



Fifth National Report  
to the  
Convention on Biological Diversity  
2015



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## Abbreviations and Acronyms

BWP	Botswana Pula
CBD	Convention on Biological Diversity
CBNRM	Community-based Natural Resources Management
CBO	Community-based Organisation
CHM	Clearing House Mechanism
CKGR	Central Kalahari Game Reserve
CNP	Chobe National Park
DAP	Department of Animal Production
DEA	Department of Environmental Affairs
DFRR	Department of Forest Resources and Rangelands
DNMM	Department of National Museum and Monuments
DWMP	Department of Waste Management and Pollution Control
DWNP	Department of Wildlife and National Parks
Ha	Hectare
HWC	Human-Wildlife Conflict
KAZA	Kavango-Zambezi Transfrontier Conservation Area
KCS	Kalahari Conservation Society
MEA	Multilateral Environmental Agreement
MEWT	Ministry of Environment, Wildlife and Tourism
MFMP	Makgadikgadi Framework Management Plan
MGR	Moremi Game Reserve
MNP	Makgadikgadi and Nxai Pans National Park
MSB	Millennium Seed Bank
NBSAP	National Biodiversity Strategy Action Plan
ODMP	Okavango Delta Management Plan
ODRS	Okavango Delta Ramsar Site
OKACOM	Permanent Commission on the Okavango Basin
ORI	Okavango Research Institute
PAC	Problem Animal Control
SA	South Africa
SEA	Strategic Environmental Assessment
TFCA	Trans-frontier Conservation Area
WMA	Wildlife Management Area
WWF	World Wildlife Fund

## Definition of Terms

Biodiversity	According to the CBD, biological diversity is “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.”
Ecoregions	Using the WWF definition, an ecoregion is a “large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions.” The boundaries of an ecoregion are not fixed and sharp, but rather encompass an area within which important ecological and evolutionary processes most strongly interact.
Ecosystem approach	As described in the CBD guidelines, the ecosystem approach is “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.”
Game stock	Where ‘game’ is the term used for commercially valuable wildlife, the economic definition of game stock is the commercial value of the wildlife as a marketable resource.
Payment of ecosystems services	The United Nations Environment Programme uses Sven Wunder’s definition of Payment for Ecosystem Services: “A voluntary transaction in which a well-defined environmental service, or a form of land use likely to secure that service, is bought by at least one ES buyer from a minimum of one ES provider if and only if the provider continues to supply that service.”

# EXECUTIVE SUMMARY

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## **INTRODUCTION**

Botswana has been party to the Convention on Biological Diversity (CBD) since 1995. The country submitted its first National Biodiversity Strategy and Action Plan (NBSAP) in 2004. The NBSAP was first revised in 2007, and is now revised again in order to update it and bring it in line with the CBD's own revised Strategic Plan and the Aichi Targets. Botswana also ratified the Cartagena Protocol in 2001 and acceded to the Nagoya Protocol in 2013, and these protocols form an integral part of this revised NBSAP.

This Fifth National Report has been prepared immediately on completion of the revision and update of Botswana's NBSAP. It builds on the findings arising from that process, and addresses developments and changes recorded since the Fourth National Report, which was submitted in 2009.

## **UPDATE ON BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR WELL-BEING**

Botswana incorporates seven of the WWF global ecoregions. Within the country, these ecoregions have different levels of diversity, resource value and protection status. 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. Of some concern is that, due to economic restrictions, very little data collection has taken place since the Fourth National Report.

### **Value of Biodiversity to the Nation**

No comprehensive valuation has yet been made for Botswana's biodiversity. Subsequent to the fourth national report, only one key ecosystem has been subjected to a valuation study: the Makgadikgadi Pans, which corresponds to the Zambebian halophytic ecoregion. It is, however, possible to infer some of the value of biodiversity by examining those key natural resources or ecosystem services for which data are recorded.

Game stock: Game resources are valuable throughout the country, but most valuable in Ngamiland, where wildlife-based tourism is centred. Ngamiland contains the Okavango Delta, a Zambebian flooded grassland ecoregion, which is also a designated Ramsar Wetland of International Importance. Buffalo affect the value strongly, with their value determined on the basis of being foot-and-mouth disease free. The value of the game stock has almost doubled in the period 2001 – 2012.

Park and reserve tourism: Chobe National Park, comprising mainly Zambebian and Mopane woodlands, and Zambebian Baikiaea woodlands as ecoregions, accounts for the majority of park visitors in Botswana and its share is increasing in time. For this reason, has the highest proportion of park revenues. Overall, however, national park revenues have fluctuated between BWP15 to 25 million and show no trends towards increased revenues.

Community-based organisations: 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 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.

Trade in CITES species: The use value of biodiversity can also in part be inferred from import and export patterns. Exports of live animals and trophies have decreased sharply since 2009 and are now close to zero. Imports of CITES species have similarly declined. 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 and exports is probably due to policy and regulatory changes, and should not necessarily be interpreted to represent a decline in value of endangered species.

Livelihoods, poverty and biodiversity: 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%) Income inequality, as measured by the Gini coefficient, has increased from 0.573 in 2002/03 to 0.645 in 2009/10 (1 is completely unequal; 0 is completely equal). Inequality is highest in rural areas and large villages. In-kind income from natural resource harvesting etc. is most important in rural areas and contributes a third of disposable income in rural areas (compared to only 7% in urban areas).

For some rural communities, participation in community-based natural resources management (CBNRM) has been a critical tool in reducing poverty. Some communities have been able to invest their income into building houses for the elderly and other community upliftment schemes. However, the levels of benefits are only significant for five communities, suggesting the need to increase the impact that CBNRM projects have outside of WMAs.

Harvesting, trade and export of veld products: The Agricultural Resources Conservation Act (2006 regulations) details the harvesting license requirements and conditions for six categories of veld products. Permit data shows that in the period 2010-2013 5 225 permits were issued for harvesting, trading and exporting activities. About 77% of these permits were for harvesting while trading permits accounted for 21%.

### **Economic Overview of Biodiversity in Dryland Ecosystems**

Very little attention has been given to the four ecoregions that comprise the dryland ecosystems covering most of Botswana's surface area: Kalahari xeric savanna, the Kalahari Acacia-Baikiaea woodlands, Southern African bushveld and the Zambezian halophytics (Makgadikgadi). Available information tends to be qualitative.

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.

Kalahari Acacia-Baikiaea Woodlands: Livestock and crop production are the dominant resource uses, particularly in eastern Botswana. Commercial wildlife use is mostly restricted to mobile tour operators and (until recently) 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 exist and generate limited revenues and only Khama Rhino Sanctuary manages to accrue significant revenues.

Southern African Bushveld: There is some hunting and ecotourism in the freehold Tuli block, and CBOs such as Kgetsi ya Tsie generate limited income. Kgetsi ya Tsie collects and processes morula nuts into oil, soap and jam. Harvesting of mopane worms is probably the most significant economic activity. 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. 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.

Zambezi Halophytics: 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. 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. Local communities also collect wild fruits such as moseme, moretwa, and morula as well as mopane worms. The latter is the most valuable resource as it is used for both subsistence and commercial purposes. Another important activity for the communities in the area is CBNRM.

### **Major Changes in Status of and Trends in Biodiversity**

Status of Protected Areas: Nationally, there has been some change in the extent of formal protected areas since 2009. The Wildlife Management Areas (WMAs) in Kgalagadi District have land board approval but are yet to be gazetted. Formal legislation of these areas as WMAs is crucial to the biodiversity of the arid ecoregions of the country. In addition, the new Flamingo Sanctuary has been gazetted in the Makgadikgadi Pans providing critical protection for flamingo breeding sites. Together, these two changes have increased the protection status of the Kalahari xeric savanna and Zambezi halophytics ecoregions. A further layer of protection is in the process of being added to Botswana's main area of biodiversity – the Okavango Delta. The area is in the process of being awarded World Heritage Site status, which will reinforce the conservation efforts currently being implemented under the Ramsar Convention and national protected area obligations.

At the same time, there are areas where the likelihood of protected status is being diminished. These include several areas that have been listed as proposed WMAs for more than 15 years, but which have never been officially gazetted. The recently issued Revised National Land Use Map shows parts of these WMAs as either proposed game ranches (such as Dobe – NG/3 in Ngamiland) or as being converted to pastoral/arable/residential (such as SO/2 – already gazetted as WMA, and which forms part of the highly critical linkage between the Kgalagadi Transfrontier Park and CKGR.

Status of Biodiversity: The number of recorded mammals has increased from 147 to 157 (improvement in small mammal inventories); amphibian records increased from 34 to 44 species and invertebrate records 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. The mammal fauna of Botswana comprises a total of 157 species, 43 of which are large mammals (i.e., in excess of five kilograms). Wildlife, by its nature of needing to disperse between wet and dry season resource areas, is easily threatened by habitat fragmentation and physical barriers. 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. DWNP has indicated a concern with declining populations of certain large ungulate species that are not of international concern.

As of 2010, there are 587 bird species recorded in Botswana. There are 25 globally threatened bird species in Botswana, and a further eight species regarded as nationally threatened or Birds of Conservation Concern in Botswana. 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. Botswana also hosts large populations of regionally vulnerable species such as White-headed Vulture (*Trionocephs occipitalis*), Lappet-faced Vulture (*Aegyptius 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 carunculatus*) and Slaty Egret (*Egretta vinaceigula*) occur in northern Botswana.

In addition to the regionally Vulnerable species, there are also several Near-threatened. This category includes the African Skimmer (*Rynchops flavirostris*), with the Okavango Delta estimated 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*).

There are no new fish species lists; the number of recorded species remains 99. Of these 99 species, two are globally threatened, *Oreochromis andersonii* and *O. macrochir*. *O. andersonii* is susceptible to fishing pressure while both species 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.

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. There are currently no reptile or amphibian species Red Listed in Botswana.

There are few inventories of invertebrates. The most comprehensive lists are of dragonflies and butterflies. Generally, invertebrates are data deficient in Botswana. Odonata (127 species recorded) are one of the best studied families of invertebrate. There are 252 butterfly species listed for Botswana in the Butterflies of Africa Database. None of the known butterflies are endangered, nor are there any known threats to this taxon. There are presently no butterflies of conservation concern in Botswana. There have been 152 grasshopper species recorded.

There are 3,096 plant species listed for Botswana, with 10 new species having recently been identified. The Millennium Seed Bank (MSB) and Botswana National Plant Genetic Resources Centre have to-date stored seeds from 595 Botswana species. The SABONET database lists 13 endemic, and 10 potentially endemic and 7 near endemic plant species in Botswana.

### **Main Threats to Biodiversity, and Consequences for Ecosystem Services**

Habitat destruction, habitat conversion and disturbance: Habitat destruction and habitat conversion is primarily due to changes in land use. In particular, 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. Much of the expansion of livestock has been into the proposed and legislated WMAs. 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 is also a major concern in terms of habitat destruction.

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.

High Populations of Elephant: 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 2013 estimate of 207,500. 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.

Increase in Poaching: Data on poaching are sparse, in part due to the sensitive nature of protecting some rare and endangered species such as rhino, and in part because much of the poaching takes place in remote areas. Anecdotal evidence suggests a large increase in poaching in recent years. In 2013 there were reported incidents of elephants and rhinos being killed for their ivory and horn respectively. However, there also appears to be an extensive domestic market for illegal bushmeat. In addition, poachers often poison the carcasses of poached animals in order to kill vultures who might give away their location. Several reports of mass killings of vultures have been made in the past 5 years. Not only are vultures threatened species, but their role in the food chain is critical to ecosystem functioning.

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.

Overuse and Over-collection of Wild Plant Species: This 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.

Alien Invasive Species: Understanding of alien invasive plant species, although relatively low on a national scale, is steadily increasing. Little is known about the dryland systems.



In the southwest of the country *Prosopis glandulosa* is perceived to be a problem. Detailed knowledge is held for the Okavango Delta, where *Pistia stratiotes* and *Salvinia molesta* pose a threat to the aquatic environment particularly if water quality deteriorates. The spread of terrestrial invasive weed species through tourism in wilderness areas of the Okavango Delta is also a concern. Common invasive species are thorn apples (*Datura ferox* and *D. stramonium*), the burweed (*Achyranthes aspera*), cocklebur (*Xanthium stramonium*), catclaw mimosa (*Mimosa pigra*), *Sesbania* species, (*Melia azederach*). An invasive bird species, the Indian Myna (*Acridotheres tristis*), has established itself in Gaborone and is spreading across urban areas of eastern Botswana.

Climate Change: 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%. 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.

Changes to Hydrology of Inflowing Rivers: The single biggest potential threat to the Okavango Delta (the primary biodiversity hotspot of the country) is changes to the hydrology (volume, frequency, variability, sediment and pulse) and water quality (decrease in water quality, eutrophication).

### **Key Threats by Ecoregion**

Kalahari Xeric Savanna: 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 prohibition 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.

An emerging threat, highlighting the role of policy, is the proposed land use changes under the Revised National Land Use Map. The land use map suggests several areas adjacent to protected areas and including proposed WMAs as game ranches – which would require fencing and further block the migratory routes that are critical for sustaining the already dwindling populations of large herbivores. The land use map also appears to suggest the degazettement of existing MWAs for pastoral/arable/residential use – a complete loss of both land and migration routes in the under-protected Kalahari xeric savanna.

Kalahari Acacia-Baikiaea Woodlands: The key threats to this ecoregion are from policies and programmes promoting livestock development, allocation of commercial fenced ranches and thus high levels of human-wildlife conflict (HWC), habitat fragmentation and loss of connectivity. Unless major policy changes are made, 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.

Southern African Bushveld: One of the biggest threats to this ecoregion is that very little of the area is protected, and none of the protection is formal. Another 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*).

Zambezi Halophytics: The Makgadikgadi Pans at the core of this system have 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. 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. 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.

Zambezi Baikiaea Woodlands: 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. The change in the woodlands is thought to affect diversity of small mammals such as bats.

Zambezi and Mopane Woodlands: The threats in this ecoregion are largely due to settlement patterns, high levels of poaching and human-wildlife conflict (HWC). The settlement patterns around the Okavango 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 HWC levels specifically with 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.

Zambezi Flooded Grasslands: 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 could affect the hydrology, sediment dynamics and water quality of the ecoregion. While 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 to the ecoregion in terms of disturbance (mainly to birds), pollution 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.

## **THE NBSAP, ITS IMPLEMENTATION, AND MAINSTREAMING OF BIODIVERSITY**

### **Extent of Implementation of the 2007 NBSAP**

Objective 1 – Better Understanding of Biodiversity and Ecological Processes: 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. One suggested reason 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 received limited attention.

Objective 2 – Long-Term Conservation and Management of Botswana’s Biological and Genetic Resources: This second objective focused on the actual management and conservation activities, in order to ensure their availability for future generations. Key activities were very much tied to district level, with the focus on implementation. An issue arising with implementation of this objective is that no clear departmental level responsibility was given for some of the tasks. Where activities were assigned either to a Ministerial level, or to NGOs or research institutions, actual responsibility is unclear. 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.

Objective 3 – Efficient and Sustainable Utilisation of all Components of Biodiversity in Botswana through Appropriate Land and Resource Use Practices and Management: The targets of this objective were all focused on sustainable use – either of key resources, or of critical ecosystems. One of the biggest challenges appears to have been creating awareness and recognition of biodiversity and its contribution to human wellbeing. This appears to be a problem across the board, from rural community members, to policy makers.

Objective 4 – An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation, Sustainable Use and Management: The three most common obstacles to successful implementation appear to be: resources, coordination, and capacity – both in terms of available manpower and skills.

Objective 5 – Coping With Environmental Change and Threats to Biodiversity: This objective 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.

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: The issue of 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. One of the bigger barriers to implementing this objective was the level to which responsibility was assigned. Ministerial levels tend to focus more on policy decisions, and not on undertaking specific activities. In addition, some of the activities identified were given to departments whose mandate is far removed from biodiversity.

Objective 7 – Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources: To a large extent, Objective 7 spoke to policy development and legal arrangements for access to resources and the sharing of benefits from them. These included guidelines for access, ways to secure intellectual property rights, and a national policy framework for indigenous knowledge.

Objective 8 – Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity: 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. 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.

Objective 9 – Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information: Essentially, this objective was about establishing the Clearing House Mechanism (CHM) for environmental and biodiversity information, which is housed in DEA. Although the project has faced some challenges, some progress has been made – for example, there is an online Environmental Information System in place, although its current functionality is limited.

Objective 10 – Recognition of Botswana’s and the Southern African Region’s Roles with Regards to Biodiversity: While Botswana had initially made much progress in creating and 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. 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. Signing of the UN Convention on Migratory Species should be considered a priority.

Objective 11 – Implementation of this Biodiversity Strategy and Action Plan: 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.

### **Effectiveness of Biodiversity Mainstreaming**

Environmental Assessment Act: In the 2007 NBSAP’s section on Mainstreaming Biodiversity for Future Generations, SEAs and EIAs are identified as specific activities to achieve the NBSAP’s strategic targets. However, neither the Environmental Assessment Act, which was revised in 2010, nor the accompanying draft guidelines refer explicitly to biodiversity directly. While 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’.

Biokavango Project: One area of success during this period was the Biokavango Project – 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.

Poverty and Environment Initiative: This project has recently come to an end, and although it did not explicitly focus on biodiversity, it is likely that evaluations will show increased awareness of the importance of sound environmental management in promoting viable rural livelihoods.

