

Greater understanding of species dynamics and biology required for those species subject to offtake; this will require substantial increase in research funding and a shift to information based management or adaptive management.

Greater engagement and funding of partners in the research, monitoring and management of biodiversity is needed. This should include private research, game farmers, trophy hunters, leasehold ranch owners, NGOs and interest groups working with or monitoring specific taxa. CBOs involved in CBNRM need greater support and funding particularly when key income streams are removed.

Since the 2007 NBSAP there have been suggestions that funding to partner institutions would be available so that they could undertake agreed responsibilities. This funding has in most cases not been forthcoming and partners have not been able to cover their commitments. This is particularly true for the NGOs. Guaranteed funding stream are required to enable partners to undertake their biodiversity commitments.

15.3 Economic Valuation of Biodiversity

Economic valuation of biodiversity can largely be based on either direct or indirect use. Direct use values in Botswana are centred on tourism, livestock and crop production, natural resources use, and mining (See relevant metadata in Appendix 3 for what studies have been done and are available).

In Botswana, most economic studies have focused on the wetter northern areas, which are critical for biodiversity, such as the Okavango and Chobe. However, the dryland ecosystems cover by far the greater part of the country, and hence encompass much of the economic use of natural resources.

15.3.1 Key gaps in economic valuation information

The largest gap, in terms of biodiversity, is that economic data are not aligned to ecological boundaries such as the ecoregions used for the NBSAP biodiversity analyses. Instead data are collected by political boundaries such as districts, and it is hard to accurately quantify the proportional contribution of the different ecosystem types, and the biodiversity housed in each, to the national economy.

Furthermore, economic valuation in the south and south-west of the country has not been done, despite the fact that it is in the dryland ecosystems that much of the game and livestock ranching, of considerable commercial value, takes place.

In terms of mainstreaming biodiversity into national accounts, little progress has been made, and the present national accounts do not provide any relevant insights into the contribution of Botswana's biodiversity to the national economy, or to its future-use or offset value for evaluating against development opportunities.

Specific data gaps include:

1) Actual hunting data or success rates of available hunting quota;
2) Harvesting, trade and export of veld products; and
3) Identification and quantification of ecosystem services by ecoregions.

15.3.2 Preliminary recommendations on the valuation of biodiversity

Natural resource use (i.e. other than agriculture) needs to be captured more thoroughly in the National Accounts. This should explicitly include establishing forest accounts. The WAVES programme that is being initiated should be strengthened for proper implementation. It is recommended that Botswana pilots ecosystem accounts under the WAVES programme.

Ecosystem accounts should be developed for some of the ecoregions, and districts should break down their data collection according to ecoregions or ecosystems. This is necessary if the country is truly concerned about following an ecosystem approach.

Many benefits of biodiversity are externalities, which are incorporated in value added of sectors without measuring them explicitly. It is recommended that Botswana review the feasibility of payment for ecosystems (PES) as a way of internalising positive BD externalities. Moreover, user fees (e.g. Parks and veld products) should be regularly reviewed based on the willingness to pay. Botswana should adopt the valuation approach used by TEEB to conduct a country-wide study such as was done in South Africa. This calls for a three-step process as follows:

1) Recognising and identifying ecosystem services;
2) Demonstration of the value of ecosystem services;
3) Capturing the value of ecosystem services through an appropriate incentive structure and policy environment for maintenance of ecosystem services and biodiversity.

The key preliminary recommendations for economic valuation of biodiversity are therefore those highlighted by the TEEB analysis:

- Assess role of biodiversity & ecosystem services in economic activities
- Ecosystem services should inform economic valuation with a focus on the costs & benefits of biodiversity conservation
- Economic valuation is less useful under radical uncertainty and ignorance about tipping points. Use pre cautionary principle and safe minim standards in those instances
- Use of a range of discount rates and conduct sensitivity analysis
- Value of changes in natural capital stocks and ecosystem services should be reflected through natural capital accounting
- Human dependency on natural capital need to be fully integrated in policies and poverty reduction strategies
- Investment is needed in ecological infrastructure to reduce poverty
- Business annual reports should disclose all major environmental externalities, environmental liabilities and changes in environmental assets

- Reform of incentive structures based on polluter-pays principle & the user pays principle
- Reform of property rights, liability regimes and e.g. consumer information
- Payment/ rewards for ecosystem services
- Establish systems of national and regional PAs.
- Economic valuation can justify PA policy, assist with funding & investment opportunities and inform conservation policies.
- Ecosystem conservation & restoration should be considered as a viable investment opportunity
- Mainstreaming of biodiversity & ecosystem services values in policies on:
    - Trade, development
    - Transport, energy & mining
    - Agriculture
    - Corporate strategies

15.4 NBSAP IMPLEMENTATION

It is noteworthy that recent policies (such as the draft Wildlife Policy of 2012) make specific reference to the CBD and NBSAP, however, the sectoral nature of Government may always place some restrictions of full integration and adoption of the ecosystem approach.

A related challenge is the institutional position of DEA, which is tasked with enforcing sustainable development and the protection of the environment, but which has no official powers over other government departments which are seen to be operating at the same level. This also restricts DEA's ability to influence the adopting of NBSAP activities by other departments, particularly those in other ministries. In instances where there is no department clearly defined, it may be necessary to give coordinating duties to DEA.

Until there is a shift in institutional arrangements within Government, that will accommodate local-level, cross-sectoral management, it may be necessary to institute a hierarchy of implementation for those activities assigned outside MEWT. This would mean always putting a DEA staff member in charge of a specific activity, who then is responsible for ongoing liaison and collaboration with the department conducting the technical aspects of the activity.

Despite the challenges faced, most of the activities in the 2007 NBSAP have been initiated, and are ongoing. Many of these activities extend beyond the 5-year lifespan of an action plan, and so it is unrealistic to see them completed. It is also encouraging to note that many of the departmental mandates – especially of the MEWT departments – already have activities in place that correspond to the Aichi targets. This will streamline the process of adopting and including these targets in the revised NBSAP.

15.4.1 Preliminary recommendations on the way forward for future NBSAP implementation

There are several key elements that require attention in order to strengthen the success rate for completing the activities of the action plan:

- Governance structure: Consideration needs to be given to the position of the competent authority in the hierarchy of government. The structure must be able to transcend

ministerial lines, so that channels for delegating tasks and for reporting can be efficiently instituted.

- MEA and policy alignment: The Convention on Migratory Species, as well as other relevant unsigned MEAs should be pursued. By-laws and regulations that specifically include biodiversity should be developed and implemented. Biodiversity conservation must be made explicit at all planning levels: national regional and district.
- Approaches to management: Landscape level approaches should be considered, and the ecosystem approach should be actively implemented. The institutional framework should be enhanced to support this – including delegation of decision-making to the district level.
- Channels of communication: Mechanisms for communication also need to be strengthened with regard to data sharing.

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UN Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Other Wastes

Un Cartagena Protocol on Biosafety

UN Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention)

UN Convention on International Trade in Endangered Species

UN Convention on Biological Diversity

UN Convention to Combat Desertification

UN Framework Convention on Climate Change

UN Guide to the Global Taxonomy Initiative

UN Rio Declaration on Environment and Development (Agenda 21)

UN Johannesburg Declaration on Sustainable Development

UN Kuala Lumpur Supplementary Protocol to Cartagena

UN Nagoya protocol on access and benefit-sharing

UN Ramsar Convention on Wetlands of International Importance

UN Rio +20 Statement on "The Future We Want"

UN Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

UN Stockholm Convention on Persistent Organic Pollutants

UN Vienna Convention for the Protection of the Ozone Layer

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APPENDIX 1: LIST OF STAKEHOLDERS CONSULTED

NAME	DEPARTMENT/ORGANISATION	TEL NO	FAX	MOBILE	E-MAIL ADDRESS	MODE OF CONSULTATION
CENTRAL GOVERNMENT DEPARTMENTS						
C. Mazereku	Department of Agricultural Research	3668203		74177447	cmazereku@gov.bw	Workshop & Questionnaire
Dr Pharaoh Mosupi	Department of Agricultural Research	3668134 / 3928108			pmosupi@gov.bw	Data Source
O.E. Kgosikoma	Department of Agricultural Research	3668203	3928900	72768904	mfana450@yahoo.com	Data Source
B. M. Makoba	Department of Agricultural Research	3668172		75035543	bmakoba@gov.bw	Data Source
C. Moatswi	Department of Crop Production	3928745		72614383	ccmoatswi@gov.bw	Workshop
A. Mogotsi	Botswana College of Agriculture	3650374	3928753		amogotsi@bca.bw	Data Source
G. Gaboutweloe	Botswana College of Agriculture	3650351		71435007	ggaboutloe@hotmail.com	Workshop
F.L Phillime	Attorney General's Chamber	3613891		72888708	fphillime@gov.bw	Workshop
G. P. Hubona	Attorney General's Chamber	3613905			ghubona@gov.bw	Workshop
T. Bareki	Ministry of Foreign Affairs and International Cooperation	3600840	3974572	76264877	tbareki@gov.bw	Workshop
A. Macheme	Department of Wildlife and National Parks	3191944	3932205	71578530	amacheme@gov.bw	Workshop
M. Munyadzwe	Department of Wildlife and National Parks	3971405	3914955	74877041	mmunyadzwe@gov.bw	Workshop
S. Sakuringwa	Department of Water Affairs	3607100		72205955	ssakuringwa@gov.bw	Workshop & Questionnaire
O. P. Motshwane	Department of International Trade	3685341	3188380		omotshwane@gov.bw	Workshop
K. Molosiwa	Department of Energy Affairs	3640200/3914200	3914201	71647069	kemolosiwa@gov.bw	Workshop
N. F. Moyo	Natural Disaster Management Office	3133048	394017	71758931	nmoyo@gov.bw	Workshop
Dr Michael Flyman	Department of Wildlife and National Parks	3996566/3171048			mflyman@gov.bw	Questionnaire
Mr Marumo	Department of National Museum and Monuments	3973860			mkjmarumo@gmail.com	Questionnaire
Ms Tswiio	Department of National Museum and Monuments	3973860			matlho2003@yahoo.com	Questionnaire
B. Gopolang	Department of Meteorological Services	3612222			bgopolang@gov.bw	Questionnaire
P. Mokotedi	Department of Tourism	3953024			pchilume@gov.bw	Questionnaire
D. Gaborekwe	Department of Environmental Affairs	3644635			ddoitsile@gov.bw	Questionnaire

M. Sentsho	Department of Wildlife and National Parks	3996585			mlsentsho@gov.bw	Data Source
S. Khuting	Department of Wildlife and National Parks (Fisheries)	3191031		71444050	skhuting@gov.bw	Data Source
O. Seabe	Department of Forestry and Range Resources	3954050	3954051	71653350	omseabe@gov.bw	Data Source
J. F. Ramontsho	Department of Forestry and Range Resources	3954050	3954051	72745807	jramontsho@gov.bw	Data Source
O. S. Manene	Department of Forestry and Range Resources	3954050	3191862	73440686	omanene@gov.bw	Data Source
S. Mosotho	Ministry of Youth, Sports and Culture	3954050		74012112	semosotho@gov.bw	Data Source
L. Basalomi	Ministry of Youth, Sports and Culture	3954050			lbasalumi@gov.bw	Data Source
Mrs Isaiah	National Herbarium and Botanical Gardens (NHBG)	3973860				
T. Lejowa	Ministry of Local Government and Rural Development	3919881	3971347	76322175	tndadi@gov.bw	Workshop
DISTRICT DEPARTMENTS						
NAME	**DEPARTMENT**	**TEL NO**	**FAX**	**MOBILE**	**E-MAIL ADDRESS**	**MODE OF CONSULTATION**
M. Moetsabatho	Department of Wildlife and National Parks-Kgalagadi	6540702/280	6540221/170	73419205	moetsabathom@gmail.com	Questionnaire
M. Promise	Department of Animal Production-Kgalagadi South (Tsabong)	6540212		72755616	pmahundu@gov.bw	Questionnaire
S. Kapeko	Department of Crop Production-Kgalagadi South (Tsabong)	6540300		72199980	skapeko@gov.bw	Questionnaire
J.G.N. Mafoko	Department of Forestry and Range resources (Ghanzi)	6597611		71549975	jomomafoko@gmail.com	Questionnaire
P. Isaac	Office of the District Commissioner-Kgalagadi	6540292			ptisaac@gov.bw	Questionnaire
K. Mosugelo	Department of Wildlife and National Parks-Ghanzi	6596323			dmosugelo@gov.bw	Questionnaire
K. Lekwapa	Department of Wildlife and National Parks-Hukuntsi	6510268			lekwapak@gmail.com	Questionnaire