Western Kalahari Conservation Corridor: This project had two aims: to conserve the biodiversity and integrity of the Western Kalahari ecosystem by establishing ecological corridors between the Central Kalahari Game Reserve (CKGR) and the Kgalagadi Transfrontier Park (KTP), and to improve the quality of life of the local communities. Mainstreaming biodiversity through raising awareness and exploring alternative livelihoods is a key component of the initiative, because without wildlife-friendly activities, the presence of communities in the area is a key threat to maintaining critical migration routes in this semi-arid region.

Kalahari-Namib Project: Focusing on decision-making, this cross-boundary initiative has the potential to further biodiversity mainstreaming through its focus on environmentally-based decision-making, particularly with regard to sustainable land management practices.

National Accounting: 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. One area of success is DWA's ongoing water accounts, which were recently reviewed under the WAVES initiative. The water accounts are to be updated regularly.

Education and Awareness Raising: DEA's National Environmental Education Division conducts regular awareness-raising activities on the economic importance of the environment and its protection. This includes information on biodiversity and its conservation. Two key environmental management plans, the Okavango Delta Management Plan and Makgadikgadi Framework Management Plan, have been prepared and implemented with strong consultative processes aimed at increasing local awareness of the need to protect and conserve the environment and natural resources. In addition, international environmental days are observed across the country, with public events held to commemorate and highlight the need for all citizens to participate in environmental management.

National Development Plan 10: The 2013 mid-term review of the current National Development Plan highlights areas of overlap between Botswana's sustainable development initiatives and the objectives of the NBSAP. Awareness-raising, engaging the general public in environmentally-friendly practices has proved to be a slower process than hoped for. With regard to sustainable use of natural resources, key policy documents that are under development include the draft Land Policy, and a revision of the National Land Use Plan. NDP 10 has also seen the development or revision of several key legal instruments: Forest Policy, Forest Act, Environmental Assessment Act, National Meteorological Services Act, and Mines and Minerals Act. NDP 10 acknowledges the NBSAP as a critical tool in safeguarding the environmental sector

### **Lessons Learned from the 2007 NBSAP Implementation Process**

**Main Resource Constraints:** In the stocktaking and gap-analysis phase of preparing this NBSAP, the following constraints to implementation were identified:

- Human resources - both in terms of sufficient staff and appropriate skills
- Alignment and coordination policy and institutional mandates / arrangements
- Coordination and communication of actions and implementation
- Awareness and degree of cross-sectoral political commitment
- Financial resources
- Insufficient research capacity.

Key Lessons: These are:

- Implementation works best when responsibilities are assigned at the departmental level.
- As may be expected, implementation and collaboration is best for those departments within MEWT, because of the clear environmental mandate.
- 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 people for whom NBSAP implementation is their sole function.
- 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 an important 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.

#### **Additional Steps Taken to Implement the CBD**

Botswana has recognised the importance of both formally and informally aligning the activities under all of the Multilateral Environmental Agreements (MEAs) to which it is party. There is a MEA committee that meets regularly, and this facilitates coordination of conservation activities. An important formal step that the country has taken has been the ratification of the Nagoya Protocol. It is important also to mention the role of non-state partners – in particular Birdlife Botswana, and Kalahari Conservation Society – which play a fundamental role in ensuring broader stakeholder participation in biodiversity conservation, as well as pursuing biodiversity objectives within their own organisations. An important formal step that the country has taken has been the recent ratification of the Nagoya Protocol, and the continued following of the 2002 Bonn Guidelines. Botswana is also one of several developing countries involved in the UNDP's Biodiversity Financing Initiative (BioFin). It is important also to mention the role of non-state partners who continue to play a fundamental role in ensuring broader stakeholder participation in biodiversity conservation, as well as pursuing biodiversity objectives within their own organisations.

#### **Contributions of the National Activities to Relevant Targets of the Millennium Development Goals**



There are two relevant MDGs: The first is Goal 1 – To Eradicate Extreme Hunger and Poverty, while the second is Goal 7 – To Ensure Environmental Sustainability. Under Goal 1, Botswana set out the following 2 targets:

- No persons living below the income poverty datum line by 2015
- To reduce, by 50%, the proportion of people who suffer from hunger and malnutrition by 2016.

It is noted that the trend in decreasing numbers of people living in poverty is on course, and that Botswana's achievements already bring the nation in line with the global target. With regard to hunger and malnutrition, the country is already on target.

Under Goal 7, Botswana listed 3 targets:

- To reduce by 50% the proportion of people without sustainable access to safe drinking water by 2016
- Reduce conflict between population growth, land usage and environmental and natural resources degradation.
- Promote environmental education and awareness necessary to reduce contamination and achieve sustainable development.

Steady improvements have been made on access to safe drinking water, but no information on progress for the last two targets is currently available.

The activities under Objectives 3, 6 and 7 of the 2007 NBSAP addressed the MDG targets in the following ways. Objective 3: CBNRM, which provides a direct link between environmental conservation and poverty alleviation, was enhanced through finalisation of the CBNRM policy and diversification of CBNRM products. Key plans, such as the Okavango Delta Management Plan and Makgadikgadi Framework Management Plan, which emphasise integrated land use zoning were developed. Objective 6: The expansion of community monitoring activities has helped rural communities take on responsibility for ecological wellbeing. The National Environmental Education Committee had several activities to raise public awareness. Objective 7: A key tool in sustaining the link between environmental conservation and poverty alleviation would be the finalisation and adoption of the Veld Product Policy. Unfortunately, this policy has yet to be finalised.

## **PROGRESS TOWARD THE 2015 GOALS AND THE 2020 AICHI TARGETS**

Due to the need to align with budgetary and planning cycles, Botswana is only now in the process of adopting the Aichi Targets, and devising a new set of actions through which the domesticated versions of these targets will be met.

### **Domestication of the CBD Goals and Aichi Targets**

The first step in contributing toward the goals of the CBD Strategic Plan and the Aichi Targets has been to prepare national goals and targets that are in line with these. These 'domesticated' goals and targets comprise the backbone of the revised NBSAP, and a Presidential Directive / Cabinet Memorandum is being pursued in order to ensure cross-sectoral commitment to the NBSAP.

### **Existing Initiatives that Address the Aichi Targets and Broader CBD Goals**

There are several ongoing activities that address the Aichi Targets and CBD goals. These include (among others):

- Awareness-raising through a range of projects and public activities
- Training of economic planners on integrating environmental values
- Including environment as a cross-cutting issue in development plans
- Inventories of species
- Development of integrated land use plans and management plans.

### **Revised NBSAP and Accommodation of the Aichi Targets**

**Vision:** The revised NBSAP is guided by the following vision:

*By 2025, ecosystem, species and genetic diversity is valued, protected, and used sustainably and equitably, through the involvement of all sectors of society and the provision of sufficient resources for its sound management.*

This vision follows that of the CBD. It encapsulates the key points that give rise to the five goals that Botswana aims to achieve within this iteration of the NBSAP.

**Goals:** The Botswana goals are aligned to those of the CBD strategy in terms of their focus:

- 1) Biodiversity is mainstreamed and valued across all sectors of society
- 2) The pressure on biodiversity is reduced and natural resources are used sustainably
- 3) Ecosystems, species and genetic resources are protected through sound management
- 4) Fair and equitable access to the benefits of biodiversity is secured
- 5) Participatory planning, knowledge management and capacity-building are in place to support NBSAP implementation

**National Targets:** As with the Aichi Targets with which they are aligned, the 20 Botswana National Targets are grouped under the 5 national goals so that these can guide and direct appropriate strategies. The national targets are also aligned with the Aichi targets. The Botswana targets are strong but realistic statements of what must be achieved in order for the 5 goals to be realised.

- 1) By 2025, all people in Botswana appreciate how biodiversity contributes to their lives, and are aware of steps they can take to conserve and use it sustainably.
- 2) By 2025, planning processes at all (district, urban and national) levels, and national accounting and reporting systems in Botswana contain explicit actions to promote biodiversity conservation.
- 3) By 2025, incentives and subsidies across all sectors are revised, designed or introduced to improve support for sustainable consumption and production and promote biodiversity conservation.
- 4) By 2025, at all levels, policy and regulatory instruments are in place to ensure production and consumption by government, industry and society are kept within sustainable levels and safe ecological limits.
- 5) By 2025, the rate of natural land conversion is at least halved, and degradation and fragmentation are significantly reduced.



- 6) By 2025, animal and plant resources in Botswana's wetlands, woodlands and savannas are sustainably managed using the ecosystem approach, so that the impacts of harvesting remain within safe ecological limits.
- 7) By 2025, wetlands, woodlands and savannas, particularly where used for use for range or crops, are managed sustainably, ensuring conservation of biodiversity.
- 8) By 2025, levels of air, water and soil pollution are maintained below levels that would threaten ecosystem functioning and biodiversity.
- 9) By 2025, key invasive alien species are identified and controlled or eradicated, and pathways for their spread are managed to prevent further introduction and establishment.
- 10) By 2025, the anthropogenic pressures on wetlands, woodlands and savannas are minimised, so that the impacts of climate change and other external perturbations on their ecological integrity and functioning can be managed.
- 11) By 2025, at least 25 percent of all Botswana's ecoregions, particularly the wetlands, rivers and pans in them, are effectively conserved through an ecosystem approach that integrates their management with that of the surrounding landscapes and involves resident communities.
- 12) By 2025, the conservation status of species in Botswana that are listed as threatened has been improved or sustained.
- 13) By 2025, the genetic resources of traditional agricultural species and their wild relatives are protected, and strategies for minimizing genetic erosion and safeguarding their genetic diversity have been implemented.
- 14) By 2025, ecosystem services are identified and restored or maintained in all Botswana's ecoregions, and contribute to livelihood improvement through strategies that enable equitable access by all vulnerable groups, including women, the poor and local communities.
- 15) By 2025, ecosystem integrity in all Botswana's ecoregions will be conserved through the adoption of ecosystem-level management approaches built around key ecological processes, so that they contribute to climate change mitigation and to combating desertification.
- 16) By 2025, the Nagoya Protocol is domesticated and operational, and specific actions that ensure fair and equitable access and benefit sharing are implemented.
- 17) By 2015, Botswana's revised NBSAP has commenced implementation with the full support of all sectors and levels of governance.
- 18) By 2025, the indigenous knowledge of Botswana's various communities, as it relates to the conservation and sustainable use of biodiversity in all the country's ecoregions, will be documented, assessed and legally protected, and - where relevant - integrated into programmes and projects supporting biodiversity conservation.
- 19) By 2025, information and techniques relating to the biodiversity and its value in all Botswana's ecoregions are efficiently documented, stored, shared, disseminated and used by all sectors and levels of society.
- 20) By 2017, at least 80% of the required budget for the revised NBSAP, generated from diverse sources, is made available for its implementation.

## **Way Forward – Preconditions for Success**

**Preconditions for mainstreaming biodiversity:** Funding and institutional arrangements are dependent on broad-based political will, and wide-spread sense of ownership of the NBSAP. These are perhaps the fundamental pre-conditions to success. Ownership in turn should be linked to broad stakeholder participation. In order for biodiversity to be mainstreamed, it first has to be valued. In this regard awareness programmes need to be given priority, but so are tighter, more explicit links between revenues from wildlife-based tourism and what such revenue is spent on. Public and CBO support is critical. It is also critical to establish cooperation between stakeholders. Most of the threats to biodiversity are due to cross sector-impacts or cumulative impacts. Similarly, there needs to be a clear alignment between responsibility for the strategic actions and the mandates of the department(s) to whom the responsibilities are assigned.

**Preconditions for valuing biodiversity:** The importance of biodiversity in a resource dependent economy like Botswana is obvious (e.g. tourism and agriculture) but nonetheless, the value of biodiversity is often not recognised in development planning. While government has carried out several valuation studies of specific ecosystems, the value of biodiversity at the national level is not yet fully appreciated. There are data inadequacies in the biodiversity sector and thus this impedes proper valuation of the resources. There is need to improve data collection, analysis, access, storage and management especially in relation to veld products harvesting, processing and trade, hunting, CBO statistics as well quantified ecosystems' services. Furthermore, data should be collected and organised by specific ecoregion.

Biodiversity currently does not adequately feature in the national accounts. Botswana has experienced with natural resources (capital) accounting since the 1990s. Further accounts are however required for ecosystems and these should be constructed by ecoregion. Tourism satellite accounts exist but need regular updating and analysis to inform policy and decision making. The 'natural resources' category needs to be re-introduced in the national accounts. Currently natural resources are subsumed within the agricultural sector and perhaps other sectors as it is not clear in the statistics. However, it is anticipated that the Wealth Accounting and Valuation of Ecosystem Services (WAVES) initiative by the World Bank and the Government of Botswana will escalate the previous work on the valuation of Ecosystems that was done in northern Botswana by constructing ecosystem accounts.

It is currently impossible to identify in more detail how much the Government of Botswana is spending on biodiversity conservation. It is recommended that a detailed analysis of DWNP and DFRR annual expenditures is conducted and that possible biodiversity expenditures and revenues of other departments are identified and included. Furthermore, biodiversity expenditures and revenues of the private sector need to be documented with the assistance of the private sector.

The current structure for incentives/dis-incentives for biodiversity is fragmented and ineffective. Environmental economic instruments are hardly utilised. It is necessary to improve the incentive structure for better and sustainable access, utilisation and management of biodiversity.

### **Preconditions relating directly to biodiversity conservation:**

- Before biodiversity can be actively managed and protected, it needs to be understood. In this regard, the following preconditions are vital:
- Identification of species, habitats and ecological processes that are under threat (this is largely available from the updated stock-take)

- Improve understanding of the species diversity, population dynamics and threats so that management to protect biodiversity improves. This should follow an adaptive management approach and effective monitoring so that theories can be tested and solutions identified on small components of a population.
- Monitor biodiversity and provide feedback into adaptive management of resources.

At the same time, a commitment to radical changes in management style is also needed. Specifically, the following actions are needed:

- Implement an adaptive management approach to biodiversity by assigning roles and responsibilities and through effective monitoring of action plan implementation.
- Institute reporting on the basis of ecoregions, not solely on district boundaries.
- Allow effective and open distribution of biodiversity data and information.

# 1. INTRODUCTION

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Botswana has been party to the Convention on Biological Diversity (CBD) since 1995. The country submitted its first National Biodiversity Strategy and Action Plan (NBSAP) in 2004. As a signatory to the convention, Botswana supports the CBD's premise that "biological diversity underpins ecosystem functioning and the provision of ecosystem services essential for human well-being", and that its contribution to livelihoods gives it a key role in poverty reduction.

The NBSAP was first revised in 2007, and is now revised again in order to update it and bring it in line with the CBD's own revised Strategic Plan and the Aichi Targets. Botswana also ratified the Cartagena Protocol in 2001 and acceded to the Nagoya Protocol in 2013, and these protocols form an integral part of this revised NBSAP.

The revised NBSAP is founded on the three original objectives of the CBD, which are: the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

This Fifth National Report has been prepared immediately on completion of the revision and update of Botswana's NBSAP. It builds on the findings arising from that process, and addresses developments and changes recorded since the Fourth National Report, which was submitted in 2009.

Where possible, the structure of the Fifth National Report follows the CBD's recommended guidelines, first providing an update on biodiversity status, trends, and threats and implications for wellbeing; then describing the NBSAP, its implementation, and mainstreaming of biodiversity; before finally evaluating progress toward the 2015 Goals, and the 2020 Aichi Targets, and contributions to relevant Targets of the Millennium Development Goals (and later, the Sustainable Development Goals that will replace these.)

## 2. UPDATE ON BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR WELL-BEING

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Botswana incorporates seven of the WWF global ecoregions. Within the country, these ecoregions have different levels of diversity, resource value and protection status (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 administrative district or other levels, 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.

Of some concern is that, due to economic restrictions, very little data collection has taken place since the Fourth National Report. Nevertheless, a detailed assessment of the status quo has been undertaken as part of the NBSAP update, and summaries of the findings are presented here.

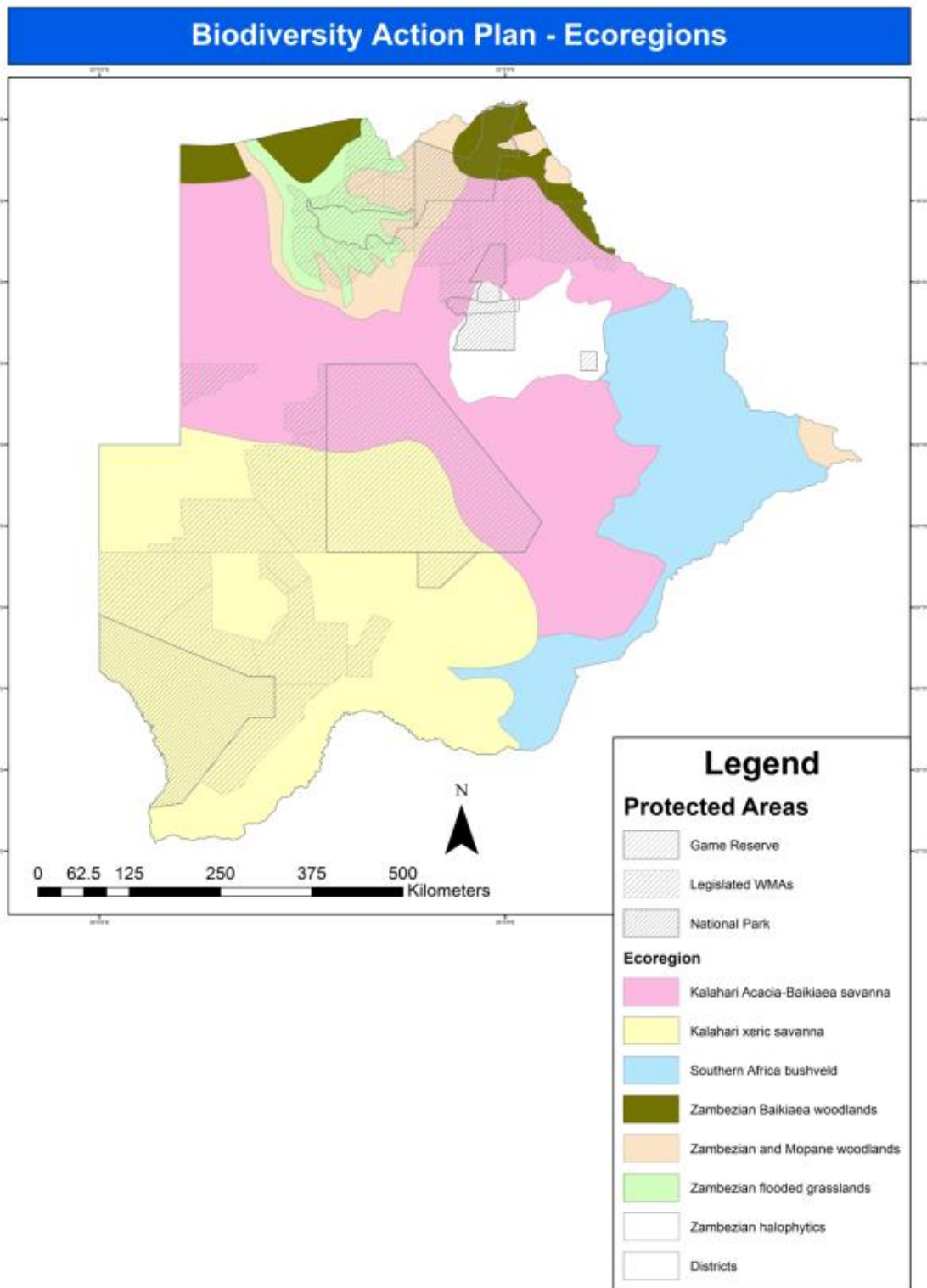


Figure 1: Ecoregions of Botswana indicating relationship with the protected area network (Partially after WWF Ecoregions Map of the World)

## 2.1 VALUE OF BIODIVERSITY TO THE NATION

No comprehensive valuation has yet been made for Botswana’s biodiversity. Subsequent to the fourth national report, only one key ecosystem has been subjected

to a valuation study: the Makgadikgadi Pans, which corresponds to the Zambebian halophytic ecoregion. 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.

Nevertheless, it is possible to infer some of the value of biodiversity by examining those key natural resources or ecosystem services for which data are recorded. These include:

- 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

### 2.1.1 Value of Botswana game stock

Game resources are valuable throughout the country, but most valuable in Ngamiland, where wildlife-based tourism is centred. Ngamiland contains the Okavango Delta, a Zambebian flooded grassland ecoregion, which is also a designated Ramsar Wetland of International Importance. Buffalo affect the value strongly, with their value determined on the basis of being foot-and-mouth disease free (Figure 2) and hence of export value which Botswana does not yet breed, or on domestic value (Figure 3) and assumed to carry the disease, and hence for local game market only.

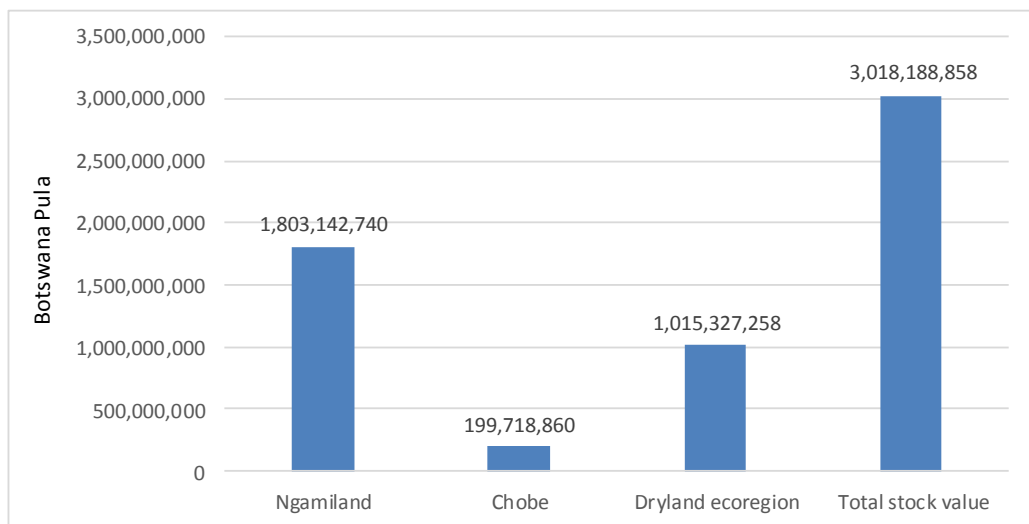


Figure 2: Game stock value based on 60% of Southern African auction prices; buffalo @ 10% of SA price

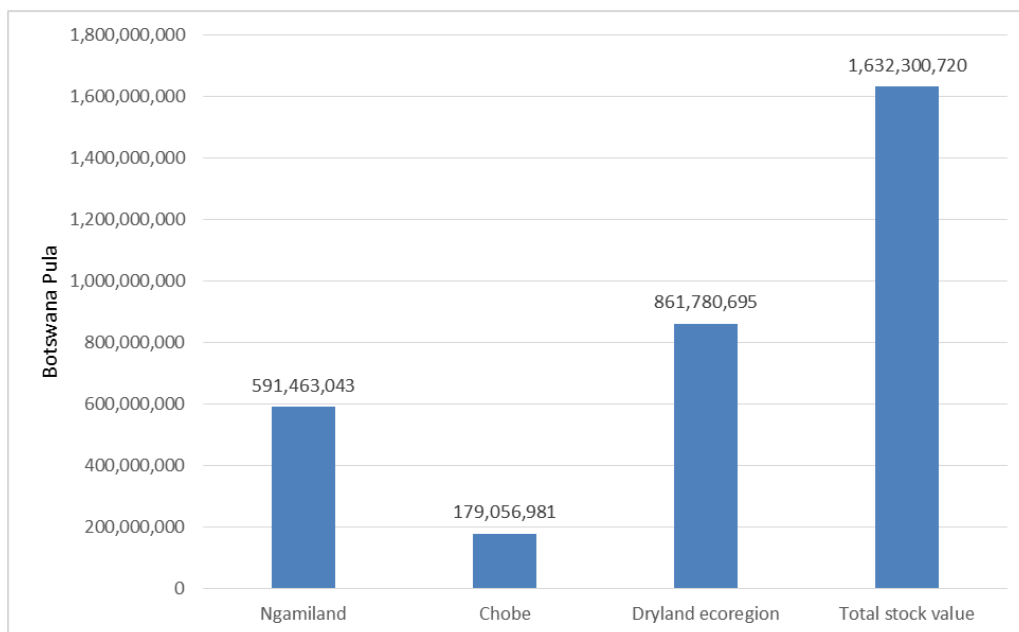


Figure 3: Game stock value based on 60% of Southern African auction prices and domestic buffalo price

The value of the game stock has almost doubled in the period 2001 – 2012 (Figure 4).

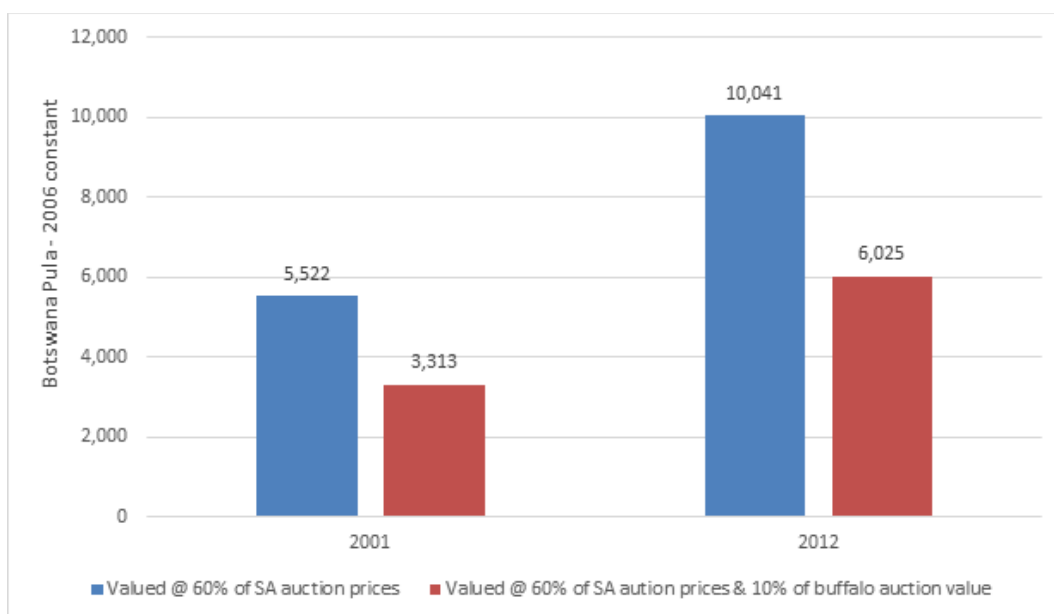


Figure 4: Estimated value of Botswana's game stock (2001 - 2012)

## 2.1.2 Park and reserve tourism

Chobe National Park, comprising mainly Zambebian and Mopane woodlands, and Zambebian Baikiaea woodlands as ecoregions, accounts for the majority of park visitors in Botswana and its share is increasing in time (Figure 5). For this reason, has the highest proportion of park revenues. Overall, however, national park revenues have



fluctuated between BWP 15 to 25 million and show no trends towards increased revenues (Figure 6).

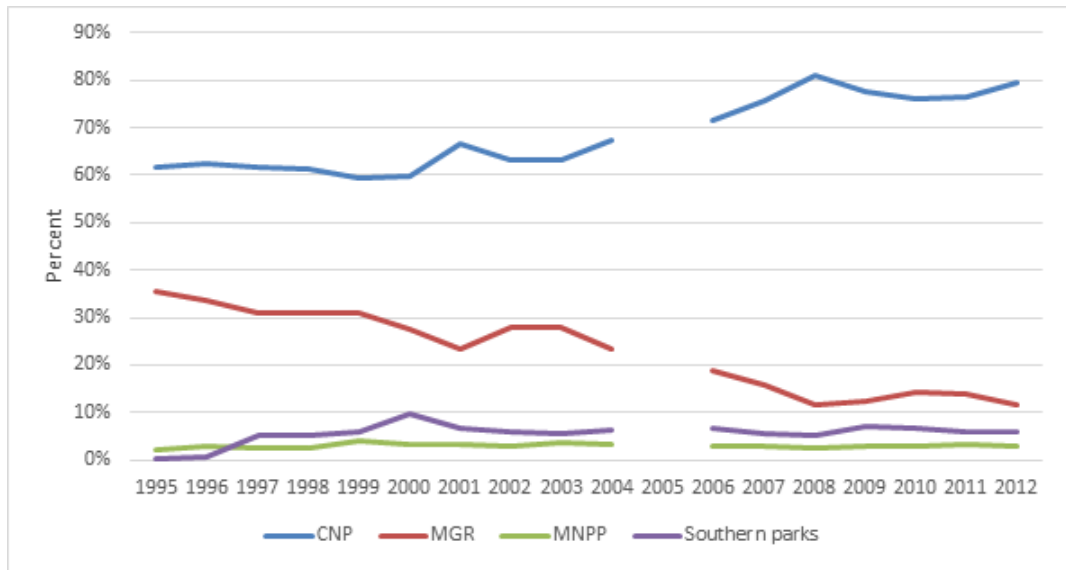


Figure 5: Trend in share of park visitors by Park (2000 - 2012), based on DWNP data (CNP = Chobe National Par, MGR = Moremi Game Reserve, MNPP = Makgadikgadi and Nxai Pans National Park).

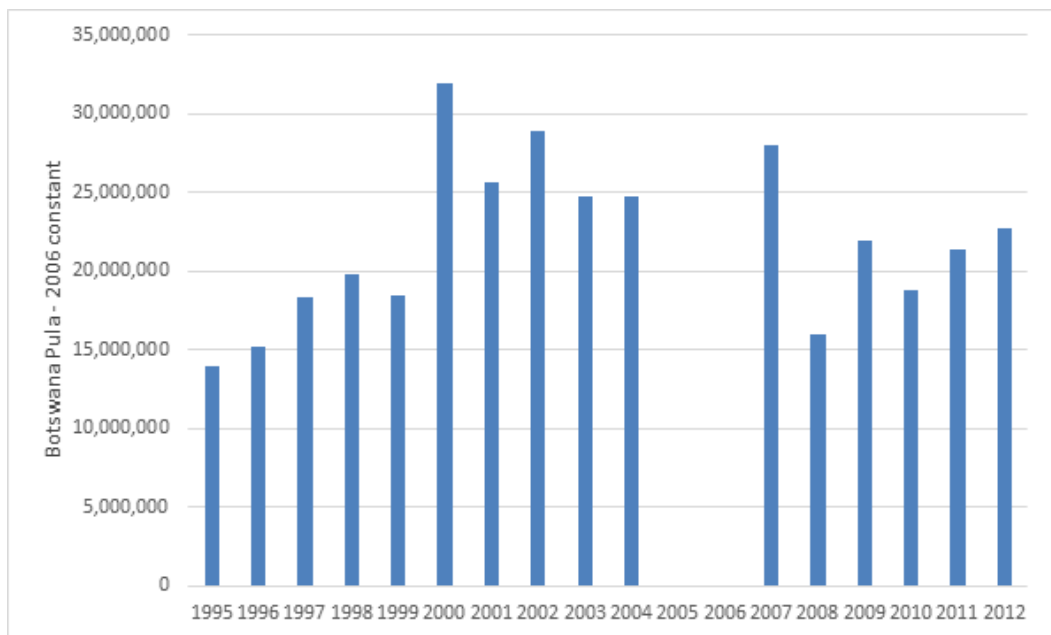


Figure 6: Trend in DWNP park / reserve revenues

### 2.1.3 Community based organisations

The trend in revenues to Community-based Organisations (CBOs) engaged in natural resources management is shown in

Figure 7. 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 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. (Note of caution: there is no time series data base for all CBOs. The figure is based on the best available data.)

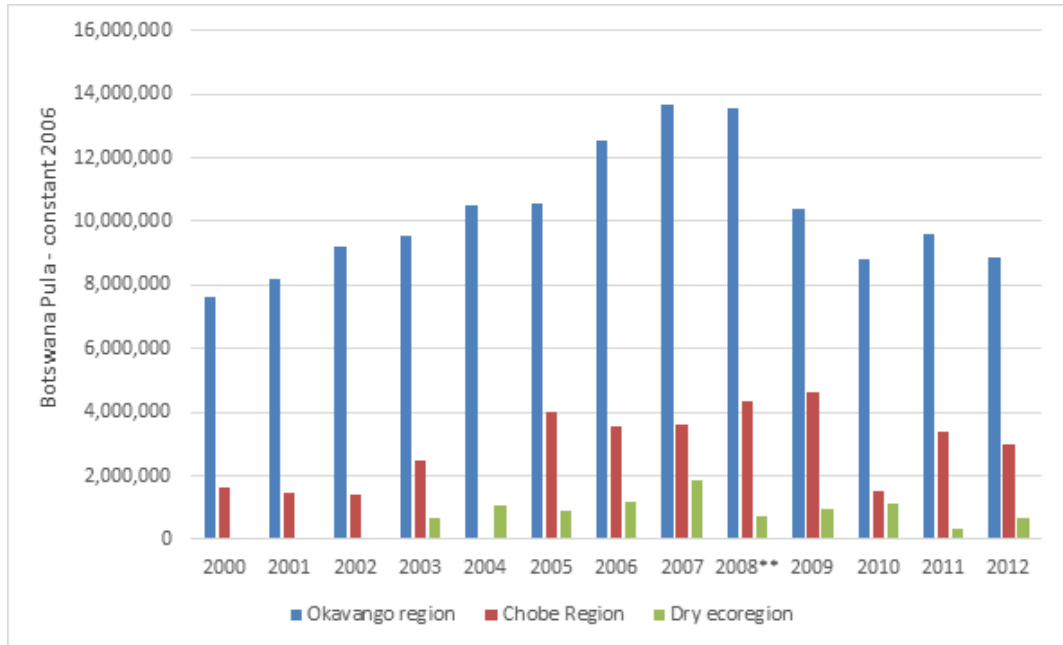


Figure 7: CBO Gross revenues in constant 2006 BWP

The distribution of the revenues is very uneven. Figure 8 shows that five CBOs near Parks receive 60 to 80% of the CBO revenues with an average of 68% in the period 1997 – 2012 (see also Table 1; the remaining 17 CBOs generate 20 to 40% of the revenues. Clearly, CBOs benefit greatly from Protected Areas.