RESEARCHERS, NON-GOVERNMENTAL ORGANISATIONS AND PARASTATALS						
R Fynn	Okavango Research Institute	6817218		74552306	rfynn@ori.ub.bw	Workshop
James Bradley	Kalahari Research and Conservation			72875659	jamesbradley@bristol.ac.uk	Workshop
JW Tico McNutt	BPCT	6862363		71525492	predatorconservation@gmail.com	Workshop
K Ngaka	Kalahari Research and Conservation			73855228	botetilion@gmail.com	Workshop
H Bartlam	Herbivore Research			72304084	hathebartlam@gmail.com	Workshop
Debbie Peake	BWMA/BWPA	6862671		71212148	172ebbie@mochaba.net	Workshop
Monametsi Sokwe	NCONGO	6862851		72304794	sokwe@ncongo.info	Workshop
Livingstone Kentshitswe	Tlhare Segolo	6864861		72397103	tlharesegolo@gmail.com	Workshop
Frances Murray-Hudson	PSUB	6817250		71482235	fmurray-hudson@ori.ub.bw	Workshop
Mike Murray-Hudson	Okavango Research Institute	6867232		75565649	mmurray-hudson@ori.ub.bw	Workshop
K. Senyatso	Birdlife Botswana	3190540	3190541	74867838	lbl@birdlife.org.bw	Workshop
H. Shoniwa	University of Botswana	3552587	3185097	74783487	hilaryshoniwa@yahoo.com	Workshop
M. Ditlhogo	Biological Sciences	3552605	3185097	71306673	ditlhogo@mopipi.bw	Workshop
D. Tlhamage	Cheetah Conservation	3500613	3960133	72303846	tlhamagedm@gmail.com	Workshop
M. Murray-Hudson	Okavango Research Institute	6817232			mmurray-hudson@ori.ub.bw	Questionnaire
A.P. Johnson	Botswana Wildlife Producers Association			71312723	jungleant@gmail.com	Questionnaire
D. Peake	Botswana Wildlife Management Association	6862677			debbie@mochaba.net	Questionnaire
F. Murray-Hudson	Pete Smith University of Botswana Herbarium			71482225	fmurray-hudson@ori.ub.bw	Questionnaire
Dr. J.W. McNutt	Botswana Predator Conservation Trust	6862363			tico@bpctrust.org	Questionnaire
Dr. C. Brooks	SAREP			71371623	cbrooks@sarepmaun.com	Questionnaire
S. Dambuza	Statistics Botswana	3181769	3952201	71726735	sgamguza@gov.bw	Data Source
D. Gaobotse	Statistics Botswana	3934968	3935628	76813167	dgaobotse@gov.bw	Data Source
K. Chigodora	Statistics Botswana			71541151	kwashic@gov.bw	Data Source
K. F.Dintwa	Statistics Botswana			71699261	kfdintwa@gov.bw	Data Source

APPENDIX 2: FOCUS GROUP WORKSHOP PROGRAMMES

Natural Systems – Government Stakeholders

Gaborone, 29th October 2013

Start Time	Session	Activity
07:45	**Registration**	Sign up sheets at door
08:00	**Overview and Objectives**	Prayer, welcoming remarks, introductions, objectives & programme, housekeeping
08:30	**Implementation of Existing NBSAP** What was and wasn't achieved	5 min presentation by each institution (10 min for DEA, DWNP, DFRR)
10:00	*15 min refreshment break*	
10:15	**Implementation of Existing NBSAP** Challenges to implementation	Plenary discussions
11:45	**Implementation of Existing NBSAP** Solutions to challenges	Group work, followed by plenary report-back
12:45	*45 min lunch break*	
13:30	**Biodiversity Vision** Evaluation and revision	Plenary discussions
14:20	**Aichi Targets** Introduction to the 20 points, and identification of lead institutions	Ecosurv presentation and plenary discussions
15:00	*15 min refreshment break*	
15:15	**Botswana's Biodiversity Status and Trends** Threats to ecoregions – priority actions	Plenary discussions
16:05	**Botswana's Biodiversity Status and Trends** Species of concern – priority actions	Group work, followed by plenary report-back
17:00	**Wrap-up**	Closing remarks, way forward

Natural Systems – NGOs, Researchers, Special Projects

Gaborone, 30th October 2013

Start Time	Session	Activity
07:45	**Registration**	Sign up sheets at door
08:00	**Overview and Objectives**	Prayer, welcoming remarks, introductions, objectives & programme, housekeeping
08:30	**Biodiversity Vision** Evaluation and revision	Plenary discussions
09:30	**Botswana's Biodiversity Status and Trends** Threats to ecoregions – major threats	Group work, followed by plenary report-back
10:15	**Botswana's Biodiversity Status and Trends** Threats to ecoregions – research and support needs	Plenary discussions
11:00	*15 min refreshment break*	
11:15	**Botswana's Biodiversity Status and Trends** Species of concern – trends	Group work, followed by plenary report-back
12:00	**Botswana's Biodiversity Status and Trends** Species of concern – research and support needs	Plenary discussions
12:30	**Biodiversity and Economics** Opportunities and threats	Plenary discussions
13:15	**Wrap-up**	Closing remarks, way forward
13:30	*Lunch*	

Agricultural Systems – Government Stakeholders

Gaborone, 31st October 2013

Start Time	Session	Activity
07:45	**Registration**	Sign up sheets at door
08:00	**Overview and Objectives**	Prayer, welcoming remarks, introductions, objectives & programme, housekeeping
08:30	**Implementation of Existing NBSAP** Successes, Challenges, Solutions	5 min presentation by each institution, followed by plenary discussions
09:00	**Biodiversity Vision** Evaluation and revision	Plenary discussions
09:30	**Aichi Targets** Introduction to the 5 Strategic Goals, and identification of lead institutions for relevant targets	Ecosurv presentation, and discussions
10:30	*15 min refreshment break*	
10:45	**Botswana's Biodiversity Status and Trends** Species of concern – trends & priority actions	Plenary discussions
12:30	**Agro-Biodiversity and Economics** Livelihoods, Incentives/Disincentives, Values and Uses	Plenary discussions
13:15	**Wrap-up**	Closing remarks, way forward
13:30	*Lunch*	

Natural Systems – NGOs, Researchers, Special Projects

Maun, 5th November 2013

Start Time	Session	Activity
07:45	**Registration**	Sign up sheets at door
08:00	**Overview and Objectives**	Prayer, welcoming remarks, introductions, objectives & programme, housekeeping
08:30	**Biodiversity Vision** Evaluation and revision	Plenary discussions
09:30	**Botswana's Biodiversity Status and Trends** Threats to ecoregions – major threats	Group work, followed by plenary report-back
10:30	*15 min refreshment break*	
10:45	**Botswana's Biodiversity Status and Trends** Threats to ecoregions – research and support needs	Plenary discussions
11:45	**Botswana's Biodiversity Status and Trends** Species of concern – trends	Group work, followed by plenary report-back
12:45	*Lunch*	
13:45	**Botswana's Biodiversity Status and Trends** Species of concern – research and support needs	Plenary discussions
14:45	**Biodiversity and Economics** Livelihoods, Incentives, Values	Plenary discussions
15:15	**Wrap-up**	Closing remarks, way forward
15:30	*Refreshments*	

APPENDIX 3: METADATA FOR ECOLOGICAL AND ECONOMIC DATA USED IN THIS REPORT

Environmental and Biological Data

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
Aerial census of animals in Botswana 2012 dry season	2012	DWNP	PDF report and shape files	Annual irregular	Data and report	High	National	Dr Flyman	mflyman@gov.bw
Dry season aerial survey of northern Botswana	2010	Elephants without Borders	Shape files and PDF report	irregular	Data and report	High	Chobe, Ngamiland, Central districts	Dr Flyman	mflyman@gov.bw
Social and Genetic population structure of free-ranging cheetah in Botswana: Implications for conservation	2013	DWNP	document	once off	Report	High	National	Dr Flyman	mflyman@gov.bw
Aerial survey of the SW Kalahari undertaken as part of the SW Kalahari Corridor project Approximately 2010	2010	Moses	Shape files and PDF report	once off	Data and report	High	Kgalagadi	Dr Flyman	mflyman@gov.bw
Plants- Draft list for species status in the Okavango, looking at the species that might present concern.	2013	Allison and Roger Haides		irregular	update	High	Okavango	Dr Flyman	mflyman@gov.bw
Conservation and Management Strategy for the White Rhinoceros *Ceratotherium simum* and the Black Rhinoceros *Diceros Bicornis* In Botswana	2005	DWNP	Document	once off	Hard copy report	Medium	National	Dr Flyman	mflyman@gov.bw
Okavango Crocodile monitoring programme	2013	Sven Bourquin & Vince Shacks	Progress reports and possible data or shapefiles	Annual	Report summary	High	Okavango	Dr Flyman	mflyman@gov.bw
Cheetah Conservation Society Report		Andries Snyman(CCB)	Data set / shapefiles			High	Tuli block	Dr Flyman	mflyman@gov.bw

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
All carnivore survey between the CKGR and KTP	2013	DWNP	PDF reports		update	High	National	Dr Flyman	mflyman@gov.bw
Leopard ecology and conservation	2013	DWNP	PDF reports		update			Dr Flyman	mflyman@gov.bw
District fish capture results for 2010-2012	2012	DWNP	Data set	Annual	Hard copy report	Medium	National	Supi Khuting	skhuting@gov.bw
Total burnt area in 2006 to 2011 by district	2006-2011	DFRR	Table xls	Annually	raw data	High	National	Ms Seabe	omseabe@gov.bw
Change in protected forestry areas	1990-2010	DFRR	Table	irregular	Report	High	National	Mr Ramontsho	jramontsho@gov.bw
Burnt Scars (2008 and 2009 no spatial reference)	2006-2011	DFRR	Shape files	Annually	maps/tables	Medium	National	Ms Mosotho	
Information from the Limpopo system	2013	Mr Molefe			update	High	Limpopo	Dr Flyman	mflyman@gov.bw
Latest information on Climate change policy, Basili	2013	DWNP	PDF report	one off	update		National	Flyman	mflyman@gov.bw
Tabular data on (a) HWC and (b) poaching, broken down by district , from 1999 – 2012	2013	DWNP	spreadsheet		Full report	High	National	Flyman	mflyman@gov.bw
Independent Researcher Database	2013	DWNP	Spreadsheet or Doc	Regularly updated	Full	High	National	Dr Flyman	mflyman@gov.bw
HWC annual and monthly data by district	2010-2012	DWNP	Spreadsheet digital	Annual	Full	Medium	National	Dr Flyman	mflyman@gov.bw
World Bank HWC Project (taxonomic survey data for five protected areas in Botswana)	2007	DWNP	PDF	irregular	Full	High	National	Dr Flyman	mflyman@gov.bw
Botswana – Elephant trophy hunting quotas, offtake and tusk weights	2012	DWNP	Report	annual	Full	Medium	National	Dr Flyman	mflyman@gov.bw
Key factors and related principles in the conservation of the large African carnivores	2012	DWNP	hard copy report	irregular	Full	High	National	Dr Flyman	mflyman@gov.bw

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
Elephants: A way forward	2013	DWNP	Book	irregular	Full	High	National and International	Dr Flyman	mflyman@gov.bw
Hunting quota for 2009, 2010, 2011	2012	DWNP/ Statistics Botswana	Document/ PDF report	Annual	Report	High	National	Dr Flyman	mflyman@gov.bw
Calibration of calling stations for non- response of lions and population trends in NG/29 and NG/30 in the Okavango Delta Botswana.	2008	DWNP	Report	one off	Full	High	Okavango	Dr Flyman	mflyman@gov.bw
Kalahari Wildlife Assessment summary report	2009	DWNP	Report	one off	Full	Medium	Kgalagadi	Dr Flyman	mflyman@gov.bw
Leopard ecology and conservation in Khutse Game Reserve	2012	DWNP	Report	quarterly	Full	High	Kweneng	Dr Flyman	mflyman@gov.bw
Kavango Zambezi Transfrontier Conservation Area (KAZA) TFCA, Wild Dog Country Report.	2012	DWNP	Report	irregular	Full	High	Okavango	Dr Flyman	mflyman@gov.bw
Wildlife mortality statistics by district	2010-2013	DWNP	Spreadsheet digital	Annual	Full	Medium	National	Dr Flyman	mflyman@gov.bw
Makgadikgadi Framework Management Plan	2010	CAR and DEA	PDF report	once off	Report	High	Makgadikgadi area	Mr. Mpofu	kmpofu@gov.bw
Update on the trend from Lesoma vulture colony	2013	BLB	Report	Annual	Update	High	Chobe	Dr Senyatso	blb@birdlifebotswana.org.bw
Common Bird Population Monitoring Report		BLB	Report	Annual	Full report	Medium	National	Dr Senyatso	blb@birdlifebotswana.org.bw
IBA status report		BLB	Report	Annual	Full report	High	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Assessing range-wide conservation status change in an unmonitored widespread African bird species	2012	BLB	Article	Irregular	Full report	High	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Short clawed lark working estimate study	2013	BLB	PDF report	Irregular	Update	High	National	Dr Senyatso	blb@birdlifebotswana.org.bw

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
Reporting of game birds in protected areas and in WMAs.	2013	BLB	Report	Annual	Update	High	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Biodiversity value for Makgadikgadi area	2011	BLB	PDF Report	Irregular	Full report	High	Makgadikgadi pans	Dr Senyatso	blb@birdlifebotswana.org.bw
Common Bird Monitoring Program	2013	BLB	Spreadsheet	Bi annual	Not available	Medium	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Short article on game birds as a cause for concern derived from Common Bird Monitoring Program	2009-2013	BLB	article	Irregular	Article	Medium	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Up to date Bird species list to be obtained from the website	2013	BLB	PDF report or spreadsheet	annually	Website	High	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Bird flight/movement corridors	2013	BLB	Map or shapes	Irregular	AEWA Website	High	National and international	Dr Senyatso	blb@birdlifebotswana.org.bw
Protected area of forestry reserves (actual area may be due to degazetting)	2013	DFRR	Word doc	irregular	Report	High	National	Mr Basalomi	lbasalomi@gov.bw
List of alien invasive species	2013	DFRR	Word doc	irregular	List	High	National	Mr Basalomi	lbasalomi@gov.bw
Prosopis management plan(Draft)	2013	DFRR	pdf	irregular	Draft report	Medium	National	Mr Mokgwathi	swmokgwathi@gov.bw
Invasive grass species found in Tswapong and Bobirwa area	2009-2013	BAC	PDF report	Irregular	update	High	North east District	Ms Mogotsi	amogotsi@bca.bw
Update of the new data list for rare and endangered species as well as alien and invasive species together with their location	2009-2013	BAC	Spreadsheet	Irregular	update	High	National	Ms Mogotsi	amogotsi@bca.bw
New location data regarding the species list Ecosurv provided	2009-2013	BAC	Spreadsheet	Irregular	update	High	National	Ms Mogotsi	amogotsi@bca.bw
Pete Smith Herbarium online species lists	Ongoing	ODIS	PDF	Irregular	Public access	High	Okavango Delta	None	
Red Data List Species of Botswana (Vulnerability review)	2006	RBG Kew	Spreadsheet	Irregular	Kew Staff and Partner Countries	High	Botswana	Sharon Balding	Sharon.Balding@kew.org

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
All Botswana seeds at Millennium Seed Bank	2013	RBG Kew	Spreadsheet	On request	Kew Staff and Partner Countries	High	Botswana	Emma Williams	e.williams@kew.org
All Botswana seeds at National Agricultural Research Centre	2013	RBG Kew	Spreadsheet	On request	Kew Staff and Partner Countries	High	Botswana	Emma Williams	e.williams@kew.org
New plant species recorded for Botswana	2013	RBG Kew	Spreadsheet	On request	Kew Staff and Partner Countries	High	Botswana	Emma Williams	e.williams@kew.org
Botswana Environment Statistics 2012	2013	Statistics Botswana	PDF report	every 6 years	Report	High	National	Statistician General	csobots@gov.bw
Dragonfly species and status list	2010	Kipping	PDF journal article	Irregular	Report	High	Okavango Delta	Jens Kipping	biocartkipping@email.de

Socio-economic Data

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
DWNP Park visitors	2000-2012	DWNP	Excel spreadsheet	regular	Data	Some gaps	park & reserve	Dr Flyman	mflyman@gov.bw
DWNP Park revenues	2000-2012	DWNP	Excel spreadsheet	regular	Data	Some gaps	park & reserve	Dr Flyman	mflyman@gov.bw
Economic valuation of the Okavango Ramsar site	2006	DEA / Turpie et al	PDF report	once off	Report	High	Okavango Ramsar site	Mrs. Segomelo	psegomelo@gov.bw
Status and trend in CBO incomes from CBNRM activities (returns from consumptive and non-consumptive resource and tourism activities)	2013	DWNP	Reports				National	Dr Flyman's Desk officers	mlsentsho@gov.bw
CBNRM national reports	2011-2012	DWNP	spreadsheet	Annual	Full	Medium	National	Dr Flyman	mflyman@gov.bw
CBNRM CBOs using bird tourism (e.g. Chobe enclave, Tswapong hills scheme, Southern Sua pan trust, Gumatshoga conservation trust, Nata sanctuary, Bonang Frans and Lake Ngami)	2013	BLB	Verbal	Irregular		medium	National	Dr Senyatso	blb@birdlifebotswana.org.bw
Change in number and area of CBNRM CBOs, change in income to CBNRM CBOs	2012	DWNP	Data set	irregular	Full report	High	National	Dr Flyman's Desk officers	mlsentsho@gov.bw
List of natural resources/ Products that need a license for harvesting, trade and exports	2013	DFRR	Hard copy (from the Act)	Annually	Hard copy report	High	National	Mr Manene	omanene@gov.bw
List of licence fees for harvesting of natural resources	2010-2013	DFRR	Hard copy	Annually	Hard copy report	High	National	Ms Manene	omanene@gov.bw
The total number of license of each category sold per year	2010-2013	DFRR	Word doc	Annually	Tables	medium	National	Ms Manene	omanene@gov.bw
Up-dated information on game ranching	2013	Farrington/ BWPA	PDF report	irregular	Report	Medium	National	Ms. Patterson	info@botswanawildlifeproducersorganisation.com

Name/Title	Date	Source	Type / Format	Frequency	Data Access Level	Data Fitness	Geographic Extent / locality	Contact Person	Email of Contact
Gross revenues CBOs in CBNRM status 2011-12 report	2013	Mbaiwa / KCS	PDF report	Irregular	Report	Medium	National & CBOs	KCS	jembaiwa@gmail.com
CBO revenue data	2000-2010	DWNP	Excel	Annual	Data	Medium	National & CBOs	Dr Flyman	mflyman@gov.bw
Exports & imports of CITES species for Botswana	2008-2012	CITES data base	Excel	Annual	Data	High	National & CBOs		www.cites.org
Harvest permit veld products	2010-2013	DFRR	word tables	Annual	Data	High	National and District	Ms Manene	omanene@gov.bw
Dealers permits veld products	2010-2013	DFRR	word tables	Annual	Data	High	National and District	Ms Manene	omanene@gov.bw
Export permits	2010-2013	DFRR	word tables	Annual	Data	High	National and District	Ms Manene	omanene@gov.bw
Botswana Core Welfare Indicators Survey	2011	Statistics Botswana	PDF report	Irregular	Report	High	National	Statistician General	csobots@gov.bw
Livelihoods and Biodiversity in the Okavango Delta, Botswana	2005	CAR	PDF report	Once off	Report	High	Okavango	Dr Arntzen	jarntzen@car.org.bw
Botswana Human Development Report	2008		Word document	Once off	Final Draft Report	Medium	National		

APPENDIX 4: DETAILED ECONOMIC VALUATION AT THE NATIONAL LEVEL

This appendix contains further details of work done on the economic analysis for the review of the NBSAP. This refers in particular to analysis that cuts across ecoregions, and is in our view relevant for the revised NBSAP. The following topics are elaborated upon:

- Game stock values
- Park and Reserve tourism)
- Community based organisations
- Trade in CITES species
- Livelihoods, poverty and biodiversity
- Problem animals and livelihoods
- Harvesting, trade and export of veld products

A: VALUE OF BOTSWANA GAME STOCK BY ECO REGION

Note: value estimates are based on a limited number of wildlife species (see main report).

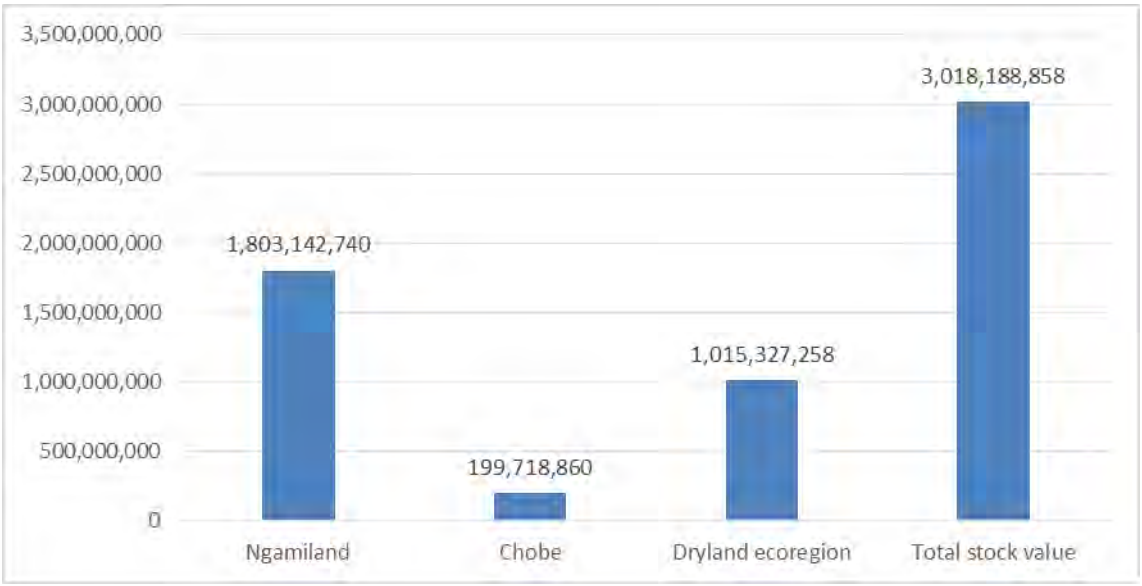

Figure 1: Game stock value based on 60% of SA auction prices; buffalo @ 10% of SA price (BWP)

Game resources are valuable throughout the country, but most valuable in the Okavango eco region.

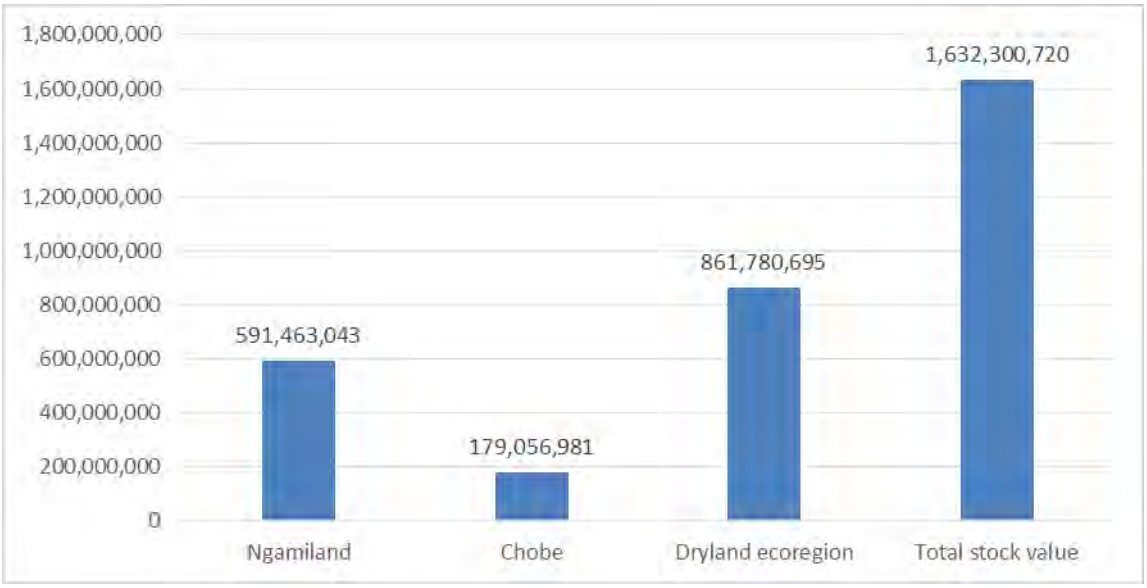

Figure 2: Game stock value based on 60% of SA Auction prices and domestic buffalo price

Lower value of buffalo reduces the game stock value substantially, especially in the Okavango eco region.

Figure 3: Estimated value of Botswana's game stock (2001 - 2012; 2006 constant BWP values)

The value of the game stock has almost doubled in the period 2001 – 2012.

B: DETAILS OF PARK AND RESERVE TOURISM

CNP accounts for the majority of visitors and its share is increasing in time.