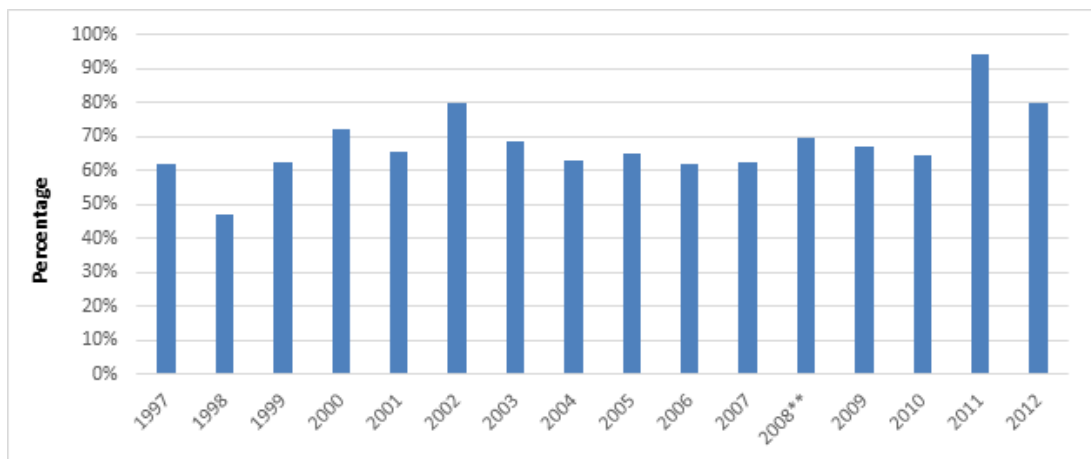


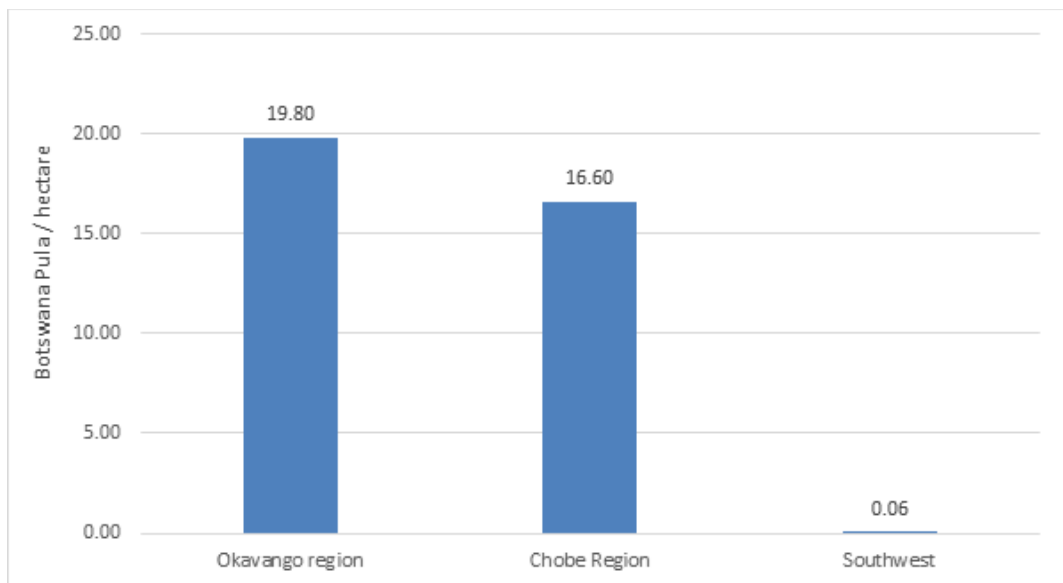
Figure 8: Trend in revenue share (%) of the five well-established CBOs

**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: Botswana CBNRM National Forum, 2013.

Figure 9 shows that per ha CBO revenues are the highest in the northern ecoregions. Land returns are very low in the dryland ecoregions, particularly the south-western part.



**Figure 9: Gross CBO revenues in different eco regions (2012)**

CBOs generate higher revenues/ ha than the DWNP Parks and Reserves with the exception of CNP (Figure 10). This can be attributed to the fact that most CBOs benefit from proximity to Parks and Reserves and manage smaller areas themselves.

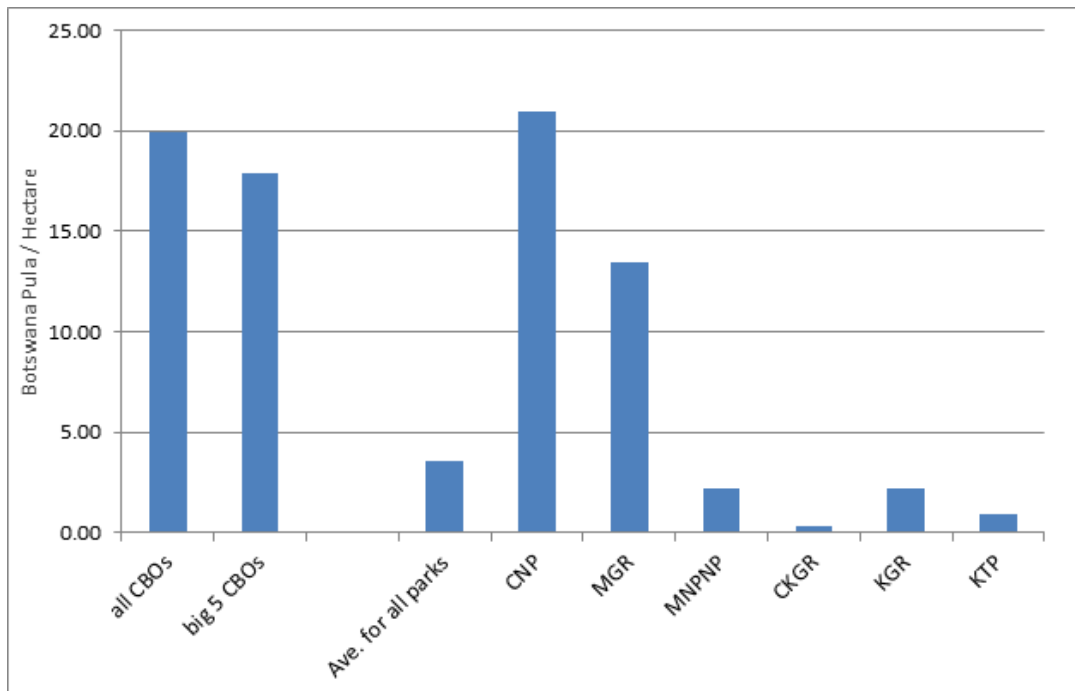


Figure 10: Revenues in DWNP protected areas and CBO areas (2012)

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

## 2.1.4 Trade in CITES species

The use value of biodiversity can also in part be inferred from import and export patterns. Recent data in imports and exports of animal and plant species could not be obtained from Statistics Botswana. However, data were 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 11). 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 12). 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. The decline in imports and exports is probably due to policy and regulatory changes, and should not necessarily be interpreted to represent a decline in value of endangered species.

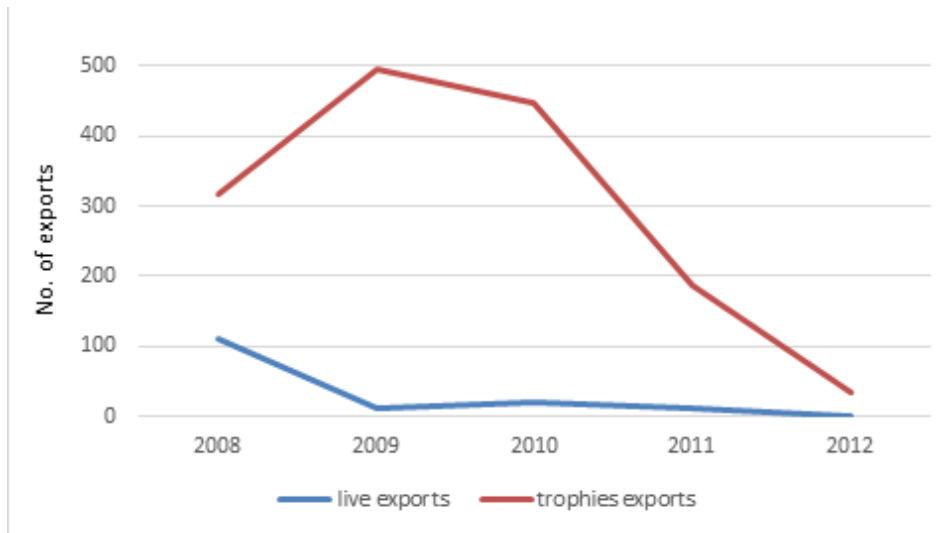


Figure 11: Trend in gross export of live animals/ plants and trophies (2008 - 2012), Source: CITES Trade Database, accessed 24 Sept 2013

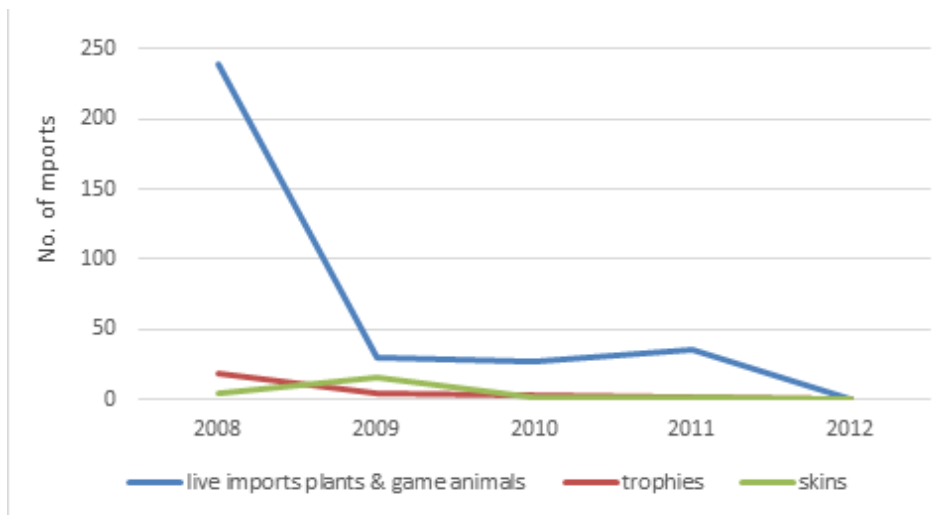


Figure 12: Trend in gross imports of animals and plants (products), Source: CITES Trade Database, accessed 24 Sept 2013

### 2.1.5 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<sup>1</sup>:

<sup>1</sup> Bobonong central and Barolong are the eastern parts with above average poverty.

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.

Income inequality, as measured by the Gini coefficient, has increased from 0.573 in 2002/03 to 0.645 in 2009/10 (1 is completely unequal; 0 is completely equal). Inequality is highest in rural areas and large villages.

In-kind income from natural resource harvesting etc. is most important in rural areas and contributes a third of disposable income in rural areas (compared to only 7% in urban areas). This suggests that family networks and collection of natural resources remain important livelihood sources in rural areas. The contribution to livelihoods, and hence poverty alleviation, from the harvesting of veld products is discussed in Section 2.1.6).

For some rural communities, participation in community-based natural resources management (CBNRM) has been a critical tool in reducing poverty. Some communities have been able to invest their income (see Section 2.1.3) into building houses for the elderly and other community upliftment schemes. However, as is discussed in Section 2.1.3, the levels of benefits are only significant for five communities, suggesting the need to increase the impact that CBNRM projects have outside of WMAs.

## 2.1.6 Harvesting, trade and export of veld products

The value of harvesting veld products to rural households and local economies has yet to be properly quantified across most of Botswana’s ecoregions. Nearly all rural households use firewood, and many build with reeds and thatching grass, and collect plants in season for food and medicinal use.

Quantitative information on harvesting is restricted to those species that are threatened and of commercial value, and for which permits are required. 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 (Figure 13).

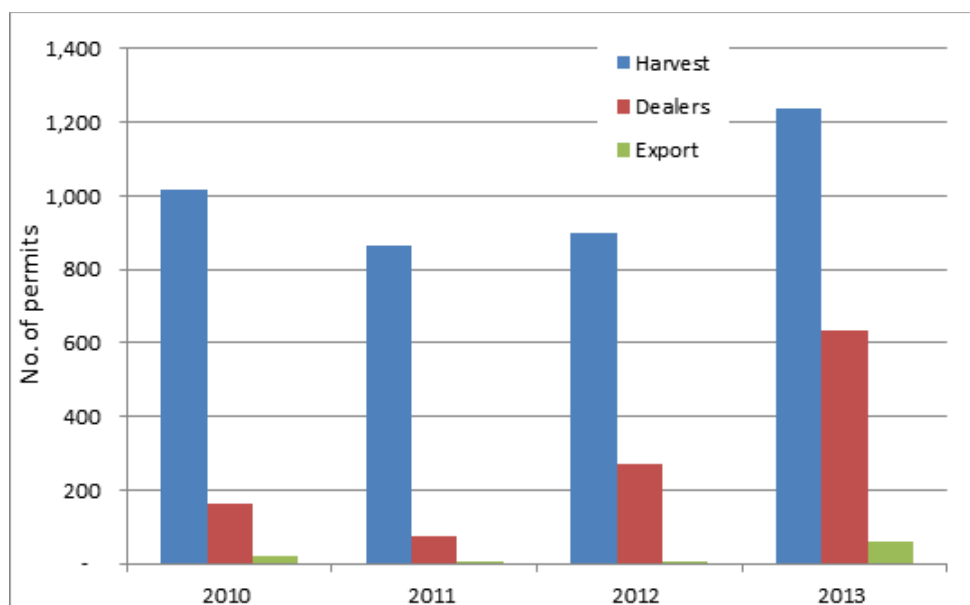


Figure 13: Total permits issued between 2010 and 2013, based on DFRR data

About 77% of these permits were for harvesting while trading permits accounted for 21%. This shows the importance of veld products for subsistence use.

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 14 and Figure 15), particularly the northern drylands (Central District) which accounted for 48% followed by the North East. These were perhaps permits for harvesting of mopane 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.

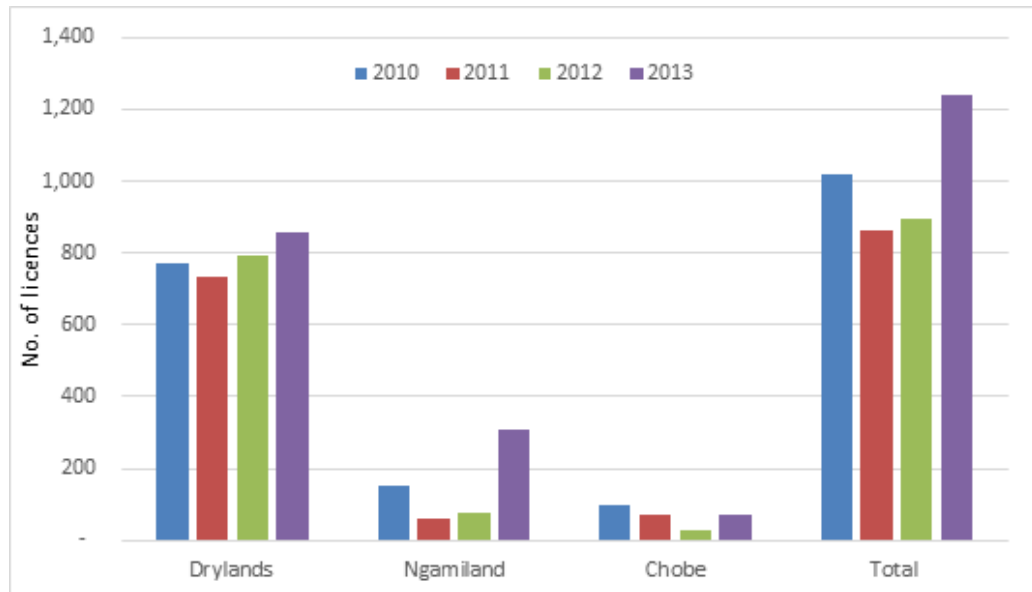


Figure 14: Total number of harvesting permits by region (2010-2013), based on DFRR data

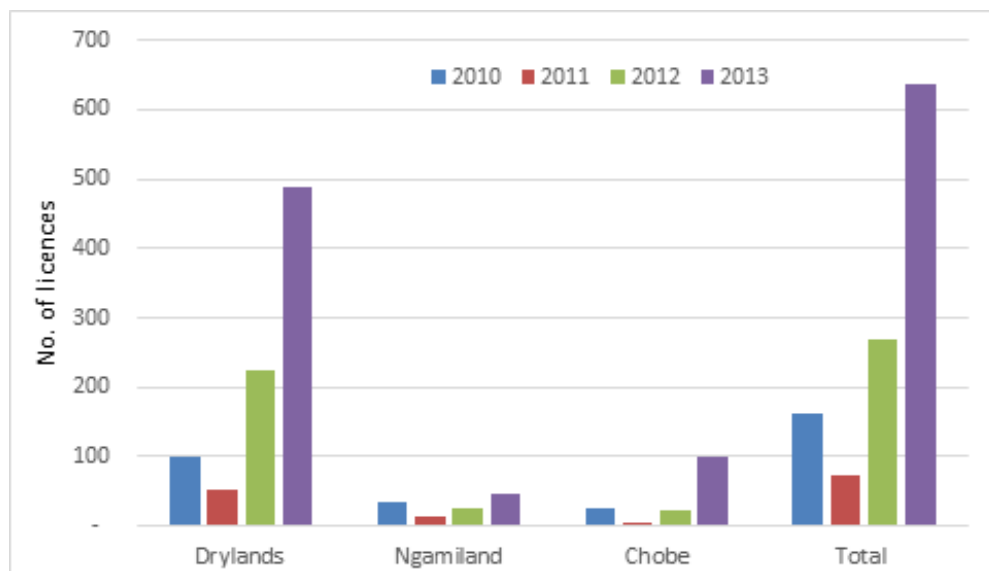


Figure 15: Number of dealer licenses by eco region (2010-2013), based on DFRR data

The Agricultural Resources Conservation Act (2006 regulations) details the harvesting license requirements and conditions for six categories of veld products (Table 2).

**Table 2: Veld products regulated under the Agricultural Resources Conservation Act 2006 regulations**

	<b>Scientific name</b>	<b>Common name</b>	<b>Harvesting conditions</b>
A: 2 species	<i>Hoodia</i> spp <i>Harpagophytum</i> spp	Thokabotshwaro/Sekopane/Seboka/Hoodia Sengaparile/Grapple Plant/ Devils Claw	harvesting requires permit except for domestic use
B: 8 species	<i>Lippia scaberrima</i> <i>Lippia javanica</i> <i>Artemisia afra</i> <i>Terfezia pfeilii</i> <i>Myrothamnus flabellifolius</i> <i>Strophanthus kombe</i> <i>Indigofera tinctoria</i> <i>Cassia abbreviata</i>	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	<i>Imbrasia belina</i>	Phane/ Caterpillar	Permit required for amounts exceeding 10 kg/p/month
D: 11 species	<i>Sclerocarya birrea</i> subsp <i>caffra</i> <i>Adansonia digitata</i> <i>Orthanthera jasminiflora</i> <i>Mimusops zeyheri</i> <i>Vangueria infausta</i> <i>Betchemia discolour</i> <i>Grewia</i> species <i>Azazanza garckeana</i> <i>Strychnos cocculoides</i> <i>Strychnos spinosa</i> <i>Phragmites australis</i>	Morula Mowana/Baobab Mosata>Nama ya setlhare Mmupudu/Red Milkwood Mmilo/ wild medlar Motsintsila/ Brown Ivory Mogwana/Moretlwa Morojwa/Snot Apple Mogorogorwane/ Corky monkey apple Morutlwa /Green monkey apple Letlhaka/Common reed	No permit required
E: 1 species	<i>Hyphaene pertesiana</i>	Mokolwane/ Mokola/ Fan palm	Permit needed for more than 10 bundles/hh/month
F: 7 species	<i>Eragrostis pallens</i> <i>Cymbopogon plurinoides</i> <i>Cymbopogon excavates</i> <i>Hyparrhenia hirta</i> <i>Hyparrhenia filipendula</i> <i>Hyparrhenia dissolute</i> <i>Stipagrostis uniplumis</i>	Motshikiri/ Thatching grass Mokamakama/Thatching grass Mosagasolo/Thatching grass Thatching grass Thatching grass Thatching grass Tshikhitshane/Thatching grass	No harvesting from 15 <sup>th</sup> Oct to 15 <sup>th</sup> July; permit for over 800 bundles/hh/month



	Scientific name	Common name	Harvesting conditions
G: 2 species		Dikgong/Firewood/Fuelwood Untreated poles/plant materials for building purposes	Permit for over 1 ton/hh/month

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
- 2) Dealers:
  - a) Citizens: BWP 50
  - b) Residents: BWP 100
  - c) Non-residents: BWP 300
- 3) Exporters:
  - a) Citizens: BWP 500
  - b) Residents: BWP 1000
  - c) Non-residents: BWP 2000

## 2.2 ECONOMIC OVERVIEW OF BIODIVERSITY IN DRYLAND ECOSYSTEMS

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While more valuation information is available for key ecoregions such as the Okavango, very little attention has been given to the four ecoregions that comprise the dryland ecosystems covering most of Botswana's surface area: Kalahari xeric savanna, the Kalahari Acacia-Baikiaea woodlands, Southern African bushveld and the Zambezi halophytics (Makgadikgadi). Qualitative summaries are given here.

### 2.2.1 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.

### 2.2.2 Valuation summary for 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, until the recent prohibition order, 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 exist 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.

### 2.2.3 Valuation summary for Southern African bushveld

As with the Kalahari Acacia-Baikiaea woodlands, no valuation studies specific to this region have been done. There is some hunting and ecotourism in the freehold Tuli block, and CBOs such as Kgetsí ya Tsie, which is a women's CBO that harvests and processes morula products, generate limited income. Kgetsí 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).

### 2.2.4 Valuation summary for Zambezian halophytics

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 mopane 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 mopane 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.

The Makgadikgadi is a relatively small but valuable ecoregion used for mining (soda ash and diamonds), livestock production, tourism and limited crop production (Table 3). 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 (

Table 4). Tourism is valuable but currently provides limited livelihood benefits (even less than crop production). The MNP operations need to be better integrated into the areas overall development (e.g. through 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.

**Table 3: Direct use value of the MFMP area**

Category	Contribution to local livelihoods (BWP)	Direct gross value added (BWP)
<b>Agriculture</b>	-	
Livestock	15 380 537	10 656 741
Crops	19 209 452	14 707 613
<b>Sub-total</b>	<b>34 589 989</b>	<b>25364 354</b>
<b>Natural resource gathering</b>		
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
<b>Subtotal</b>	<b>73 570 663</b>	<b>83 777 571</b>
<b>Tourism</b>	-	-
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
<b>Subtotal</b>	<b>14 732 000</b>	<b>55 341 000</b>
<b>Mining<sup>2</sup></b>	-	-
<b>Soda ash and salt</b>	<b>74 250 000</b>	<b>190 000 000</b>
<b>Total</b>	<b>197 142 653</b>	<b>354 482 926</b>

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

**Table 4: Indirect use values of the MFMP area**

	Category	Best estimate (BWP million)	Low estimate (BWP million)	High estimate (BWP million)
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
	<b>Total</b>	<b>155.4</b>	<b>73.6</b>	<b>253.4</b>
	<b>Total /ha</b>	<b>43.17</b>	<b>20.44</b>	<b>70.39</b>

Source: DEA and CAR, 2010.

<sup>2</sup> 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.

## 2.3 MAJOR CHANGES IN STATUS OF AND TRENDS IN BIODIVERSITY

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### 2.3.1 Status of protected areas

Nationally, there has been some change in the extent of formal protected areas since 2009. The Wildlife Management Areas (WMAs) in Kgalagadi District have land board approval but are yet to be gazetted. Formal legislation of these areas as WMAs is crucial to the biodiversity of the arid ecoregions of the country. The Kgalagadi WMAs will increase the area under this land use category from approximately 75 000 km<sup>2</sup> to over 110 000 km<sup>2</sup> (Table 5). In addition, the new Flamingo Sanctuary has been gazetted in the Makgadikgadi Pans providing critical protection for flamingo breeding sites. Together, these two changes have increased the protection status of the Kalahari Xeric Savanna and Zambezian halophytics ecoregions (Table 6).

A further layer of protection is in the process of being added to Botswana's main area of biodiversity – the Okavango Delta. The area has recently been awarded World Heritage Site status, which will reinforce the conservation efforts currently being implemented under the Ramsar Convention and national protected area obligations.

At the same time, there are areas where the likelihood of protected status is being diminished. These include several areas that have been listed as proposed WMAs for more than 15 years, but which have never been officially gazetted. The recently issued Revised National Land Use Map shows parts of these WMAs as either proposed game ranches (such as Dobe – NG/3 in Ngamiland) or as being converted to pastoral/arable/residential (such as SO/2 – already gazetted as WMA, and which forms part of the highly critical linkage between the Kgalagadi Transfrontier Park and CKGR.

Table 5: Types of protected areas in Botswana

Type of area	Km <sup>2</sup>	% of total land area	Legal constitution	Level of protection <sup>a</sup>
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
WMAs	Legislated 72,090 Not legislated 65,780	23	Wildlife Conservation and National Parks Act No 28 of 1992	V Hunting prohibition order 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 and Okavango Delta	Tsodilo: 48 + buffer zone 704 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)

Table 6: Representation and protection status of ecoregions in Botswana

Ecoregion	Global status	Area in Botswana (km <sup>2</sup> )	Ecoregion as % of Botswana	% of ecoregion in Botswana "protected"	Main types of protection	% of ecoregion in Botswana under formal protection (Game Reserve / National Park)
Kalahari Acacia-Baikiaea savanna	Vulnerable	185522	32	56.4	Game Reserve, Legislated WMAs, Unlegislated WMAs	17.3
Kalahari xeric savanna	Relatively stable	216947	37	37.9	Legislated WMAs, Unlegislated WMAs, Game Reserve, National Park	24.2
Southern African bushveld	Vulnerable	77371	13	3.5	Private Game Farms	0 (however, 3.5 % is conserved without legal protection under private game farms or community nature reserves)
Zambezian and Mopane woodlands	Stable	29913	5	47.9	Legislated WMAs, National Park, Game Reserve	19.3
Zambezian Baikiaea woodlands	Vulnerable	21598	4	60.3	Forest Reserve, National Park, Unlegislated WMAs, Legislated WMAs	19.9
Zambezian flooded grasslands	Relatively stable	22745	4	71.4	Legislated WMAs	18.2
Zambezian halophytics	Vulnerable	25189	4	40.0	National Park, Unlegislated WMAs	23.1

## 2.3.2 Status of biodiversity

There have been some improvements in national species lists between the Biodiversity Stocktake in 2003 (Ecosurv 2003) and present. The number of recorded mammals has increased from 147 to 157 (improvement in small mammal inventories); amphibian records increased from 34 to 44 species and invertebrate records 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 7: 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

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

### **Mammals**

The mammal fauna of Botswana comprises a total of 157 species, 43 of which are large mammals (i.e., in excess of five kilograms). Botswana's ecosystems support a variety and abundance of mammals which are globally threatened (Table 8). It harbours many threatened large mammal species and contains one of the largest remaining populations of the African wild dog (*Lycaon pictus*) and other carnivores (Table 9) and the largest remaining population of African Elephant (*Loxodonta africana*). Wildlife, by its nature of needing to disperse between wet and dry season resource areas, is easily threatened by habitat fragmentation and physical barriers. 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.

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 Zambezi halophytics), tsessebe, roan and sable antelope and giraffe in northern Botswana in the Kalahari Acacia-Baikiaea savanna and Zambezi Mopane woodlands and lechwe and sitatunga in the Zambezi flooded grasslands. The most recent aerial survey (DWNP 2013) has highlighted these concerns, detailed below by species:

- Declines of certain species within some of the protected areas even though the populations remain stable nationally; examples are:
  - Eland – a non-significant decline in populations in the CKGR;
  - Gemsbok – a non-significant decline in Mabuasehube, CKGR and Nxai Pans;
  - Giraffe – a non-significant decline in CNP, CKGR and Makgadikgadi Pans;
  - Hartebeest – a non-significant decline in CKGR;
  - Lechwe – a significant decline in populations in Moremi;
  - Ostrich – a non-significant decline in Moremi, CKGR Mabuasehube and Nxai Pans;
  - Sable – a non-significant decline in Moremi;
  - Springbok – a significant decline in CKGR, non-significant declines in all other reserves except Khutse (where no declines were observed);
  - Wildebeest – a 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 (the trans-frontier conservation area or TFCA).

**Table 8: List of globally threatened large herbivores in Botswana**

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



**Table 9: Conservation status of carnivore species in Botswana**

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

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).

**Table 10: Conservation status of Insectivora, Macroscelidea and rodent species in Botswana**

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

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

**Table 11: 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	<i>Chaerephon shortridgei</i>	Least concern
Natal clinging bat	<i>Miniopterus natalensis</i>	Near threatened
Giant leaf-nosed bat	<i>Hipposideros vittatus [ex Marungensis]</i>	Near threatened
Short-eared trident bat	<i>Cloetis percevali</i>	Least concern
Lesser woolly bat	<i>Kerivoula lanosa</i>	Least concern (rare)
Rendall's serotine bat	<i>Neoromicia rendalli</i>	Least concern (rare)
Botswana long-eared bat	<i>Laephotis botswanae</i>	Least concern (rare)
Anchieta's bat	<i>Hypsugo anchietae</i>	Least concern (rare)
Butterfly bat	<i>Chalinolobis variegatus</i>	Least concern
Straw-coloured fruit bat	<i>Eidolon helvum</i>	Near threatened
Peters' epauletted fruit bat	<i>Epomophorus crypturus</i>	Least concern
Dobson's fruit bat	<i>Epomops dobsonii</i>	Least concern
Cape serotine bat	<i>Eptesicus capensis</i>	Least concern
Sundevall's leaf-nosed bat	<i>Hipposideros caffer</i>	Least concern
Commerson's leaf-nosed bat	<i>Hipposideros commersoni</i>	Near threatened
Schreibers' long-fingered bat	<i>Miniopterus schreibersii</i>	Near threatened
Common slit-faced bat	<i>Nycteris thebaica</i>	Least concern
Schlieffen's bat	<i>Nycticeius schlieffenii</i>	Least concern
Banana bat	<i>Pipistrellus nanus</i>	Least concern
Geoffroy's horseshoe bat	<i>Rhinolophus clivosus</i>	Least concern
Dent's horseshoe bat	<i>Rhinolophus denti</i>	Least concern
Flat-headed free-tailed bat	<i>Sauromys petrophilus</i>	Least concern
Yellow house bat	<i>Scotophilus dinganii</i>	Least concern

Species Common Name	Scientific Name	Status IUCN Red Data Book
Pale free-tailed bat	<i>Tadarida (Chaerephon) chapini</i>	Least concern
Nigerian free-tailed bat	<i>Tadarida (Chaerephon) nigeriae</i>	Least concern
Little free-tailed bat	<i>Tadarida (Chaerephon) pumila</i>	Least concern
Angola free-tailed bat	<i>Tadarida (Mops) condylura</i>	Least concern
Midas free-tailed bat	<i>Tadarida (Mops) midas</i>	Least concern
Egyptian free-tailed bat	<i>Tadarida (Tadarida) aegyptiaca</i>	Least concern
Tomb bat	<i>Taphozous mauritanus</i>	Least concern
Egyptian tomb bat	<i>Taphozous perforatus</i>	Least concern

Table 12: Conservation status of Galagidae in Botswana

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

### Avifauna

As of 2010, there are 587 bird species recorded in Botswana. There are 25 globally threatened bird species in Botswana, and a further eight species regarded as nationally threatened or Birds of Conservation Concern in Botswana (Table 13). 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 13: List of globally threatened bird species found in Botswana

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

No	Scientific Name	English Name	Conservation Status
25	<i>Numenius arquata</i>	Eurasian Curlew	Near Threatened
26	<i>Polemaetus bellicosus</i>	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 16 shows the distribution of threatened and vulnerable bird species in Botswana.

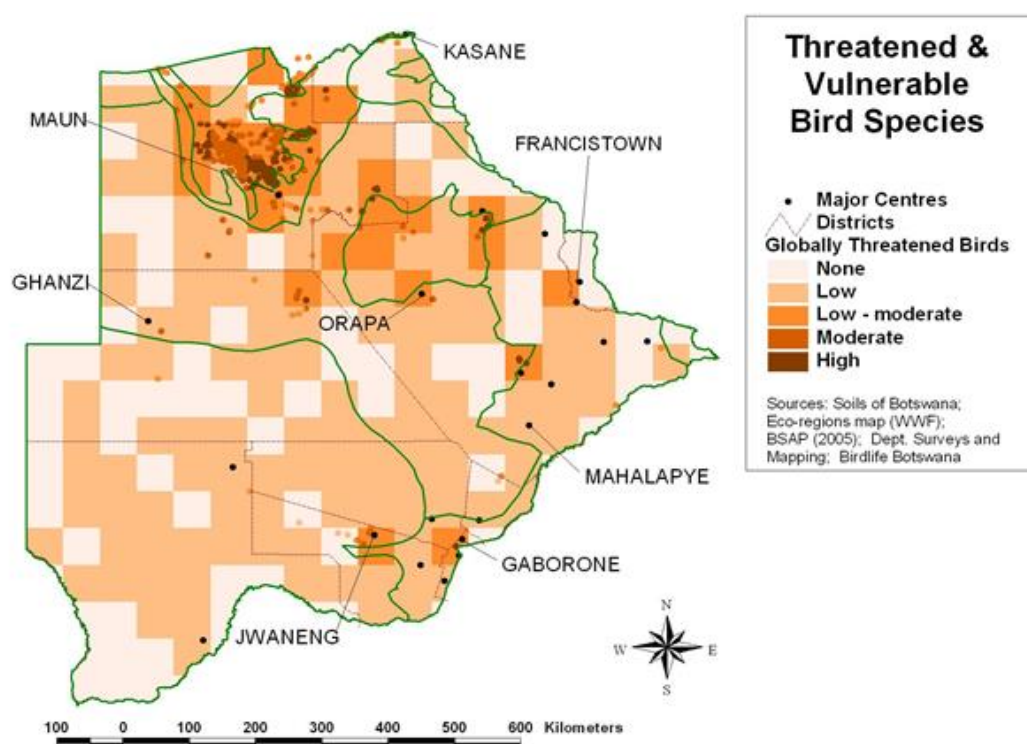


Figure 16: Distribution of threatened and vulnerable bird species in Botswana (Source: Birdlife Botswana)

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 carunculatus*) and Slaty Egret (*Egretta vinaceigula*) occur in northern Botswana.