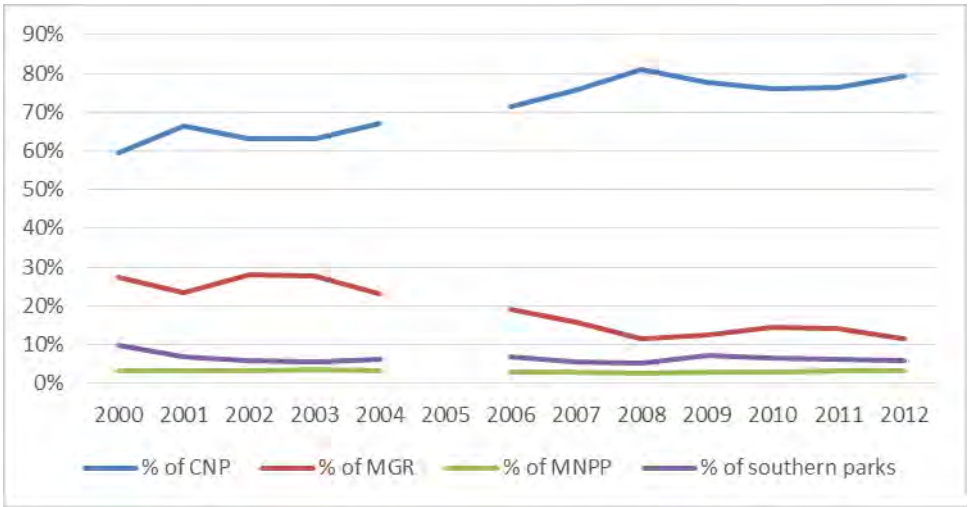

Figure 4: Trend in share of Park visitors by Park (2000 – 2012), based on DWNP data.

Revenues have fluctuated between BWP15 to 25 million and show no trends towards increased revenues.

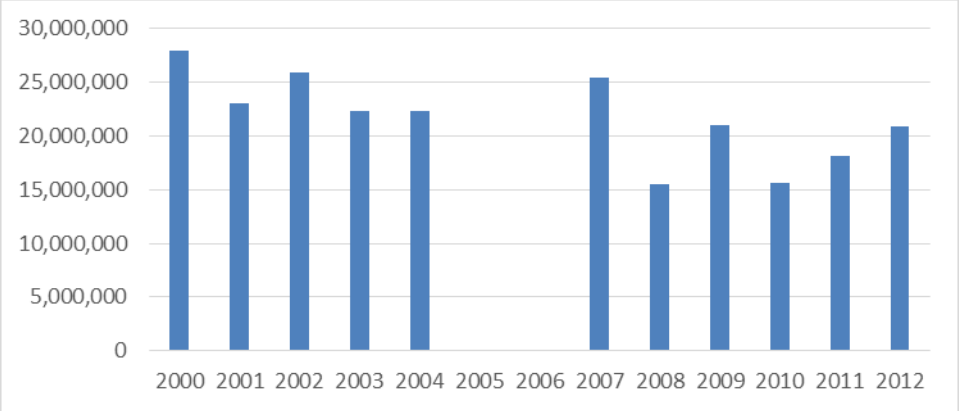

Figure 5: Trend in DWNP Park/Reserve revenues (constant 2006 BWP)

KTP, CKGR, KGR and MNPNP attract a majority of private visitors. CNP attract mostly day visitors.

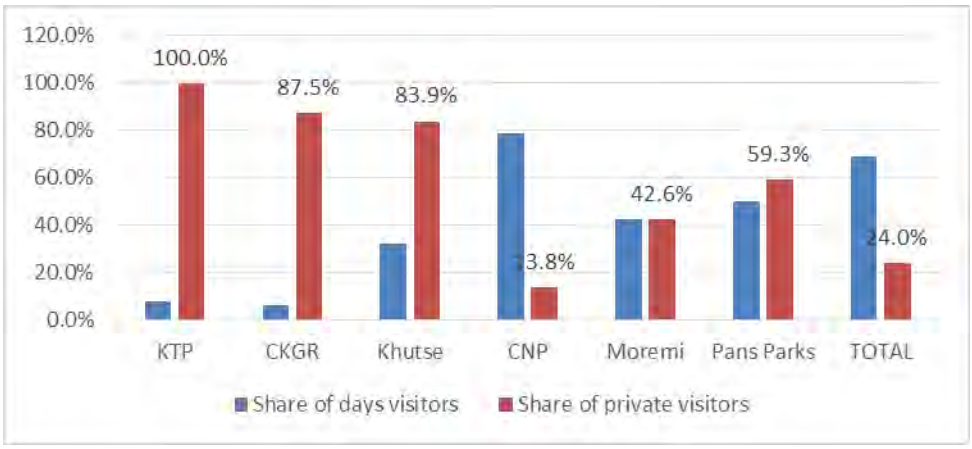

Figure 6: Type of visitor by DWNP Park / Reserve (2012)

Tourist densities are generally low to modest with the exception of CNP where densities are high and increasing, especially along the river front.

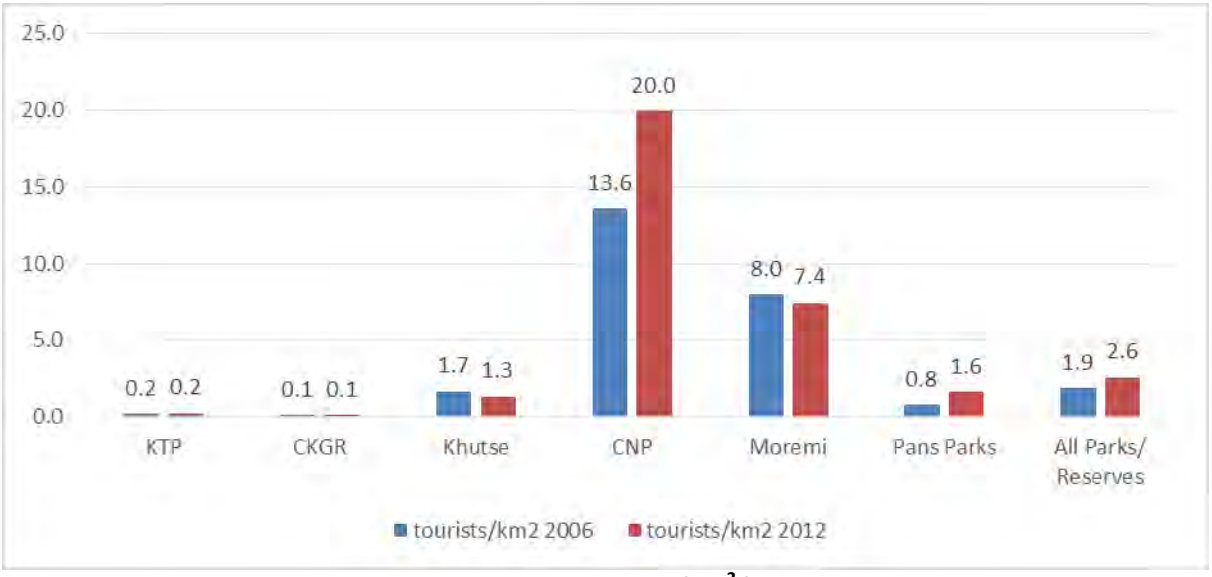

Figure 7: Tourist densities in Parks & Reserves (tourists/km^2/annum)

C: DETAILED INFORMATION OF CBOS

The trend in revenues is shown in Figure 8. CBO revenues grew rapidly from around BWP 1 million in 1997 to over BWP20 million in 2008. Since 2008, revenues have declined, particularly in real terms. Revenues are just over half of the DWNP Park revenues. The rapid initial growth can be attributed to the growing number of active CBOs and expansion of activities. The decline seems to coincide with the implementation of the 2007 CBNRM Policy, which was meant to support and grow CBOs and rural livelihoods. This has not happened, possibly due to the fact that the fund introduced in the policy has discouraged CBOs from further development and expansion.

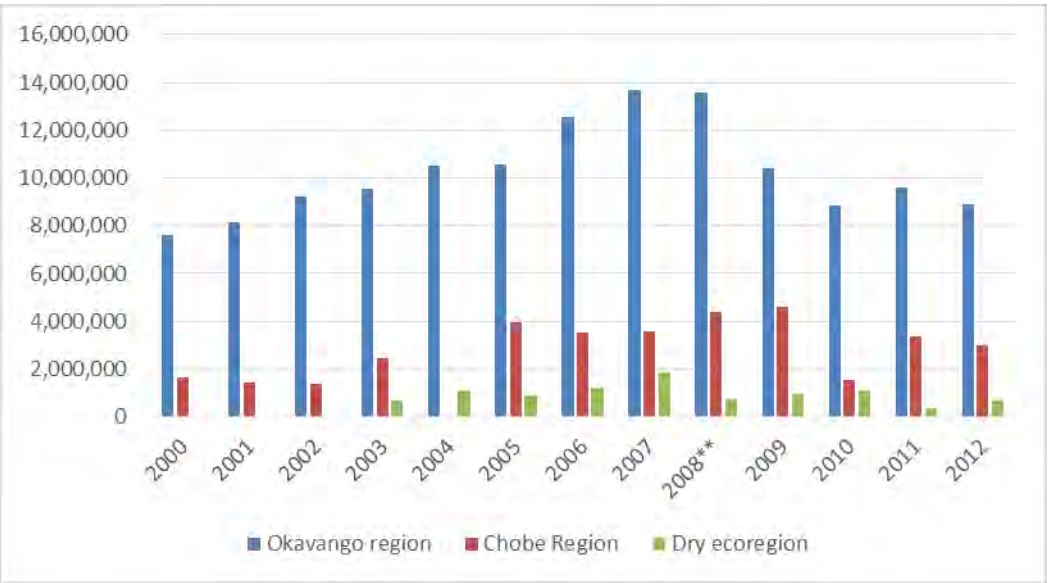

Figure 8: Gross CBO Gross revenues in constant 2006 BWP

CBO revenues have increased during the period 2000 – 2007 but are declining since then. Note of caution: there is no time series data base for all CBOs. The figure is based on the best available data.

The distribution of the revenues is very uneven. Figure 9 shows that five CBOs near Parks receive 60 to 80% of the CBO revenues with an average of 68% in the period 1997 - 2012; the remaining 17 CBOs generate 20 to 40% of the revenues. Clearly, CBOs benefit greatly from Protected Areas.

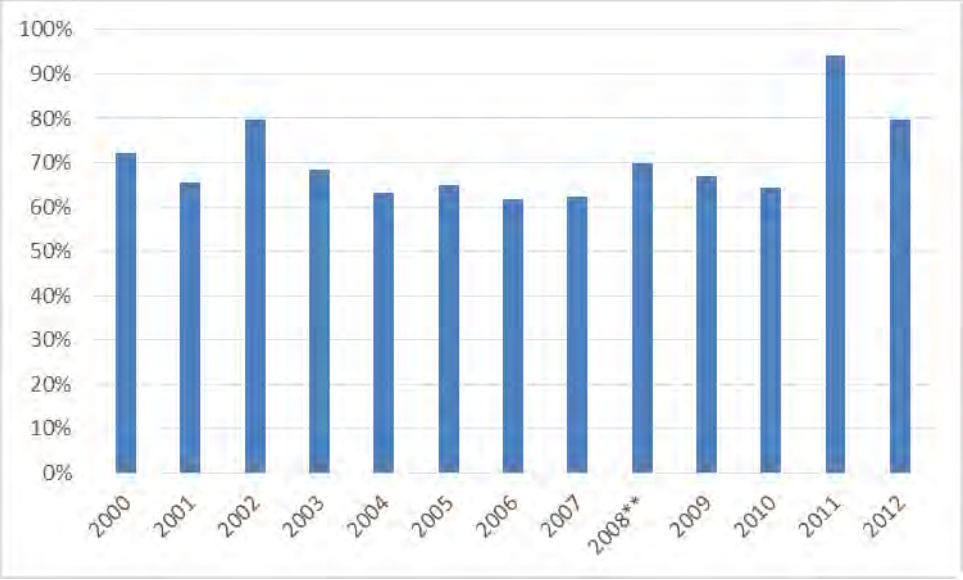

Figure 9: Trend in revenue share (%) of five CBOs (CECT, STMT, MZCDT, KDT, OKMC)

Table 1: Revenue from CBOs in Ngamiland District (BWP; 2000-2012)

Year	Sankuyo	Khwai	Mababe	OCT	OKMCT
2000	215 923	1 129 783	687 000	878 993	1 100 000
2001	227 448	833 525	828 733	1 278 068	1 155 000
2002	1 496 394	1 214 567	867 917	1 356 631	1 200 000
2003	1802 633	446 258	1 121 427	1 579 111	1 300 000
2004	1 734 666	1 250 567	1 183 295	2 453 077	-
2005	2 127 412	1 564 454	1 319 995	1 766 155	2 090 580
2006	2 321 066	1 691 723	1 335 683	2 500 000	2 193 364
2007	2 507 497	2 426 667	2 426 667	2 457 851	3 121 780
2008	3 314 031	3 146 932	3 146 933	2 500 000	4 160 180
2009	2 711 277	2 704 437	1 566 149	2 500 940	4 137 424
2010	3 378 061	2 552 417	1 996 132	3 185 940	3 486 718
2011	2 063 762	4 274 939	No data	2 771 962	4 633 025
2012	No data	No data	2 000 000	No data	4 360 981

Source: Mbaiwa, 2013.

Figure 10 shows that per ha CBO revenues are the highest in the northern eco region. Land returns are very low in the dry land eco region, particularly the south-western part.