In addition to the regionally vulnerable species, there are also several Near-threatened. This category includes the African Skimmer (*Rynchops flavirostris*), with the Okavango Delta estimated 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 presence of extensive seasonal pans in the Makgadikgadi makes it an important breeding area for several bird species that are of conservation significance. The area is a key breeding site for Lesser Flamingo, 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 Moseitse River which floods onto the pan just north of the main breeding site. Further threats involve colony desertion resulting from disturbance by low-flying aircraft, and disruption of migration patterns through poorly aligned powerlines.

Vultures: 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 the topmost threat 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 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.

Birdlife Botswana is 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.

### **Fish**

There are no new fish species lists; the number of recorded species remains 99. Of these 99 species, two are globally threatened, *Oreochromis andersonii* and *O. macrochir*. *O. andersonii* is susceptible to fishing pressure while both species 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. 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.

### **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.

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

*Typhlosaurus gariensis* – Gariiep 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

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

*Crocodylus niloticus* – Nile crocodile

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. 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.

### **Invertebrates**

There are few inventories of invertebrates. The most comprehensive lists are of dragonflies and butterflies. Generally, invertebrates are data deficient in Botswana.

Odonata (127 species recorded) are one of the best studied families of invertebrate. 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*).

**Table 14: IUCN Red Data species for Odonata occurring in Botswana (Kipping 2007)**

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

There are 252 butterfly species listed for Botswana in the Butterflies of Africa Database ([http://en.wikipedia.org/wiki/List\\_of\\_butterflies\\_of\\_Botswana](http://en.wikipedia.org/wiki/List_of_butterflies_of_Botswana)). None of the known butterflies are endangered, nor are there any known threats to this taxon. There are presently no butterflies of conservation concern in Botswana.

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

**Table 15: IUCN Red Data species for invertebrates (apart from Odonata) occurring in Botswana (DWNP/EU, 2007 and this review)**

Scientific Name	Class	Conservation Status
<i>Mutela zambesiensis</i>	Bivalvia	Least concern
<i>Potamonautes warreni</i>	Crustacea	Least concern
<i>Burnupia trapezoidea</i>	Gastropoda	Data deficient
<i>Bulinus depressus</i>	Gastropoda	Least concern
<i>Pila occidentalis</i>	Gastropoda	Least concern
<i>Melanoides victoriae</i>	Gastropoda	Least concern
<i>Doratogonus rugifrons</i>	Diplopoda	Least concern
<i>Doratogonus stephensi</i>	Diplopoda	Data deficient
<i>Eriksonia edgei</i> (is thought to occur in Botswana but has not been collected)	Lepidoptera, Lycaenidae family	Vulnerable but considered critically endangered in South Africa

In part due to data deficiency, no major threats to invertebrates are known. This gap in information is important, because invertebrates can serve as key indicators of ecosystem health. For example, dragonflies 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 and other major wetlands would affect dragonflies.

### **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 16.

**Table 16: 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
<b>Total</b>	<b>182</b>	<b>911</b>	<b>3,086</b>

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. 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 17: New species of plant not previously collected in Botswana

Family	Genus	Species	Author	Verifier
Acanthaceae	<i>Barleria</i>	<i>albostellata</i>	C.B.Clarke	Iain Darbyshire, Kew
Acanthaceae	<i>Thunbergia</i>	<i>annua</i>	Hochst. Ex Nees	Kai Vollesen, Kew
Aizoaceae	<i>Hereroa</i>	<i>glenensis</i>	(N.E.Br.) L.Bolus	Prisilla Burgoyne, SANBI
Aizoaceae	<i>Nananthus</i>	<i>aloides</i>	(Haw.) Schwantes	Emma Williams, Kew
Asteraceae	<i>Gutenbergia</i>	<i>polycephala</i>	Oliv. & Hiern.	Emma Williams, Kew
Convolvulaceae	<i>Merremia</i>	<i>xanthophylla</i>	Hall.f.	Emma Williams, Kew
Cyperaceae	<i>Alinula</i>	<i>lipocarphioides</i>	(Kük.) J.Raynal	K.Bauters, Ghent University
Leguminosae	<i>Indigofera</i>	<i>baumiana</i>	Harms (LC)	Brian Schrire, Kew
Malvaceae	<i>Corchorus</i>	<i>fascicularis</i>	Lam.	Emma Williams, Kew
Vitaceae	<i>Cyphostemma</i>	<i>kilimandscharicum</i>	(Gilg) Desc. Ex Wild & R.B.Drumm.	Emma Williams, Kew

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

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 17 shows sites where Botswana's threatened and vulnerable plant species have been collected.

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

Family	Botanical Name	Status
Bombaceae	<i>Adansonia digitata</i> L.	Protected
Ebenaceae	<i>Diospyros mespiliformis</i> Hochst ex A.D.C.	Protected
Euphorbiaceae	<i>Spirostachys africana</i>	Protected
Fabaceae	<i>Afzelia quanzensis</i> Welw.	Protected
	<i>Baikia plurijuga</i> Harms.	Protected (Near threatened)
	<i>Brachystegia</i> spp.	Protected
	<i>Guibourtia coleosperma</i> (Benth) J. Leon	Protected
	<i>Pterocarpus angolensis</i> D.C.	Protected (Near threatened)
Meliaceae	<i>Entandrophragma caudatum</i> Sprague	Protected
Rhamnaceae	<i>Berchemia discolor</i> (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	<i>Barleria matopensis</i> S. Moore	Least concern	No
	<i>Blepharis bainesii</i> S.Moore ex C.B.Clarke	Least concern	Yes
Apocynaceae	<i>Adenium boehmianum</i> Schniz	Endangered	No
	<i>Adenium oleifolium</i> Stapf	Vulnerable	Yes
Asclepiadaceae	<i>Ceropegia floribunda</i>	Data deficient	No
	<i>Hoodia currori</i> subsp. <i>Lugardi</i> (N.E. Br.) Bruyns	Vulnerable	Yes
	<i>Huernia levyi</i> Oberm.	Vulnerable	No
	<i>Orbea tapscottii</i> (I.Verd.) L.C.Leach	Endangered	Yes
	<i>Orbea knobelii</i> (E.Phillips) L.C.Leach	Vulnerable	Yes
Asteraceae	<i>Arctotis rogersii</i> (Benson) M.C.Johnst.	Data deficient	No
	<i>Arctotis serpens</i> (S.Moore) Lewin	Data deficient	No
	<i>Erlangea remifolia</i> Wild & G.V.Pope	Data deficient	Yes
	<i>Rennera laxa</i> (Bremek. & Oberm.) Källersjö	Data deficient	No
Aizoaceae	<i>Nananthus aloides</i> (Haw.) Schwantes	Data deficient	Yes
	<i>Nananthus margaritiferus</i> L.Bolus	Data deficient	No
Capparaceae	<i>Boscia foetida</i> Schinz subsp. <i>Minima</i> Toelken	Least concern	Yes
Cyperaceae	<i>Eleocharis cubangensis</i> H.E. Hess	Data deficient	No
	<i>Pycreus okavangensis</i> Podlech	Least concern	Yes
Droseraceae	<i>Aldrovanda vesiculosa</i>	Endangered (IUCN)	No
Eriospermaceae	<i>Eriospermum linearifolium</i> Baker	Data deficient	No
	<i>Eriospermum seineri</i> Engl. & K.Krause	Data deficient	No
Euphorbiaceae	<i>Euphorbia venterii</i> L.C.Leach ex R.H.Archer & S.Carter	Endangered	Yes
	<i>Jatropha botswanica</i> Radcl.-Sm.	Least concern	Yes
Fabaceae	<i>Acacia hebeclada</i> subsp. <i>Chobiensis</i> (O.B.Mill.) A.Schreib.	Least concern	Yes
	<i>Acacia hebeclada</i> DC. Subsp. <i>Tristis</i> A.Schreiber	Rare	Yes
Leguminosae	<i>Dalbergia melanoxylo</i>	Near threatened (IUCN)	No
Indigofera	<i>Indigofera baumiana</i> Harms (LC)	Least concern	Yes
Lythraceae	<i>Nesaea minima</i> Immelman	Vulnerable	No
Orchidaceae	<i>Ansellia Africana</i> Lindl.	Vulnerable	Yes
	<i>Eulophia angolensis</i> (Rchb.f.) Summerh.	Vulnerable	No
	<i>Eulophia latilabris</i> Summerh.	Vulnerable	Yes
	<i>Habenaria pasmithii</i> G.Will.	Data deficient	No
	<i>Zeuxine africana</i> Rchb.f.	Rare and threatened	No
Pedaliaceae	<i>Harpagophytum procumbens</i> DC.	Vulnerable	Yes
	<i>Harpagophytum zeyheri</i> (sub species <i>zyheri</i> and <i>sublobatum</i> ) Decne.	Least concern	Yes
Poaceae	<i>Aristida wildii</i> Melderis	Data deficient	Yes
	<i>Panicum coloratum</i> var. <i>makarikariense</i> Goossens	Data deficient	No
	<i>Panicum gilvum</i> Launert	Data deficient	Yes
	<i>Panicum pilgerianum</i> Schweickerdt Clayton	Data deficient	No
	<i>Sporobolus bechuanicus</i> Gooss.	Data deficient	Yes



Family	Species name	Status	Ex situ Storage
Portulacaceae	<i>Avonia rhodesica</i> (N.E.Br.) G.D.Rowley (formerly <i>Anacampseros rhodesica</i> )	Vulnerable	Yes
Rosaceae	<i>Grielum cuneifolium</i> Schinz.	Data deficient	No
Santalaceae	<i>Thesium dissitum</i> N.E.Br.	Data deficient	No
Sapindaceae	<i>Erythrophysa transvaalensis</i> I.Verd.	Vulnerable	Yes
Scrophulariaceae	<i>Jamesbrittenia integerrima</i> (Benth. ) Hilliard	Data deficient	No
	<i>Jamesbrittenia concinna</i> (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	<i>Blepharis bainesii</i> S.Moore ex C.B.Cl.	Potentially Endemic
Amaranthaceae	<i>Amaranthus dinteri</i> subsp. <i>Dinteri</i>	Endemic
Anacardiaceae	<i>Rhus magalismsontana</i> subsp. <i>Magalismsontana</i> Burch x <i>Rhus pyroides</i> var. <i>pyroides</i>	Endemic
Asclepiadaceae	<i>Orbea knobelii</i> (Phill.) Leach	Endemic
Asteraceae	<i>Arctotis rogersii</i> S.Moore	Potentially Endemic
	<i>Arctotis serpens</i> S.Moore	Potentially Endemic
	<i>Erlangea remifolia</i> Wild & Pope	Endemic
Capparaceae	<i>Rennera laxa</i> (Brem. & Oberm.) Kallersjo	Endemic
	<i>Boscia matabelensis</i> Pest	Near Endemic
Convolvulaceae	<i>Cleome kalachariensis</i> (Schinz) Gilg & Ben	Endemic
	<i>Ipomoea fanshawei</i> Verdc.	Near Endemic
Eriospermaceae	<i>Eriospermum linearifolium</i> Bak.	Potentially Endemic
	<i>Eriospermum seineri</i> Engl. & Krause	Potentially Endemic
Euphorbiaceae	<i>Euphorbia rubriflora</i> N.E.Br.	Near Endemic
	<i>Jatropha botswanica</i> Radcliff-Sm.	Endemic
	<i>Tragia gardneri</i> Prain	Near Endemic
Iridaceae	<i>Gladiolus rubellus</i> Goldblatt	Endemic
Lythraceae	<i>Nesaea minima</i> Immelman	Endemic
Neuradaceae	<i>Grielum cuneifolium</i> Schinz	Potentially Endemic
	<i>Neuradopsis bechuanensis</i> Bremek. & Oberm	Endemic
	<i>Aristida stipitata</i> subsp. <i>Spicata</i> (De Winter) Meldeis apud Launert	Endemic
Poaceae	<i>Aristida wildii</i> Meld.	Potentially Endemic
	<i>Eragrostis leptotricha</i> Cope	Near Endemic
	<i>Eragrostis phyllacantha</i> Cope	Near Endemic
	<i>Eragrostis subglandulosa</i> Cope	Endemic
	<i>Sporobolus bechuanicus</i> Goossens	Endemic
	<i>Thamnosma rhodesica</i> (Baker f.) Mendonca	Near Endemic
Santalaceae	<i>Thesium dissitum</i> N.E.Br.	Potentially Endemic
Scrophulariaceae	<i>Jamesbrittenia integerrima</i> (Benth.) Hilliard	Potentially Endemic
Scrophulariaceae	<i>Jamesbrittenia concinna</i> Hiern	Potentially Endemic

Source: Setshogo & Hargreaves, 2002, RBG Kew 2003

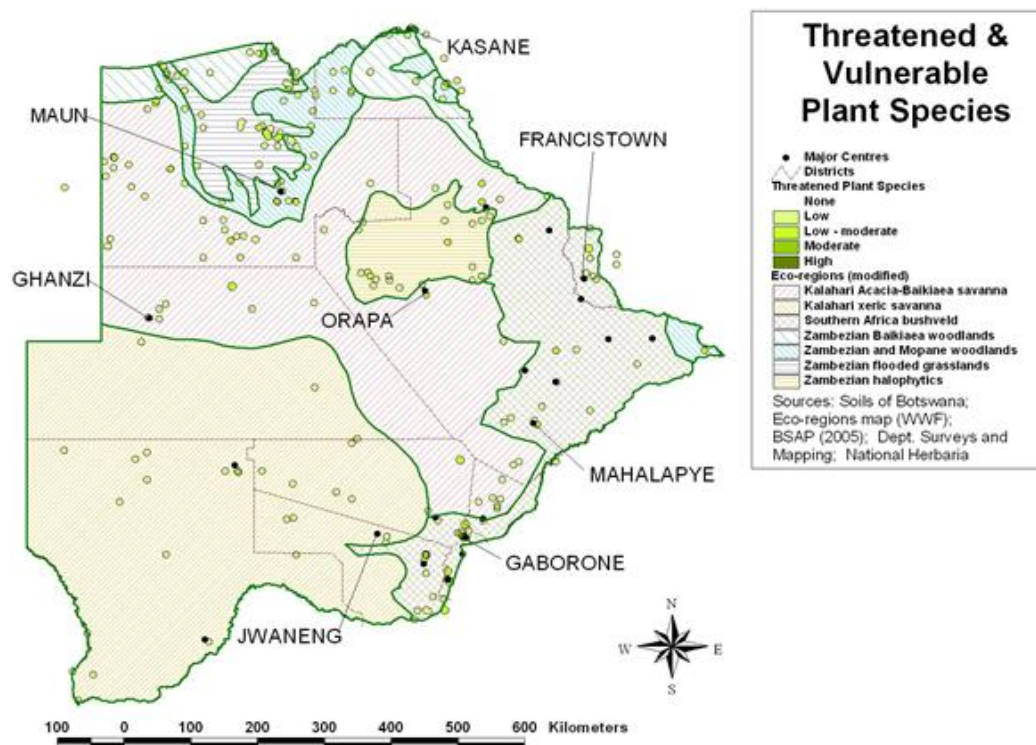


Figure 17: Distribution of threatened and vulnerable plant species in Botswana (Sources: South African National Biodiversity Institute, National Herbarium (Botswana), RBG Kew)

## 2.4 MAIN THREATS TO BIODIVERSITY, AND CONSEQUENCES FOR ECOSYSTEM SERVICES

Threats and contributing factors to biodiversity loss can be largely broken down into those that are internal to Botswana, and those that are external to, or at a large scale than, the country.

Internal threats derive primarily from development expansion, but are also due to limited management of environment and natural resources. External threats are largely outside of Botswana's control. The major *direct* threats to Botswana's biodiversity, together with their causes, impacts and implications, are presented in Table 21. These direct threats are presented at national level, summarising conditions across all ecoregions and all forms of land use. Below the table, the major threats are presented in greater depth.

Most 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.

It is also important to talk about the potential *indirect* threat from policy and institutional arrangements that, while supporting national development, and even

theoretically aimed at conservation, may in fact undermine sound biodiversity management. Chief in this regard, and described in depth in the Stocktaking and Gap Analysis Report, is the issue of the interplay between policy decisions surrounding legal hunting, and lack of institutional support for poaching control. There is a strong need to ensure all key policy decisions are based firmly on science, and that formal enforcement measures and resources are in place to adequately control direct social threats.

An emerging threat, highlighting the role of policy, is the proposed land use changes under the Revised National Land Use Map. The land use map suggests several areas adjacent to protected areas and including proposed WMAs as game ranches – which would require fencing and further block the migratory routes that are critical for sustaining the already dwindling populations of large herbivores. The land use map also appears to suggest the degazettement of existing MWAs for pastoral/arable/residential use – a complete loss of both land and migration routes in the under-protected Kalahari xeric savanna. These include the CHAs SO/2, parts of GH/10 and GH/11 as well as part of KD/12 in a proposed WMA. Loss of these lands for wildlife will seriously undermine the viability of large herbivore populations in Botswana, as well as the predators that feed on them, and which are of global conservation concern.

Table 21: Summary of stakeholder-identified threats to biodiversity, and potential consequences of its loss in Botswana

Threat	Underlying Causes	Main Impacts	Key Consequences
<b><i>Internal threats</i></b>			
Habitat destruction, habitat conversion and disturbance	<ul style="list-style-type: none"> <li>Changes in land use (e.g., settlement expansion, agricultural expansion)</li> </ul>	<ul style="list-style-type: none"> <li>High levels of human-wildlife conflict (HWC) and predator depredations (problem animal control and poaching) Prevention of seasonal wildlife movements (e.g., through the Schwelle)</li> <li>Disturbance of communally nesting birds' nesting sites</li> <li>Reduction of air and water quality</li> </ul>	<ul style="list-style-type: none"> <li>Reduction in likelihood of some WMAs being legislated</li> <li>Reduction in populations of migratory species</li> <li>Implications for ecosystem services in both aquatic and terrestrial environments, especially for rural poor</li> </ul>
Barriers to wildlife movement	<ul style="list-style-type: none"> <li>Need to control veterinary diseases, EU subsidies, increased fencing of rangelands through ranch creation</li> </ul>	<ul style="list-style-type: none"> <li>Reduction in populations of migratory species</li> <li>Isolation of protected areas (PAs)</li> <li>Increased pressure on wildlife in PAs</li> </ul>	<ul style="list-style-type: none"> <li>Further separation of direct benefits from natural resources by local communities, and increased HWC, reduction in quality of rural livelihoods.</li> <li>With warming and erratic rainfall under climate change, links between dry and wet season wildlife ranges become even more important to maintain.</li> </ul>
High populations of elephant	<ul style="list-style-type: none"> <li>Dispersal into new ranges, reduction of range in neighbouring countries</li> </ul>	<ul style="list-style-type: none"> <li>Habitat modification and disturbance</li> <li>Reduction of biomass, and plant and animal species</li> </ul>	<ul style="list-style-type: none"> <li>Loss of habitat diversity, loss of biodiversity, undermining of the ecotourism potential of the country</li> </ul>
Increase in poaching	<ul style="list-style-type: none"> <li>Loss of benefits from wildlife</li> <li>Increased rural poverty</li> <li>Penetration of illegal international wildlife trade</li> <li>Loss of management presence in remote areas</li> </ul>	<ul style="list-style-type: none"> <li>Decline in populations of large mammals, including some globally threatened species</li> <li>Increased social conflict</li> </ul>	<ul style="list-style-type: none"> <li>Breakdown of rural support for conservation</li> </ul>
Disruption of natural fire regime	<ul style="list-style-type: none"> <li>Unmanaged use of fire, fire use pushed underground by legislation. (Fires used to stimulate sprouting for grazing, clear bush to improve visibility, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Unseasonal fires, and in some areas too-frequent fires, affect recruitment of key tree species, and disturb bird breeding, especially in riparian zones</li> </ul>	<ul style="list-style-type: none"> <li>Currently unknown, as insufficient research has been done.</li> </ul>

Threat	Underlying Causes	Main Impacts	Key Consequences
Overuse and over-collection of wild plant species	<ul style="list-style-type: none"> <li>Poverty</li> <li>Insufficient management and enforcement of legislation</li> </ul>	<ul style="list-style-type: none"> <li>Localised impacts, pressure on certain valuable or medicinal species</li> </ul>	<ul style="list-style-type: none"> <li>Potential loss of key species, but also ultimately reduction in availability of resources important to rural livelihoods</li> </ul>
Alien invasive species	<ul style="list-style-type: none"> <li>Habitat degradation (e.g., overgrazing, nutrient loading in riparian systems)</li> </ul>	<ul style="list-style-type: none"> <li>Displacement / replacement of indigenous species</li> <li>Change in water quality</li> <li>Reduction in range quality</li> </ul>	<ul style="list-style-type: none"> <li>Potential loss of key species, but also ultimately reduction in availability of resources important to rural livelihoods</li> </ul>
<ul style="list-style-type: none"> <li><b>External threats</b></li> </ul>			
Climate change	<ul style="list-style-type: none"> <li>Global carbon emissions, overconsumption of fossil fuels</li> <li>Greed and inequality</li> </ul>	<ul style="list-style-type: none"> <li>Warming, particularly over the dryland ecoregions, especially the Kalahari xeric savannas. Increase in extreme weather events, and increasing weather unpredictability</li> </ul>	<ul style="list-style-type: none"> <li>Reduction in ecosystem services and natural resource availability, with negative consequences for rural livelihoods</li> <li>For biodiversity, linkages between wet and dry season ranges will become increasingly important, increasing the need to address barriers to movement</li> </ul>
Changes to hydrology and water quality of inflowing rivers	<ul style="list-style-type: none"> <li>Nutrient runoff in catchment in neighbouring countries, dams</li> <li>Increased development and urbanisation</li> <li>Land &amp; resource use practices (e.g. agriculture and water harvesting)</li> </ul>	<ul style="list-style-type: none"> <li>Decreasing variability in flow, cessation of low season flow, eutrophication, decreasing water quality, decrease in sediment inputs</li> <li>Change in the timing, duration, quality and extent of annual floods</li> </ul>	<ul style="list-style-type: none"> <li>Loss of floodpulse would likely convert the deltaic systems to a single course river channel, losing extensive seasonally flooded floodplains</li> <li>Change to the character and functioning of Botswana's primary biodiversity hotspot – the Okavango, leading to loss of ecosystem services and natural resources for both rural livelihoods and the national tourism industry.</li> <li>Change from fresh water to more saline conditions</li> </ul>

## 2.4.1 Habitat destruction, habitat conversion and disturbance

Habitat destruction and habitat conversion is primarily 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 deprecations on livestock (Figure 18). Compensation payments exceed a million Pula per annum.

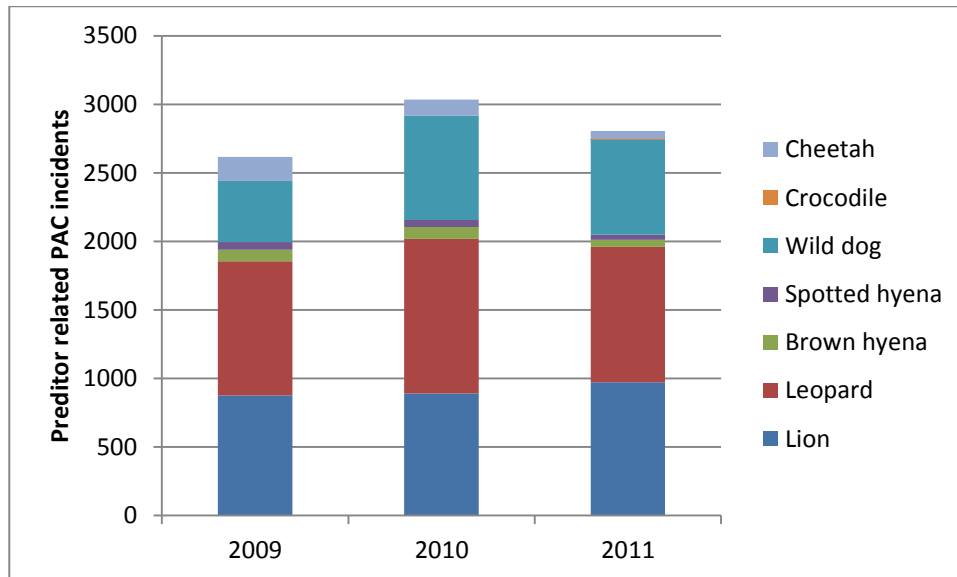


Figure 18: National predator related PAC incidents 2009 - 2011 (Source DWNP statistics)

The expansion of livestock into traditional wildlife areas (Figure 20) has created high levels of predator deprecations. 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 19).

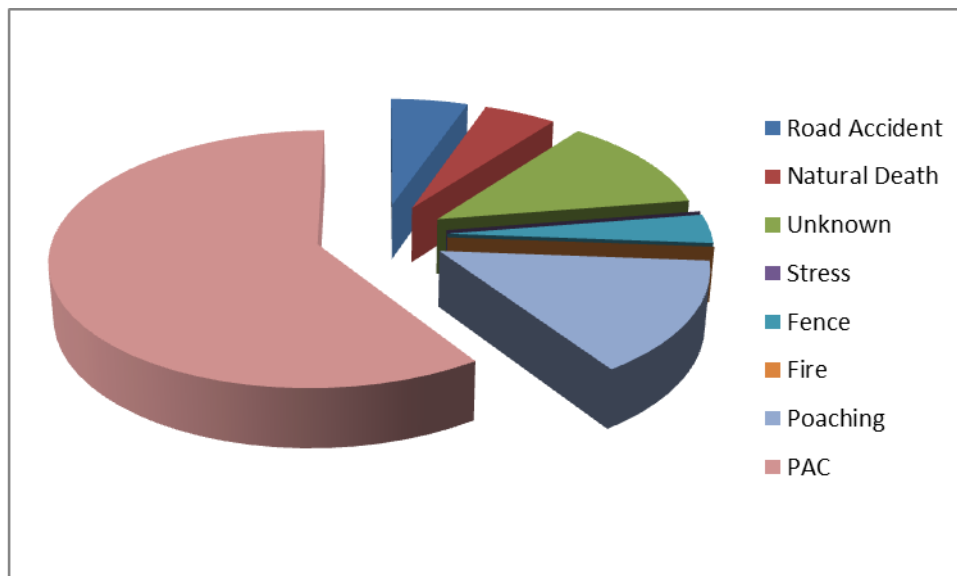


Figure 19: National wildlife mortalities 2009 - 2011 (DWNP records)

Much of the expansion of livestock has been into the proposed and legislated WMAs. As indicated in Figure 20 the main expansion areas are:

- 1) 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.
- 2) Westward expansion of livestock and land allocation into the Gcwihaba WMA (not legislated). The expansion is reducing the likelihood of the WMA being legislated.
- 3) Expansion of cattle into the main Ghanzi WMAs which link the CKGR with the Schwelle.
- 4) Encroachment of cattle into across the Schwelle effectively preventing seasonal movements of wildlife across the area.
- 5) Expansion of cattle throughout the proposed Makgadikgadi WMAs.
- 6) 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.

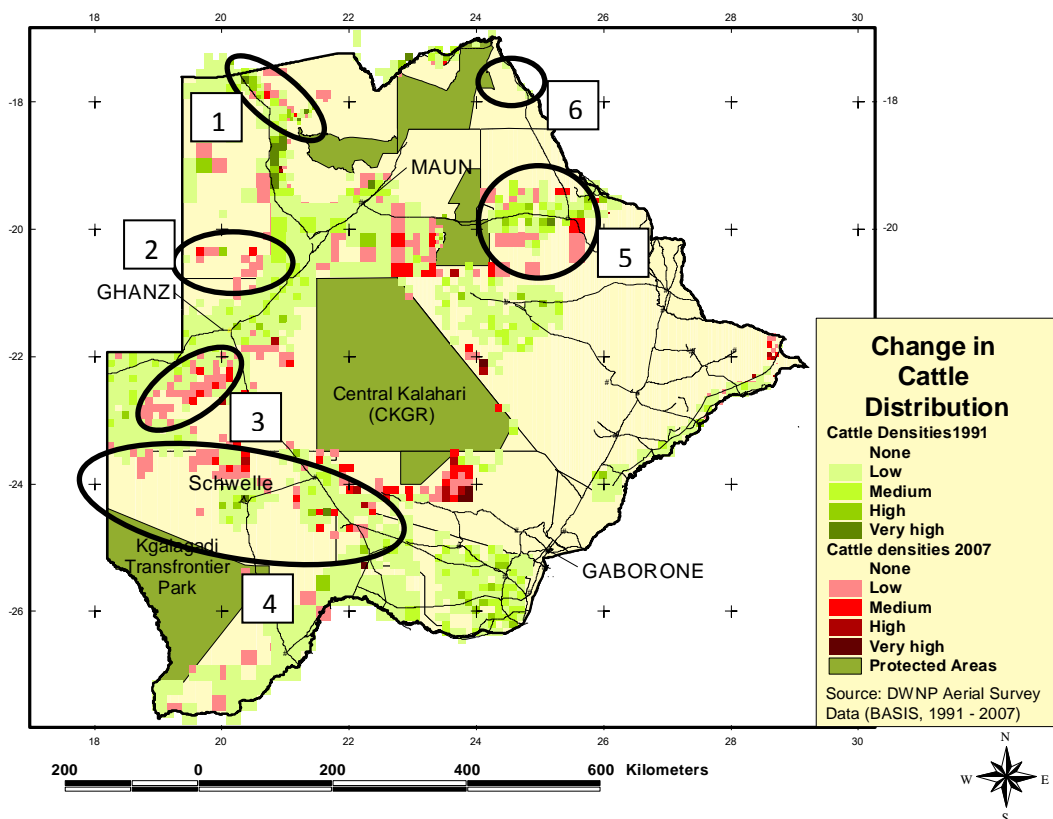


Figure 20: Expansion of livestock based on DWNP aerial survey data. Red squares denote livestock expansion into new areas mostly during the last decade. Major conflict areas indicated with circles. Note: the absence of livestock in eastern Botswana is because no aerial surveys were undertaken in the 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<sup>3</sup>, 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.

## 2.4.2 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.

## 2.4.3 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 2013 estimate of 207,500. The high densities of elephant and the resulting habit modification and

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<sup>3</sup> In addition to the diamond mines, there was one soda ash mine, one underground colliery and copper nickel abstraction.



disturbance is thought, by the DWNP to be depressing wildlife populations of species sensitive to disturbance and habitat modification.

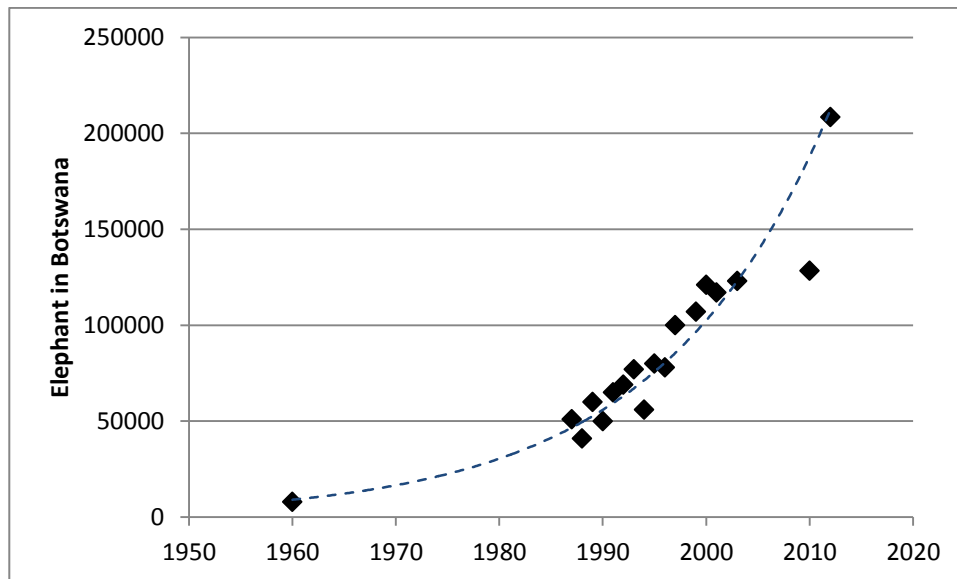


Figure 21: Estimates of elephant numbers in Botswana 1960 - 2012 (Source: 1960 from literature and aerial surveys for the other points - DWNP, KCS, Elephants Without Borders)

#### 2.4.4 Increase in poaching

Data on poaching are sparse, in part due to the sensitive nature of protecting some rare and endangered species such as rhino, and in part because much of the poaching takes place in remote areas. Anecdotal evidence suggests a large increase in poaching in recent years. In 2013 there were reported incidents of elephants and rhinos being killed for their ivory and horn respectively.

However, there also appears to be an extensive domestic market for illegal bushmeat. 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 cause of wildlife deaths (Figure 19). 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.

In addition, poachers often poison the carcasses of poached animals in order to kill vultures who might give away their location. Several reports of mass killings of vultures have been made in the past 5 years. Not only are vultures threatened species, but their role in the food chain is critical to ecosystem functioning.

#### 2.4.5 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 22 & Table 22) indicate that the Zambezan 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 Zambezan and Mopane woodlands. Fire frequency varies considerably in the Zambezan 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.