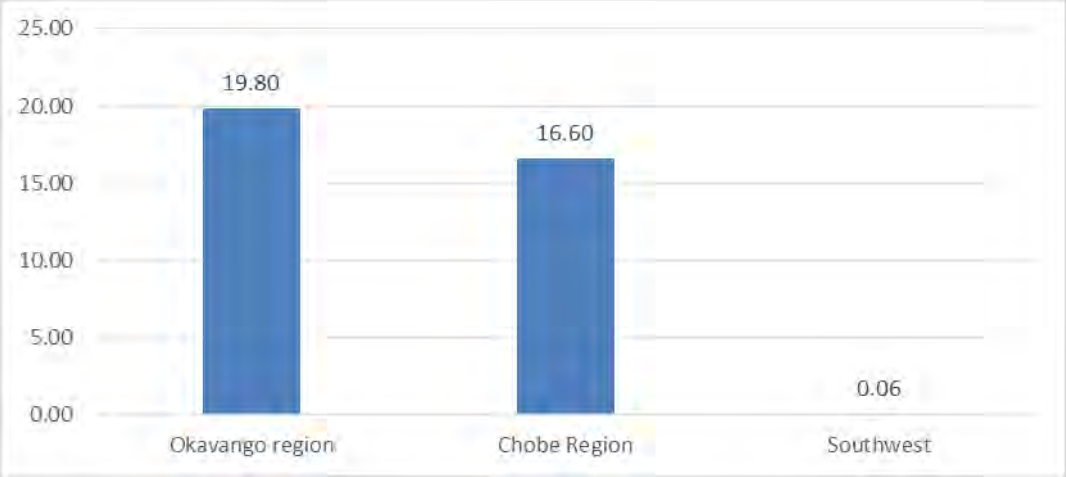

Figure 10: Gross CBO revenues in different eco regions (2012; BWP/ha)

CBOs generate higher revenues/ ha than the DWNP Parks and Reserves with the exception of CNP (Figure 11). This can be attributed to the fact that most CBOs benefit from proximity to Parks and Reserves and manage smaller areas themselves.

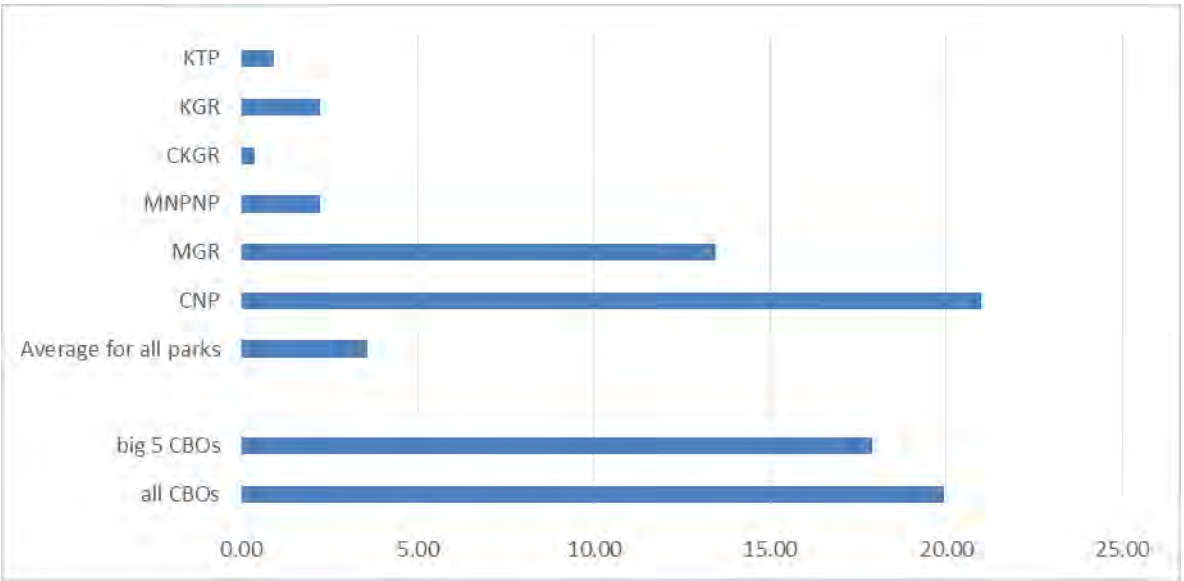

Figure 11: Revenues/ ha in DWNP Protected Areas and CBOs (2012)

Notes: 1) Big 5 CBOs are: CECT, TMT, MZCDT, KD and OKMCT. 2) Parks: KTP = Kalahari Transfrontier Park, KGR = Khutse Game Reserve, CKGR = Central Kalahari Game Reserve; MNPNP = Makgadikgadi & Nxai Pan National Park; MGR = Moremi Game Reserve; CNP = Chobe National Park

D: TRADE IN CITES SPECIES

The use value can also be reflected in import and export patterns. Recent data in imports and exports of animal and plant species could not be obtained from Statistics Botswana. However, a data was found for imports and exports of endangered species. The Convention for International Trade in Endangered Species (CITES) regulates the global trade in endangered species, and export or imports of listed species are either not permitted (CITES appendix 1), or subject to control and notification (CITES appendix 2 - globally endangered species; CITES appendix 3 - nationally endangered species). Botswana exports live animals and animal products, mostly trophies and skins. Exports of plants and birds are rare.

Exports of live animals and trophies have decreased sharply since 2009 and are now close to zero (Figure 12). Exports of skins are very low with the exception of 2010 when 36 301 crocodile skins were exported, presumably from a crocodile farm. The decline in export reduces the risk of loss of biodiversity but also the value of natural resources.

Imports of CITES species have similarly declined (Figure 13). The import of live plants is more common than that of animals. Imports of wildlife products are minimal. In terms of amounts, imports of hoodia products (derivates, powder etc.) appear significant. A wide variety of cycads and aloes is also imported in small numbers. The decline in imports reduces the risk of biodiversity ''pollution'' with alien species, but can also restrict opportunities to import locally threatened species and new genetic sources for breeding.

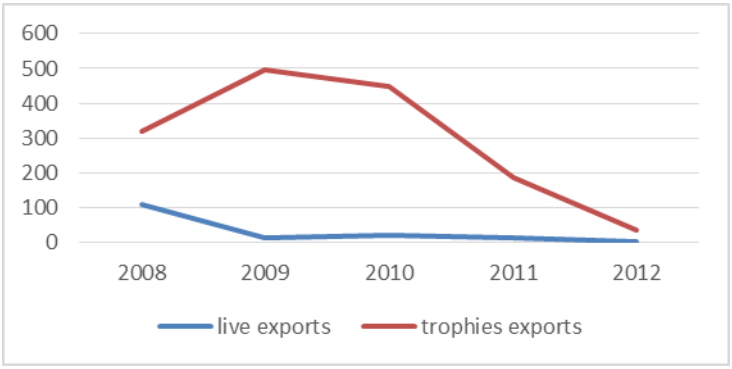

Figure 12: Trend in gross export of live animals/ plants and trophies (2008 – 2012), Source: CITES Trade Database, accessed 24 Sept 2013

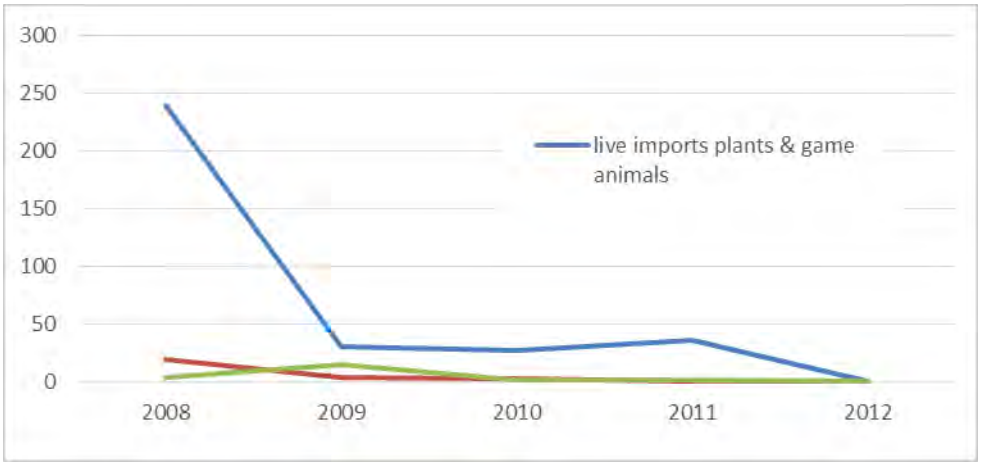

Figure 13: Trend in gross imports of animals and plants (products) , Source: CITES Trade Database, accessed 24 Sept 2013

E: LIVELIHOODS, POVERTY AND BIODIVERSITY

Botswana has carried out regular livelihood surveys over the last decade. The overall trends have shown a decline in poverty at the national level, an increase in income inequality and large regional differences in poverty.

According to the latest survey, poverty has declined from 30.6% in 2002/3 to 19.3% in 2009/10 (SB, 2013). Poverty levels are lowest in urban areas (8%) and highest in rural areas (24.3%). However, poverty decreased fastest in rural areas (44.8% in 2002/3). Persons most likely to be poor live in households with unmarried and untrained household heads, who engage in subsistence agriculture or have lowly paid jobs such as petrol attendants, security guards or shop assistants. In cities and towns, household heads that work in the private sector are more likely to be poor. Areas with above average poverty levels are mostly located in northern and western Botswana[15]: Ngamiland, western parts of Southern and Kweneng Districts, Ghanzi and northern Kgalagadi. In terms of expenditures, transport, food and accommodation are the largest expenditure categories. Together these categories accounts for around half of people's final consumption.

[15] Bobonong central and Barolong are the eastern parts with above average poverty.

Income inequality has increased as measured by the Gini coefficient, which has increased from 0.573 in 2002/03 to 0.645 in 2009/10 (1 is completely unequal; 0 is completely equal). Inequality is rural areas and large villages.

In-kind income from gathering etc. is most important in rural areas and contribute a third of disposable income in rural areas (compared to only 7% in urban areas). This suggest that family networks and collection of natural resources remain important livelihood sources in rural areas. Unfortunately, no further breakdown of data could be obtained for this study.

Most CBOs make an insignificant contribution to rural livelihoods. The average gross annual revenues from the CBOs was BWP336/ annum or BWP28/ month (data available for 17 CBOs). Mababe inhabitants received the highest revenues (BWP965/ month/person); only three CBO had gross revenues of over BWP500/ month and another two had gross monthly revenues of BWP100 – 499/ person.

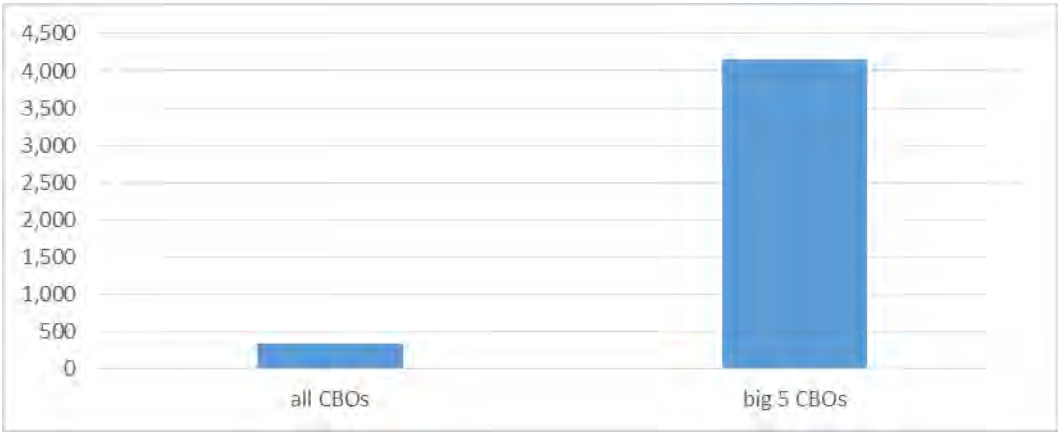

Figure 14: Gross revenues per village inhabitant (2012).

F: PROBLEM ANIMALS AND LIVELIHOODS

Human wildlife conflicts are common in areas with wildlife resources and people. Government offers compensation for damage to livestock, fields and property inflicted by nine species. The conflicts by these species have increased from 2 875 in 2009 to 3 409 in 2011. Figure 15 shows that three species (elephant, lion and leopard) together cause 90% of the PAC. Elephant and lion damage occurs mostly in northern Botswana (Ngamiland, Chobe and northern parts of Central District) while leopards cause problems throughout the country, including in south-western Botswana. Species such as cheetah and wild dog cause mostly problems in south western Botswana (Kgalagadi and Ghanzi). A human wildlife co-existence white Paper is currently in preparation by the DWNP (a Green Paper was completed in 2010 by CAR).

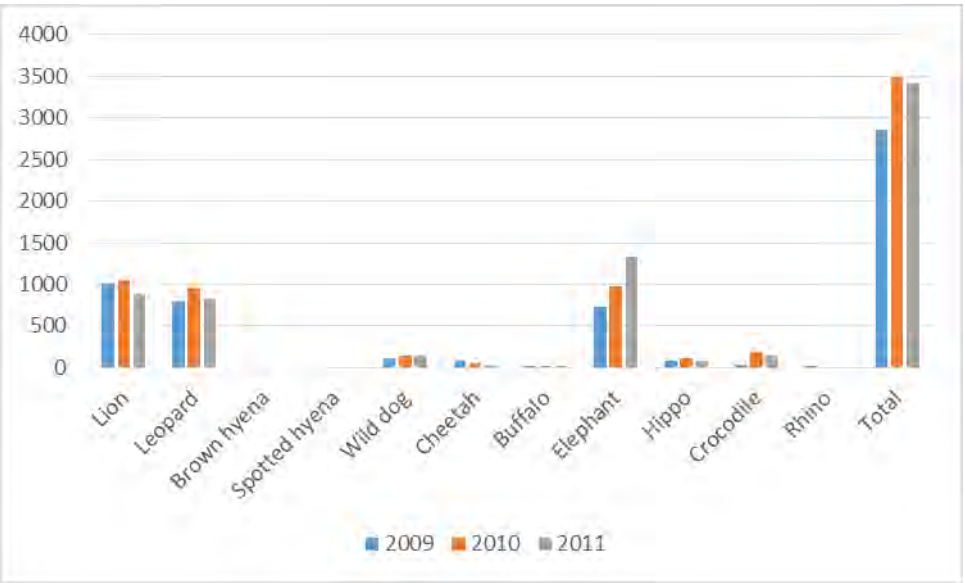

Figure 15: PAC incidences for species attracting compensation (2009-2011), based on DWNP data

In a study in northern Botswana, Bowie (2009) found that crop damage by elephants per crop producing household was estimated at BWP 220 (2006 prices) and for livestock losses BWP 225/ per livestock producing household with the highest damage around the Kwando and Chobe Rivers.

In terms of the spatial distribution of PAC incidences, reliable data were obtained from DWNP regarding details of the PAC for the year 2010/11. In the year 2010/11, Central District and Ngamiland have the highest PAC incidences. Chobe, Kweneng, Ghanzi and Kgalagadi have medium levels of PAC, while reported PACs are low in South-East, Southern and Kgatleng. The main reason is that the latter districts have low populations of wildlife species that attract compensation (less than 40% of the reported PACs attracted compensation).

The spatial picture changes if the indicators of PA cases/km^2 and PAC cases/person are used. In terms of incidences per km^2, South East has the highest incidence while Kgalagadi and Ghanzi scored lower because of their vastness. In terms of PAC/head of population, Chobe District scores highest together with the other high incidence districts (Ngamiland, Ghanzi and Kgalagadi). The high score of Chobe is due to its small population. Central District is average (as compared to Botswana).

G: UTILISATION OF VELD PRODUCTS

The Agricultural Resources Conservation Act (ARCA 2006 regulations) details the harvesting license requirements and conditions for six categories of veld products (Table 2).

Table 2: Veld products regulated under the ARCA 2006 regulations

	Scientific name	Common name	Harvesting conditions
A: 2 species	*Hoodia* species *Harpagophytum* species	Thokabotshwaro/Sekopane/Seboka/ Hoodia Sengaparile/Grapple Plant/ Devils Claw	harvesting requires permit except for domestic use
B: 8 species	*Lippia scaberrima* *Lippia javanica* *Artemisia afra* *Terfezia pfeilii* *Myrothamnus flabellifolius* *Strophanthus kombe* *Indigofera tinctoria* *Cassia abbreviata*	Mosukudu/Fever Tea Mosukujane/Mosukubyane/Fever Tea Lengana/Wild wormwood Mahupa/Truffles Gala la tshwene/Resurrection plant Kombi/Poison Rope Mhero/Africa Indigo (basket dyes) Monepenepe/Long tailed cassita	Permit required for amounts of over 2kg/person/month
C: 1 species	*Imbrasia belina*	Phane/ Caterpillar	Permit required for amounts exceeding 10 kg/p/month
D: 11 species	*Sclerocarya birrea subsp caffra* *Adansonia digtata* *Orthanthera jasminiflora* *Mimusops zeyheri* *Vangueria infausta* *Betchemia discolour* *Grewia species* *Azazanza garckeana* *Strycnos cocculoides* *Strycnos spinosa* *Phragmites australis*	Morula Mowana/Baobab Mosata/Nama ya setlhare Mmupudu/Red Milkwood Mmilo/ wild medlar Motsintsila/ Brown Ivory Mogwana/Moretlwa Morojwa/SnotApple Mogorogorwane/ Corky monkey apple Morutlwa /Green monkey apple Letlhaka/Common reed	No permit required
E: 1 species	*Hyphaene pertesiana*	Mokolwane/ Mokola/ Fan palm	Permit needed for more than 10 bundles/hh/month
F: 7 species	*Eragrostis pallens* *Cymbopogon plurinoides* *Cymbopogon excavates* *Hyparrhenia hirta* *Hyparrhenia filipendula* *Hyparrhenia dissolute* *Stipagrostis uniplumis*	Motshikiri/ Thatching grass Mokamakama/Thatching grass Mosagasolo/Thatching grass Thatching grass Thatching grass Thatching grass Tshikhitshane/Thatching grass	No harvesting from 15th Oct to 15th July; permit for over 800 bundles/hh/month
G: 2 species		Dikgong/Firewood/Fuelwood Untreated poles/plant materials for building purposes	Permit for over 1 ton/hh/month

Source: 2006 ARCA Regulations.

All trade and export requires a license from the Agricultural Resources Conservation Board. The fees are as follows (source: DFRR):

1) Harvesting licenses:
   a. Individuals: BWP 2
   b. CBO: BWP 5
6) Dealers:
   a. Citizens: BWP 50
   b. Residents: BWP 100
   c. Non-residents: BWP 300
7) Exporters:
   a. Citizens: BWP 500
   b. Residents: BWP 1000
   c. Non-residents: BWP 2000

Permit data were obtained from DFRR for the years 2010-2013. The analysis shows that in that period 5 225 permits were issued for harvesting, trading and exporting activities (Figures 16 and 17). The number of permits issued per annum fluctuates significantly but the average annual number of permits for the period 2010 – 2013 were as follows:

1) Harvesting permits: 1004 per annum
2) Dealers permits: 285 per annum
3) Export permits: 23 per annum

About 77% of these permits were for harvesting while trading permits accounted for 21%. The analysis indicates a fluctuating trend for the permits issued with a growth experienced in 2013. A large share of the harvest and dealer permits was in the dryland areas (Figure 17 and 18), particularly the northern drylands (Central District) which accounted for 48% followed by the North East. These were perhaps permits for harvesting of mophane worms which are commonly found in these areas. All export permits were issued in the dryland eco region. The export data seem unreliable and need further investigation.

Unfortunately data on the quantities harvested, traded and exported has not been availed.

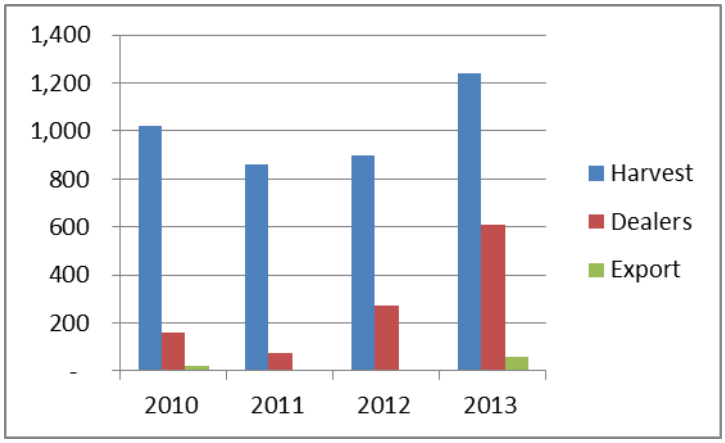

Figure 16: Total permits issued between 2010 and 2013, based on DFRR data

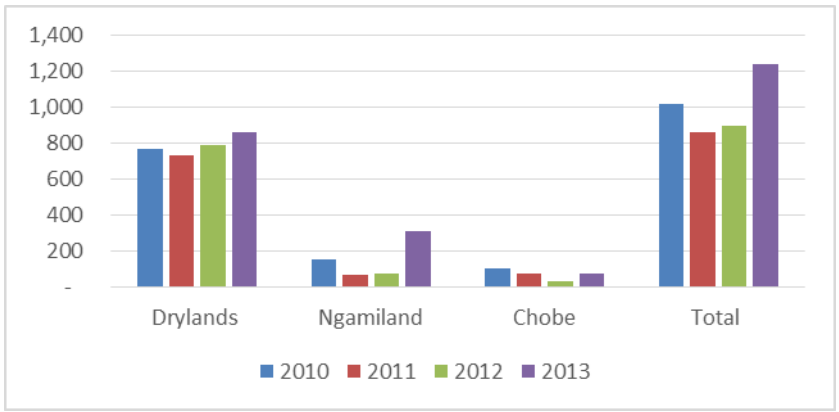

Figure 30: Total number of harvesting permits by region (2010-2013), based on DFRR data

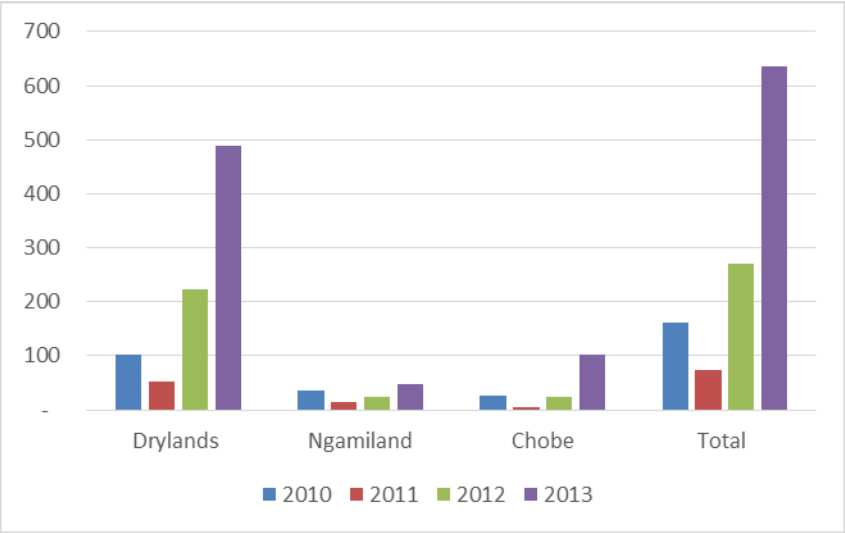

Figure 31: Number of dealer licenses by eco region (2010-2013), based on DFRR data

APPENDIX 5: STAKEHOLDER CONCERNS FOR EACH ECOREGION

Focus Group Meeting 30th October 2013 Research and NGOs Gaborone

Kalahari Xeric Savanna

Threats	Research and support needs
Invasive species (*Prosopis* – mesquite increasing in Kalahari; *Cenchrus biflorus*)	[A management plan is being developed by DFRR. Research on Prosopis is ongoing.] Understand the extent to which invasive species are spreading, and appropriate methods for control. Strengthen the coordinating structure responsible for invasive species within DFRR.
Poaching	Understand size and underlying causes of bush meat trade, and what the main target species are. Strengthen law enforcement, and increase penalties.
Illegal trade (international) – live trade	Understand the size and underlying causes of trade, and the main target species. Strengthen law enforcement and the CITES office, and increase penalties.
Change in fire regime	Understand link between fire regime/grazing/rainfall/biodiversity. Implement the fire management strategy.
Increase in cattle population (new ranches? cattleposts?) Effect on species composition from grazing	Refer to Western Kgalagadi Conservation Corridor report for recommendations. Strengthen DAP's ability to implement guidelines on stocking. DTRP to align policies to remove financial (agricultural) incentives for locations that are biodiversity hotspots.
Large scale clearing for crop production (Borolong)	Ensure EIAs are conducted (strengthen legal process). Mainstream biodiversity into the EIA process. DTRP to align policies to remove financial (agricultural) incentives for locations that are biodiversity hotspots.
Restriction of large herbivore movement in extreme conditions	Establish and maintain movement corridors.
Transport corridors	Maintain EIA biodiversity recommendations in the long-term. DWNP to monitor road [and train] kills.
Activity-based tourism expansion into ecologically sensitive areas, and unsuitable activities	DEA to call for SEA of tourism development in xeric savanna ecoregion. MEWT's Research and Development office to be strengthened.
Collapse of CBOs due to reduction in commercial hunting quotas	CBNRM Office to guide diversification of CBO activities. DWNP to address underlying cause of wildlife decline.

Kalahari Acacia-Baikiaea Woodlands

Threats	Research and support needs
Mining and explorations, especially coal *De facto* degazettement of PA status for mining	[Regional SEA of coal-fired power plants is ongoing] Strengthen legal process/instruments, use revision of Wildlife Act as an opportunity, and address the issue of the ability of the Minister to over-ride.
Habitat fragmentation through land use and land tenure conversion to agriculture	Limit conversion in biodiversity hotspots through zoning and removing incentives. NSO to ensure relevant policies are geographically based.
Continued existence of Kuke-CKGR fences	DEA to call for SEA on alignment of all fences.
Change in fire regime	Understand link between fire regime/grazing/rainfall/biodiversity. Implement the fire management strategy. Transboundary fire management strategies to be implemented.
Powerlines (especially for waterfowl and birds of prey)	DEA to call for SEA on powerline network. Research to identify powerlines of main concern.
Transport corridors (e.g. Nata-Kaz)	Maintaining EIA biodiversity recommendations in the long-term. DWNP to monitor road [and train] kills.
Hunting ban leading to increase in poaching	Let science lead – DWNP to contract independent empirically-based scenarios assessment report (of both ecological and economic aspects).
Invasive species (*Prosopis, Mellia)*, (Myna)	[A management plan is being developed by DFRR. Research on Prosopis is ongoing.] Understand the extent to which invasive species are spreading, and appropriate methods for control. Strengthen coordinating structure responsible for invasive species within DFRR.
Expanding elephant population leading to habitat conversion	Elephant Management Plan to include list of habitats of concern (biodiversity hotspots)

Zambezian and Mopane Woodlands

Threats	Research and support needs
Areas in NE under threat from conversion to commercial agriculture	Ensure EIAs are conducted (strengthen legal process). Institutional arrangements in place to allow DEA enforcement (EMA). Mainstream biodiversity into the EIA process. DTRP to align policies to remove financial (agricultural) incentives for locations that are biodiversity hotspots.
Loss of plant (tree) species diversity due to elephants	Implement Elephant Management Plan. Effective implementation of KAZA plans. Incorporate elephant issues into regional 'master' KAZA plan.
Overharvesting of *phane* worms in East	Research on overharvesting of *phane* populations

Zambezian Baikiaea Woodlands

Threats	Research and support needs
Change in fire regime (especially in areas with open canopy – and interactions with elephant damage?)	Understand link between fire regime/grazing/rainfall/biodiversity. Implement the fire management strategy. Implement transboundary fire management strategies. DFRR to update national inventory of tree stock.
Impact of elephants on tree species diversity and habitat conversion	Implement Elephant Management Plan. Effective implementation of KAZA plans. Incorporate elephant issues in regional 'master' KAZA plan.
Proposed boreholes in forest reserves	Research to understand impacts of introducing year-round water supply to wildlife and habitat.
Degazettement of forest reserves for urban expansion	--

Zambezian Flooded Grasslands

Threats	Research and support needs
Poaching (bushmeat, ivory, rhino horn)	Understand size and underlying cause of bush meat trade, and main target species. Strengthen law enforcement, and increase penalties.
Changes in upstream water regime	[Okavango Basin SEA is ongoing] Strengthen OKACOM. Research to identify ecological thresholds for flow, pulse, and quality of hydrological cycle.
Poisoning of poached carcasses affecting birds of prey (especially vultures)	Strengthen law enforcement, increase penalties. Coordinate transboundary enforcement and response.
Settlement in sensitive areas	Implementation of ODRS SEMP – especially land use zones Judicious application of Settlement Policy (e.g. settlement size)
Seasonal timing of fires (nesting, seed-setting)	Implementation of Fire Management Strategy
Expansion of lodges and lodge 'villages'	Enforce limits set in revised ODMP.
Invasive species	Implementation of ODRS SEMP.
Upstream water pollution	[Okavango Basin SEA is ongoing] Strengthen OKACOM. Research to identify ecological thresholds for flow, pulse, and quality of hydrological cycle.
Permanent restriction of large herbivore movement between wet and dry season range	Implement the Integrated Land Use Plan.

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Kalahari Xeric Savanna

Threats	Research and support needs
Habitat fragmentation leading to wildlife declines (wildebeest, hartebeest, springbok), increasing blockage of movement routes, transport corridors being fenced	In extreme years, need to find ways to provide water in the Schwelle so they don't need to migrate, but can move within that area.
Continued HWC (lion predation – lions moving into WMAs and villages, grazing / no kraaling at night)	Continued research and monitoring of translocated lions.
Poor range management and decreased carrying capacity	[Lot of data exist, especially for semi-arid areas.] Support for implementation of Sustainable Land Management, collaborative grazing, extension at village level, and restructuring of policies (especially on poverty alleviation) Research into harmonizing policies. Investment into other activities. Follow up on the WKCC plan and implement it. Research people's perceptions of biodiversity's value. Grassroots interventions from bottom up. Support for local governance, and for resurrection of IK, and acknowledgement of IK practices.
Change in fire frequency, and interplay between poor range management and fire	[Lots of data are readily available] Research why people burn. Research impact on biodiversity (invertebrates, birds, small mammals as indicators), especially extensive fires. Implement Fire Management Strategy (DFRR). Identify appropriate fire regimes/strategies for different ecosystems.
Woody encroachment	As for range management that supports healthy grasslands = sound range management Awareness raising among farmers (people think wood is good).

Kalahari Acacia-Baikiaea Woodlands

Threats	Research and support needs
Poor or no range management	As for xeric savanna.
HWC – predators, elephants between CKGR and surroundings, especially onto people's farms	--

Threats	Research and support needs
Removal of hunting tourism	Ongoing monitoring of wildlife populations across the continuous landscape, of poaching incidents, and of livestock incursion. Proactively lobby government with research data showing impacts. Research economic impacts at different scales. EMS to be incorporate research data. Forum for data exchange between researchers and NGOs for lobbying. Government to systematically consult with researchers and NGOs for data, relevant to ongoing activities, and to strengthen linkages. Remove charges for research that would support Government needs, and support researchers. Research-based decision-making to be mainstreamed into all policies.
Adventure tourism at high numbers (unwritten BTO policy)	Collation of operator monitoring and analysed together. Ensure that at 5-year review, tourism carrying capacities are set at ecologically sustainable levels (and economically realistic).
Inappropriate land use (policies), not ensuring zones are adhered to	Ensure WMAs are never degazetted. Research viability of landscape conservancy approaches, and implement where practical. Ensuring NE Botswana WMAs remain as sinkholes, dispersal areas that are water-free.
Too high waterhole densities leading to too big resident populations	DEA to ensure all waterholes have EIAs, and that EMPs are adhered to, each taking into consideration existing waterholes in area. Ensure Elephant Management Plan is implemented.
Policies are conflicting, not harmonised	--
Removal of existing water holes may affect rare antelope	Ongoing monitoring of wildlife populations across the continuous landscape.
Commercialisation of building poles	DFRR to enforce adherence to permits, to set limit on number of permits, and to scale penalties/fines higher. Roll-out and extend CBFRM (e.g. Tubu), devolve management to local level, strengthen local authorities' power to enforce.
Expansion of mining (linked to policy harmonisation issue)	Ensure mineral exploration is stopped in biodiversity hotspot areas or critical migratory routes. Critical migratory routes to be identified and mapped. Come up with economic valuations of biodiversity areas to allow comparison against mineral value. DNMM to review PAs to change their status to heritage listings. Ensure World Bank standards are adhered to by mines. Environmental Management Act to be finalised and enforced. Strengthen DEA capacity to review and enforce EIAs. Strengthen authority of DEA over other departments.
Fire issues	As for xeric savanna.
Loss of *Pterocarpus* (fire regimes)	Research to understand its fire needs.
Fences (red zones), with no sales, cattle populations increasing, HWC increasing	Do holistic Strategic Environmental Assessment of ALL fences (not just individually).

Zambezian and Mopane Woodlands

Threats	Research and support needs
Elephant	Implement the elephant management plan. Research impact of elephants related to distance from water.
Illegal bushmeat trade / poaching	Quantify to understand impacts on biodiversity and natural resources. Research into supply chain. Increase penalties. Understand role of reduction of support for CBNRM, people poaching or colluding? corruption?
Poor fire management (including increased access for poaching via fire breaks)	Need to understand role of fire in this system, needs a very set regime (see Isaac Theopolis' PhD). Fire management is under-resourced. Control of unwanted fires to be moved from DFRR to an outsourced body? Need more research on fire in all systems, its frequency, distribution, effects. Outsourcing for many activities (not just fire management).
Climate change (including increased reliance on natural resources by poor), decrease in soil moisture -> reduction in Baikiea-Burkea woodland	Research effects of climate change on soils, on moisture use, species composition. Climate change strategy – ensure research added as key activity.
Fragmentation , impact on mammals (e.g. firebreaks -> policy conflicts)	Research impact of fragmentation on invertebrates, small mammals.. [See earlier need regarding policy alignment]
Unplanned infrastructure development (e.g. powerlines)	[See earlier recommendations re: EIA implementation & enforcement] NGOs to lobby Botswana Power Corporation

Zambezian Baikiaea Woodlands

Threats	Research and support needs
Climate Change	[As above for climate change] Quantify carbon value of these forest stocks (also for some other ecoregions) – carbon off-sets. "This is the southern limit so we may lose it, but also a strip less threatened by settlement than in neighbours to north, so therefore a very critical strip!"
Pan-type grasslands threatened by commercial agricultural expansion	Policy harmonisation. KAZA to support efforts to establish cross-border links to Hwange.
HWC (elephant, predation)	[same as above region]
Elephants	[same as above region]
Loss of roan / sable habitat to farming	[same as above region]
[Poor fire management as above]	[same as above region]
(Pesticide) pollution from Pandamatenga farms spraying (GMO as potential threat)	Support DAR and Cartagena Protocol. Restrictions on chemicals are allowed to be used. Monitoring of invertebrates in Miombo. Monitoring of impacts of GMO farming on species composition of surroundings.

Threats	Research and support needs
Unmanaged use of woody species	All woodlands to be identified and mapped in terms of resources to be managed.

Zambezian Flooded Grasslands

Threats	Research and support needs
Change in nutrient status of incoming water	Strengthen OKACOM. Water quality data to be shared on EMS and OKACOM. Strengthen international data-sharing protocols. Getting research data to NGOs and CBOs in a way they can use
Upstream users (fertilisers, abstraction)	Strengthen OKACOM. Strengthen crossboundary collaboration (KAZA, SAREP).
Elephants [as above]	[as above] Effect on species composition and structure of riparian and other woodlands. Effect of increased debris and blockage formation. Effect on species composition and population structure of other mammals and of birds.
Dams and hydro-power projects changing shape of flood pulse	--

Zambezian Halophytics

Threats	Research and support needs
[see MMP]	[see MMP]
Fences, isolation of northern cons area from the Okavango Animal movements	Maintenance of fences. Alignment of fences – communication between Agriculture and Wildlife. Establish forum for research data disseminated to government.
Fencing east of park	Ensuring an EIA is done (taking on recent research, including looking at need for fence in the first place), and implemented and enforced.
Mining, expansion of soda ash (change in salinity of soils) Habitat loss	Research into effects of desalination on vegetation, and on flamingos through food chain, research of disturbance in flamingo breeding.
Understanding of full range of habitats / veg communities	Baseline vegetation survey.
Change in hydrology, impact on plant species composition	[similar to mining, might work in opposite way]
Climate change	[as above discussion]

Trends in Species of Concern: Research and Support Needs

Species	Status & Trend	Research and Support Needs
Vultures (~2,500 vultures dead in Savuti /Linyanti?), poisoning of poached carcasses	Threatened, declining	[Monitoring is ongoing] Lobby to have carbofuran banned. Active community participation in conservation.
Elephants	Overabundant, increasing, leading to habitat loss for other species	[as for ecoregion needs] Implement Elephant Management Plan.
All predators (leopard, lion, cheetah, wild dog, hyenas)	Declining, HWC through predation	Data sharing, need to share concession ground counts. Policy implementation – the Predator Strategy is done, but not used. Ensure SAREP database is in place and used.
Chobe Bushbuck, habitat loss from elephants	Declining	Data to support understanding of trends, to capture cause/effect – long-term monitoring (e.g. Lucas Rutina research – elephant : impala).
Giraffe [a good indicator species]	Declining	Monitoring.
Mimosa pigra	Documented here but status unknown, invasive in wetland systems (e.g. Kafue)	Need to map distributions, need to put in place monitoring systems Need to create species distribution models for predicting spread
Various invasives, e.g. (salvinia, azolla, as noted by ORI PSUB herbarium)		[Sven Bourquin doing list, ORI setting up research project re: Delta invasives] More power should be given to Aquatic Weed Control to regulate boat movement and spraying.
Hyphaena ventricosa	Impact of wine tapping (trend not established)	Auticology of *Hyphaena* must be established. DFRR to promote indigenous species not exotics.
Baobab	Unknown, debarking by elephants	Research, map distribution.
Wildebeest	Declining	Research into population drivers, especially populations in CKGR & KTP & Makgadikgadi.
Hartebeest	Declining	Research population drivers.
Roan	Declining	Research population drivers.
Sable	Unknown	Research population drivers.
Lechwe, Reedbuck and Sitatunga (all grazers in Okavango that cannot move in response to flood levels)	Declining	Research population drivers. Address poaching.
Gemsbok	Declining	Research into population drivers, especially populations in CKGR & KTP & Makgadikgadi.
Tsessebe	Declining	Research population drivers. Address poaching.

Species	Status & Trend	Research and Support Needs
Springbok	Declining	Research into population drivers, especially populations in CKGR & KTP & Makgadikgadi.
Aeolanthus altissima (Prison Tree)	Invasive, increasing	Identify distribution. Public awareness against its use, suggest alternatives.
Combretum imberbe	Declining, overharvesting	Phyto-sociological work to establish trends. Public awareness against its use, suggest alternatives.
Alien fish species (e.g. carp, *Oreochromis* from Zambezi) threat to Three-spot	Not here yet, but a threat as little control	All invasives need concerted publicity campaign. Monitoring. Cross-border management through OKACOM, SAREP.
Hippo	Unknown but keystone	Research to understand population status, then monitoring to understand dynamics
Crocs	Unknown, believed unstable (many young) but keystone	Research to understand population status (Vince Shacks has done some work), then monitoring to understand dynamics.
Rhino	Limited	Ongoing research and monitoring. Data sharing on poaching among appropriate parties.
Threatened wetland plants as listed (in ODMP Kew report, orchids, etc.)		Determine habitat, map distributions, and get data where needed, basic research. Increase support for plant movement control (borders, increase species on permitting list).
Flamingos, threatened by habitat loss, anthropogenic effects	Local status OK	Research on contribution of small seasonal pans to migration.]
All raptors, human expansion -> reduction in prey		[Monitoring is ongoing] Lobby to have carbofuran banned. Active community participation in conservation.
Mynas	Invasives	Monitor spread, research predators.
Pied crows	Invasives	Monitor spread.
House sparrows	Invasives	Monitor spread.
Tacoma.,	invasive	Monitor spread.
Melia azedarach (syringa), on hardveld	invasive	Monitor spread.
Leucaena	invasive	Monitor spread.
Dung beetles	Unknown, but keystone	--
Dragonflies – best indicator of water quality : Jens Kipping (from Chris)	Endemics	--

APPENDIX 6: ASSESSMENT OF THE KALAHARI XERIC SAVANNA

Introduction

The SW Kalahari can be visualized as a corridor extended from the Kalahari Transfrontier Park (KTP) to the Central Kalahari Game Reserve (CKGR), incorporating all the Wildlife Management Areas (WMAs), commercial ranches and communal/tribal grazing areas in between. It comprises the Ghanzi and Kgalagadi Districts. This is an area of particular natural resource value to Botswana. Many desert-adapted fauna and flora found here contribute to the species richness and overall biodiversity of the country.

Even though it is an area of "low biodiversity priority" (BSAP 2004) in national terms, it is an ecosystem sensitive to changes in land use and other anthropogenic pressures; and thus requires careful protection and management. A few indirect use valuations by the IUCN express the value of this ecosystem in monetary terms (IUCN 2007):

- Annual net change in carbon sequestration = P 7 000 000
- Protection from wind erosion, measured as annual production losses averted = P 430 000
- Annual wildlife refuge value = P 15 000

The above figures do not take into account the importance of the SW Kalahari Ecosystem in terms of ecological and human well-being; or the direct value of the ecosystem in terms of hunting, plant products (e.g. Hoodia gordonii), tourism etc. (IUCN 2007). For a full description on the benefits of this ecosystem, see "The Real Jewels of the Kalahari" (IUCN 2007). Perseverance of biodiversity benefits humans greatly. Careful planning and understanding when undertaking development and changes in land use will insure economic benefits can be concurrent to the many benefits (economic included - e.g. tourism and ecosystem services) afforded us by nature (Keeping 2009).

A list of key literature and research used in this study:

- Aerial Census of Animals in Botswana (DWNP 2012)
- Consultancy to Identify Important Habitats for Key Wildlife in the Western Kgalagadi Conservation Corridor (WKCC) - Final Draft Report (Green Mamba 2010)
- Review of the National Land Use Map - Final Report (prepared for the Department of Lands, Ministry of Lands and Housing by Landflow Solutions (Pty) Ltd 2009)
- Kalahari Wildlife Assessment - Summary Report (Derek Keeping 2009)
- Key policies relating to threats to biodiversity of the SW Kalahari:
- 1975 Tribal Grazing Land Policy (GoB 1975)
- 1991 Agricultural Development Policy (GoB 1991)

Both of the above policies stimulate ranching, particularly the increase in cattle numbers and distribution. In the SW Kalahari, livestock development is a major pressure, and presents a significant threat to biodiversity. Population growth and correlated pressure to alter land use in this sensitive ecosystem is inevitable, but the need to practice sustainable development is apparent if we are to conserve this resource. Sustainable development can be achieved through informed decisions.

KTP, CKGR and WMAs have an equally important role in continuing biodiversity of the SW Kalahari; the latter perhaps even more so. Many large herbivores and carnivores have ranges that incorporate WMAs, and these corridors increase connectivity for fauna and flora: vital to

biodiversity, especially with climate change and the subsequent niche shifts of species. Thus the need for conservation of these areas and the associated conservation of biodiversity should not be underestimated in development plans.

Here we present a review of current literature and synthesize a summary of the threats to biodiversity in the SW Kalahari.

Threats to Biodiversity

Cattle and Other Livestock

Livestock (i.e. cattle, donkey, horse, sheep and goats) comprise most of the herbivore biomass in Botswana (DWNP 2012). Livestock numbers in Botswana are growing, despite reports of overgrazing and warnings that long-term rangeland degradation is imminent. The impact of livestock on biodiversity is high; with bush encroachment, loss of favourable species, alien plant invasion and desertification a few of the more unassailable factors resulting from overuse (Green Mamba 2010).

The cattle population of Botswana has had an observed increase of 322% from 1992 to 2012, while the springbok and tsessebe populations have declined by 71% and 79% respectively for the same period (Green Mamba 2010; DWNP 2012). Recent decisions to increase Botswana's national herd will apply increasing pressure on natural- and cultural-resources within the SW Kalahari. Unfortunately, cattle ranching leads to degradation of habitats, loss of biodiversity, and results in social inequalities. Data from recent Wildlife Assessments show that mammal diversity and abundance outside of KTP (in the WMAs) is comparable to within the park, and care should be taken to correctly manage these areas under the current development policies to allow perseverance of biodiversity. Communal grazing areas have been shown to have significantly lower biodiversity values than WMAs (Green Mamba 2010; Keeping 2009).

Other Threats

Habitat fragmentation and loss through land use changes, fencing, and an expanding human and livestock population will severely threaten the ability of biodiversity within the SW Kalahari to respond to predicted climate change.

Other threats to biodiversity in the SW Kalahari are (Green Mamba 2010):

- Invasive Plants: Mesquite (Prosopis species) has invaded and is continuing to invade the Molopo and Nossop River beds and the surrounding rangelands (It is also widespread in parts of Ghanzi District). The plant has successfully colonised these areas. Its allelophathic properties have enabled it to out-compete and replace most of the indigenous vegetation, forming dense thorn bushes. Circumstantial evidence suggests that it may also be lowering important fresh-water aquifers and clogging boreholes with its extensive root system. This has seriously degraded rangelands and reduced biodiversity.
- Bush Encroachment: The expansion of species such as *Acacia mellifera* and *Dichrostachys cinerea* in the Kgalagadi District has reduced the productivity of grasslands for cattle production, hence the need and desire by farmers to move to other areas, perceived to be more productive and less congested.
- Overstocking: The high stocking rates in the communal areas is in fact the cause of bush encroachment and the spread of invasive plants, which thrive on disturbed land.
- Human encroachment encouraged by mineral exploration and associated road construction provide increasing access to natural areas; resulting in negative impacts on biodiversity.

Community-Based Natural Resource Management (CBNRM)

CBNRM has thus far met with limited success (Green Mamba 2010). Despite the program's potential, support for the model has been largely ambivalent (Taylor 2008); and it is unclear how beneficial CBNRM is to biodiversity conservation.

The loss of hunting income will be detrimental to CBNRM programs, as selling of their wildlife quota to hunters has been their main income source since project inception. This will indirectly have a negative impact on biodiversity, as funds available for biodiversity conservation are decreased, and the local communities will lack this economic incentive to preserve their environment. In terms of suitable subsidies for the ban on hunting; high-return photographic tourism is not a feasible option for the SW Kalahari, as it is in areas like the Okavango Delta. In general, ecotourism in the SW Kalahari cannot compare with the successful models demonstrated in the north. Low volume 4x4 tourism is a means of generating income, but will not yield revenue comparable to that generated by hunting.

Communities in the SW Kalahari have expressed their desire to protect their natural worth (Green Mamba 2010); thus review and strengthening of the CBNRM would be beneficial to biodiversity conservation. In this process, a review on the restriction of hunting tourism should be assessed.

Conclusion and Recommendations

From available research, it appears that the principal threat to biodiversity in the SW Kalahari is livestock pressure through livestock distribution change and population increase. This is directly linked to Botswana's Livestock Development Programs. Lesser threats include poaching and other forms of land use change, such as mining or high-volume tourism development. Tourism development is, nonetheless, the "only realistic developmental path to secure economic growth and livelihood opportunities for most of the rural people in that region" (Braack 2010; Green Mamba 2010).

General trends established in aerial surveys are that livestock are increasing, while wildlife species are in decline (DWNP 2012). Of significance to the SW Kalahari is the exceptional decline in springbok numbers (71%) between 1992 and 2012 (DWNP 2012), as this area is their stronghold in Botswana.

An appropriate management response is warranted, including but not limited to: improved monitoring of wildlife resources, improved law enforcement, increased understanding and gains of CBNRM, and policy review (DWNP 2012). There is also a need for adaptive livestock management. Monitoring and review of conservation/development policies; and the promotion of integrated landscape management that involves community-based natural resource management strategies, is also necessary (Western, Russel and Cuthill 2009; Green Mamba 2010; DWNP 2012).

A means of identifying which biodiversity types under most threat - and from which threat - should be identified. Monitoring of biodiversity trends in response to identified threats is a plausible method. In this respect, the use of Biodiversity Indicators will be helpful - data should be collected specifically for the indicators to ensure representivity, usefulness and accuracy; important in ensuring direct results and thus correctly guiding management response. Monitoring of wildlife trends using spoor-based monitoring (for example) should employ local, under-privileged talent - the benefits being, for example, a reduction in poaching and encouraging/empowering local communities to feel more involved in biodiversity conservation (Keeping 2009).

Wildlife corridors present in the SW Kalahari should be maintained as much as possible, for as long as possible - these are critically important to the perseverance of biodiversity as they allow migration and prevent full fragmentation. Changing climate will increase their

importance. No surface watering points or any cattle-related development should be permitted in these corridors (Landflow 2010). Wildlife in the SW Kalahari are extremely mobile, and their conservation depends on their ability to move through space and time in response to grazing availability (directly linked to the highly variable rainfall of the area) (Green Mamba 2010).

Poaching should be addressed more effectively in the SW Kalahari: according to Keeping (2009) the current process of identifying and prosecuting poachers is inefficient. The intended increase in boreholes and cattle will negatively impact on wildlife populations, biodiversity and socio-cultural aspects in the area: caution should be used to ensure sustainable development (Keeping 2009).

Within pastoral Kalahari systems, ecological resources and their dynamics are critically important for livelihoods (Sallu et al. 2009). Loss of biodiversity through cattle ranching will decrease the quantifiable benefits of ecosystem services, such as fuel wood, construction material, grazing for livestock, medicines, veld foods (vegetables and fruits) and scenic landscape with high tourism potential (IUCN 2008).

Low volume 4X4 tourism is an option that would minimize human disturbance and be an attraction in the vast landscape of the SW Kalahari, as well as generate revenue. In comparison to hunting though, the economic benefits are small. Hunting tourism provides economic benefits while maintaining ecosystem integrity and ensuring a biodiversity-conservation mindset. In fact, hunting is a successful conservation tool and would be the best land use in terms of conserving the highly valuable biodiversity of the SW Kalahari; assuming local communities are the main beneficiaries (Keeping 2009). Biodiversity in WMAs is comparably high. These areas should have a strong focus on biodiversity conservation as they are vitally important to meeting local, national and international targets.

Environmentally sustainable agricultural development appears to be the way forward in the SW Kalahari, to meet social demands, conserve natural resources and encourage economic growth and empowerment. Community-based resource management systems that build on the strengths of traditional management approaches will promote improved rangeland management and sustainable livelihoods (Taylor 2008). The feasibility of mixed game and cattle farms to serve as wildlife/cattle buffer should be explored, but impacts on biodiversity need to be minimized or mitigated where possible (Landflow 2009).