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

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

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

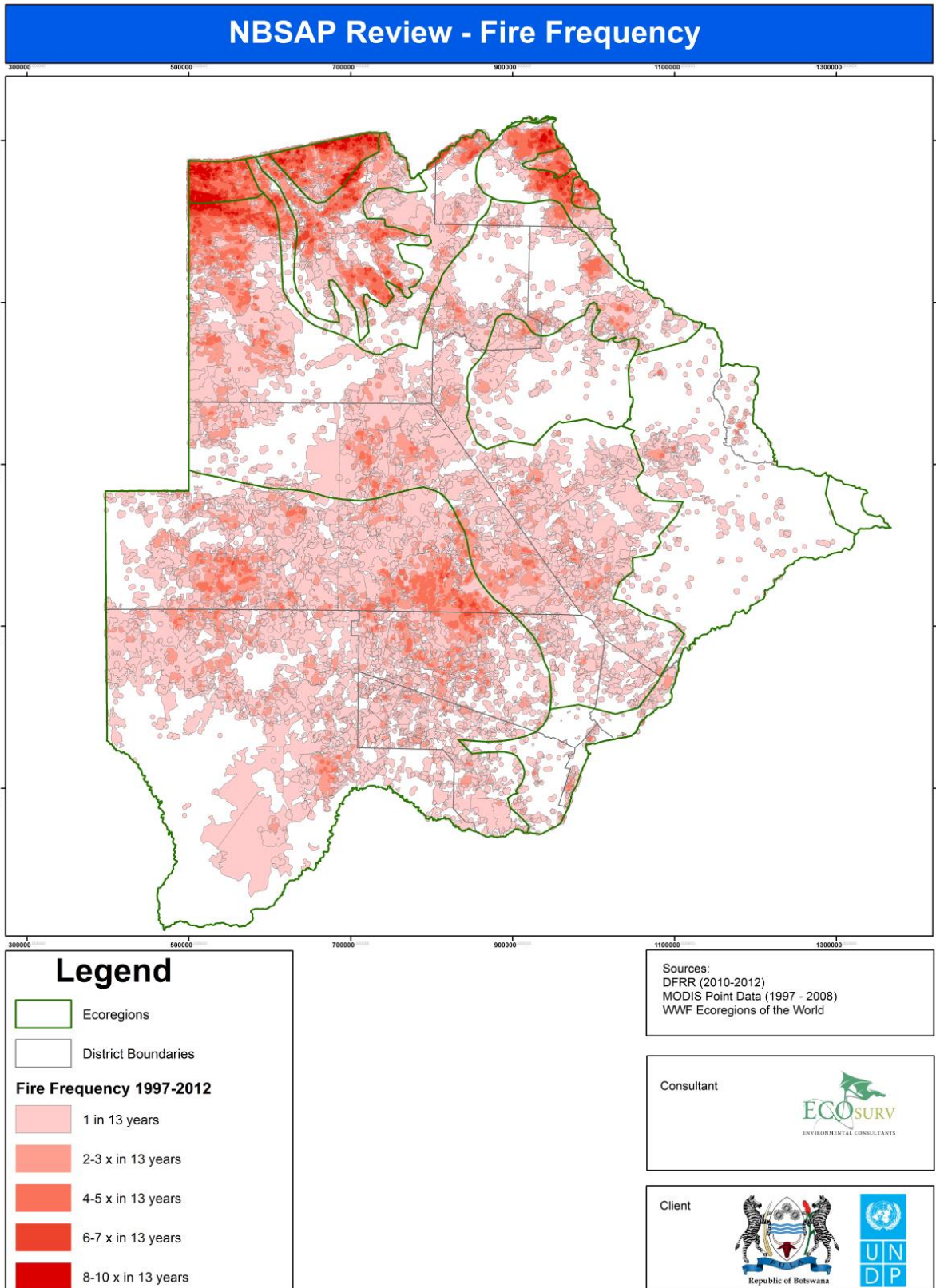


Figure 22: Fire frequency based on MODIS data (1997-2008) and DFRR data (2010 - 2012)

## 2.4.6 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.

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. 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.

## 2.4.7 Alien invasive species

Little is known about the status of terrestrial alien invasive plant species in Botswana, although the state of knowledge is steadily increasing, although relatively low on a national scale, is increasing. Alien invasive species have the potential to pose 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. 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).

For aquatic invasive species, the level of information is high. In the Okavango Delta *Pistia stratiotes* and *Salvinia molesta* pose 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 (*Mimosa pigra*), Sesbania species, (*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 mexicana* (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 (Setshogo; 2005) identified the following as additional invasive species:

- *Xanthium spinosum*
- *Opuntia ficus-indica*
- *O. imbricate*
- *Salsola kali*
- *Senna occidentalis*
- *Phytolacca dioica*
- *Cardiospermum halicacabum* (both var *halicacaum* and *microcarpum*)
- *Solanum seafortianum*
- *Nicotiana glauca*
- *Lantana camara*
- *Duranta erecta*
- *Agave americana*
- *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.).

## 2.4.8 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 Second National Communication to the UNFCCC, 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%).

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.

### 2.4.9 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<sup>4</sup>) 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 (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).

## 2.5 KEY THREATS BY ECOREGION

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### 2.5.1 Kalahari xeric savanna

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 is 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).

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<sup>4</sup> The flood pulse refers to the initial floodwater surge



## 2.5.2 Kalahari Acacia Baikiaea woodlands

The key threats to this ecoregion are from policies and programmes promoting livestock development, allocation of commercial fenced ranches and thus high levels of human-wildlife conflict (HWC), habitat fragmentation and loss of connectivity.

Unless major policy changes are made, 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.

## 2.5.3 Southern African bushveld

One of the biggest threats to this ecoregion is that very little of the area is protected, and none of the protection is formal (see Table 6).

Another 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*).

Other threats come through land-use change: arable clearing and wood cutting together with bush encroachment; associated with overgrazing, also occur throughout the region. There is extensive mineral exploration particularly for coal, coal bed methane, copper and uranium.

## 2.5.4 Zambezian halophytics

The Makgadikgadi Pans at the core of this system have 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.

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 Moseitse 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.

### 2.5.5 Zambebian Baikiaea woodlands

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. The change in the woodlands is thought to affect diversity of small mammals such as bats.

### 2.5.6 Zambebian and Mopane woodlands

The threats in this ecoregion are largely due to settlement patterns, high levels of poaching and HWC. The settlement patterns around the Okavango 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 HWC levels specifically with 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).

### 2.5.7 Zambebian flooded grasslands

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 could affect the hydrology, sediment dynamics and water quality of the ecoregion. While 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 to the ecoregion in terms of disturbance (mainly to birds), pollution 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.



### 3. THE NBSAP, ITS IMPLEMENTATION, AND MAINSTREAMING OF BIODIVERSITY

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This section examines both the preceding 2007 NBSAP, as well as the version currently being prepared.

#### 3.1 2007 NATIONAL GOALS AND TARGETS

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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 11 objectives are:

- 1) Better Understanding of Biodiversity and Ecological Processes
- 2) Long-Term Conservation and Management of Botswana’s Biological and Genetic Resources
- 3) Efficient and Sustainable Utilisation of all Components of Biodiversity in Botswana through Appropriate Land and Resource Use Practices and Management
- 4) An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation, Sustainable Use and Management
- 5) Coping With Environmental Change and Threats to Biodiversity
- 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
- 7) Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources
- 8) Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity
- 9) Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information
- 10) Recognition of Botswana’s and the Southern African Region’s Roles with Regards to Biodiversity
- 11) Implementation of this Biodiversity Strategy and Action Plan

## 3.2 EXTENT OF IMPLEMENTATION OF THE 2007 NBSAP

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This section explores the extent to which each of the 11 strategic objectives was met. It also highlights major obstacles to completion.

### 3.2.1 Objective 1 - Better Understanding of Biodiversity and Ecological Processes

Objective 1 addressed research and monitoring, providing and compiling a continuous set of data that would allow the sustainability of development to be measured, particularly in terms of the impact of development on biodiversity.

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. One suggested reason 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 received limited attention. This is a challenge, because 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.

### 3.2.2 Objective 2 - Long-Term Conservation and Management of Botswana's Biological and Genetic Resources

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

An issue arising with implementation of this objective is that no clear departmental level responsibility was given for some of the tasks. 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 either between different Government sectors, or between Government and other potential implementing organisations such as NGOs and research institutes. 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.

### **3.2.3 Objective 3 - Efficient and Sustainable Utilisation of all Components of Biodiversity in Botswana through Appropriate Land and Resource Use Practices and Management**

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 were all focused on sustainable use – either of key resources, or of critical ecosystems.

One of the biggest challenges appears to have been creating awareness and recognition of biodiversity and its contribution to human wellbeing. This appears to be a problem across the board, from rural community members, to policy makers.

### **3.2.4 Objective 4 - An Institutional Environment, Including Human Capacity, Conducive to Effective Biodiversity Conservation, Sustainable Use and Management**

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

The three most common obstacles to successful implementation appear to be:

- Resources
- Coordination
- Capacity – both in terms of available manpower and skills.

### **3.2.5 Objective 5 - Coping With Environmental Change and Threats to Biodiversity**

To some extent, this objective could have been 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.

This objective 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.

### **3.2.6 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**

The issue of 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 were 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.

One of the bigger barriers to implementing this objective was the level to which responsibility was assigned. Ministerial levels tend to focus more on policy decisions, and not on undertaking specific activities. In addition, some of the activities identified were 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.

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

### **3.2.7 Objective 7 - Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources**

To a large extent, Objective 7 spoke to policy development and legal arrangements for access to resources and the sharing of benefits from them. These included guidelines for access, ways to secure intellectual property rights, and a national policy framework for indigenous knowledge. 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.

Much of the focus under this objective was 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.

### **3.2.8 Objective 8 - Safe Industrial and Technological Development and Other Services Based on National Biodiversity Resources for Future Prosperity**

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.

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.

### **3.2.9 Objective 9 - Improved Availability and Access to Biodiversity Data and Information, and Promotion of Exchange of Information**

Essentially, this objective was about establishing the Clearing House Mechanism (CHM) for environmental and biodiversity information, which is housed in DEA. Although the project has faced some challenges, some progress has been made – for example, there is an online Environmental Information System in place, although its current functionality is limited.

The challenges that have hampered 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.

### **3.2.10 Objective 10 - Recognition of Botswana's and the Southern African Region's Roles with Regards to Biodiversity**

This objective intended to address the 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 had initially

made much progress in creating an enabling environment for such cross-border collaborations (signatory to SADC Regional Biodiversity Strategy; SADC Protocol on Wildlife Conservation and Law Enforcement; SADC Protocol on Forestry; and regional partners in the Okacom and Oresacom national action plans and strategic actions plans), 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.

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. Signing of the UN Convention on Migratory Species should be considered a priority.

### 3.2.11 Objective 11 - Implementation of this Biodiversity Strategy and Action Plan

Essentially Objective 11 was about making sure the other 10 objectives were pursued and achieved. This requires political will and high level support. For this reason, all of the strategic targets were aimed at ministerial level activities.

One of the key concerns was the decline in environmental monitoring activities that should have underpinned many of the preceding targets' 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.

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.

## 3.3 EFFECTIVENESS OF BIODIVERSITY MAINSTREAMING

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This section first evaluates specific policy and project initiatives that were put in place during the last NBSAP phase, before giving a brief overview of mainstreaming into national accounts and public awareness.

### 3.3.1 Environmental Assessment Act

In the 2007 NBSAP's section on Mainstreaming Biodiversity for Future Generations, SEAs and EIAs are identified as specific activities to achieve the NBSAP's strategic targets. In this section, 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.

However, neither the Environmental Assessment Act, which was revised in 2010, nor the accompanying draft guidelines refer explicitly to biodiversity directly. While 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.

### 3.3.2 Biokavango project

One area of success during this period was the Biokavango Project – 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.

### 3.3.3 Poverty and Environment Initiative

The Poverty and Environment Initiative shared several ideals with the NBSAP; namely, the need for sustainable development, the concern about environmental conservation, the recognition of ecosystem services, inter alia.

This project has recently come to an end, and although it did not explicitly focus on biodiversity, it is likely that evaluations will show increased awareness of the importance of sound environmental management in promoting viable rural livelihoods.



### 3.3.4 Western Kalahari Conservation Corridor

This project had two aims: to conserve the biodiversity and integrity of the Western Kalahari ecosystem by establishing ecological corridors between the Central Kalahari Game Reserve (CKGR) and the Kgalagadi Transfrontier Park (KTP), and to improve the quality of life of the local communities.

Mainstreaming biodiversity through raising awareness and exploring alternative livelihoods is a key component of the initiative, because without wildlife-friendly activities, the presence of communities in the area is a key threat to maintaining critical migration routes in this semi-arid region.

### 3.3.5 Kalahari-Namib project

The full name of this project is “Kalahari-Namib Project: enhancing decision-making through Interactive Environmental Learning and Action in the Molopo-Nossob River Basin in Botswana, Namibia and South Africa”. This cross-boundary initiative has the potential to further biodiversity mainstreaming through its focus on environmentally-based decision-making, particularly with regard to sustainable land management practices.

### 3.3.6 National accounting

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.

One area of success is DWA’s ongoing water accounts, which were recently reviewed under the WAVES initiative. The water accounts are to be updated regularly.

### 3.3.7 Education and awareness raising

Botswana has an updated National Environmental Education Strategy and Action Plan. Through this, the National Environmental Education Committee conducts regular awareness-raising activities on the economic importance of the environment and its protection. This includes information on biodiversity and its conservation.

Two key environmental management plans, the Okavango Delta Management Plan and Makgadikgadi Framework Management Plan, have been prepared and implemented with strong consultative processes aimed at increasing local awareness of the need to protect and conserve the environment and natural resources.

In addition, international environmental days are observed across the country, with public events held to commemorate and highlight the need for all citizens to participate in environmental management. Of particular relevance are World Wetlands Day, and World Environment Day. In addition, the Department of Forest and Range resources regularly holds national tree planting activities, and community-level awareness-raising around woodland management and bushfire management.



### 3.3.8 National Development Plan 10

The 2013 mid-term review of the current National Development Plan highlights areas of overlap between Botswana's sustainable development initiatives and the objectives of the NBSAP. The review documents achievements to date, highlights of which are presented here. Efforts were made to integrate pollution control measures into the planning processes. Rural sanitation and urban sewerage programmes were expanded. As with the NBSAP awareness-raising, engaging the general public in environmentally-friendly practices has proved to be a slower process than hoped for. With regard to sustainable use of natural resources, key policy documents that are under development include the draft Land Policy, and a revision of the National Land Use Plan. Because habitat destruction and degradation is seen as a key threat to biodiversity, several land rehabilitation projects have been implemented. Threatened species, such as rhino, have been restocked into important wildlife areas. Over 400 000 trees have been planted.

NDP 10 has also seen the development or revision of several key legal instruments: Forest Policy, Forest Act, Environmental Assessment Act, National Meteorological Services Act, and Mines and Minerals Act.

NDP 10 acknowledges the NBSAP as a critical tool in safeguarding the environmental sector.

## 3.4 LESSONS LEARNED FROM THE 2007 NBSAP IMPLEMENTATION PROCESS

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Soon after preparing the previous (2007) NBSAP, Botswana's economy was hit hard by the 2008 global recession. With cutbacks in place, Government had to prioritise activities that were more immediate and urgent, with the result that some of the less direct activities were not as keenly pursued. Thus, as is discussed below, objectives that do not speak directly to conservation, such as monitoring, institutional arrangement, valuation, or issues of access, lagged behind those that were directly related to conservation management, such as responding to environmental threats and development of plans to support sustainable land management.

### 3.4.1 Main resource constraints

In the stocktaking and gap-analysis phase of preparing this NBSAP, the following constraints to implementation were identified:

- Human resources - both in terms of sufficient staff and appropriate skills
- Alignment and coordination policy and institutional mandates / arrangements
- Coordination and communication of actions and implementation
- Awareness and degree of cross-sectoral political commitment
- Financial resources
- Insufficient research capacity.

### 3.4.2 Key lessons

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 Department of Youth and Culture'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 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 an important 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.

## 3.5 ADDITIONAL STEPS TAKEN TO IMPLEMENT THE CBD

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Botswana has recognised the importance of both formally and informally aligning the activities under all of the Multilateral Environmental Agreements (MEAs) to which it is party. A milestone event securing support for all MEAs was the Gaborone Declaration. This reaffirmation of intent not only bolsters NBSAP initiatives, but also enhances the opportunities for cross-border conservation efforts. There is a MEA committee that meets regularly, and this facilitates coordination of conservation activities. In addition, this iteration of the NBSAP contains an appendix where NBSAP activities are explicitly linked to the various other conventions and protocols that Botswana has signed.

An important formal step that the country has taken has been the recent ratification of the Nagoya Protocol, and the continued following of the 2002 Bonn Guidelines.

Botswana is also one of several developing countries involved in the UNDP's Biodiversity Financing Initiative (BioFin), with MEWT and MFDP working together to establish biodiversity budgets, financing and expenditures. The resource mobilisation strategies being developed will further support NBSAP implementation.

It is important also to mention the role of non-state partners who continue to play a fundamental role in ensuring broader stakeholder participation in biodiversity conservation, as well as pursuing biodiversity objectives within their own organisations. Key projects that have contributed toward the CBD goals include:

- Southern African Regional Environmental Project (SAREP) from 2010 to 2014
- Management Oriented Monitoring Systems (MOMS) implemented in CBNRM, private concession areas, and parks and reserves – ongoing and expanding
- Environmental Support Programme imbedded in DEA from 2005 to 2010
- Continued deployment of the NGO Fund under MEWT to assist NGOS in implementation of biodiversity related projects
- Ongoing UNDP-Botswana Government partnerships and environmental projects under the UNDP Development Assistance Framework
- Funding to Forest Conservation Botswana, a non-profit company, for implementing a range of conservation and land reclamation projects.

### 3.6 CONTRIBUTIONS OF THE NATIONAL ACTIVITIES TO RELEVANT TARGETS OF THE MILLENNIUM DEVELOPMENT GOALS

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The Millennium Development Goals (MDGs) are set for 2015, making this a suitable point in time to assess NBSAP contributions toward these goals. There are two relevant MDGs: The first is Goal 1 – To Eradicate Extreme Hunger and Poverty, while the second is Goal 7 – To Ensure Environmental Sustainability.

Under Goal 1, Botswana set out the following 2 targets:

- No persons living below the income poverty datum line by 2015
- To reduce, by 50%, the proportion of people who suffer from hunger and malnutrition by 2016.

A 2010 review of progress (UNDP 2010) suggested that Botswana would be unlikely to be able to meet the first target under Goal 1, as a high proportion of people are still living in poverty. However, it is noted that the trend in decreasing numbers of people living in poverty is on course, and that Botswana's achievements already bring the nation in line with the global target, having fallen from 47% in 1993/94 to 23% in 2009.

With regard to the second, the country is reported to be on target, and likely to achieve the intended reduction in hunger and malnutrition. However, while hunger may be addressed, there are still challenges with malnutrition, particularly among children, where HIV/AIDS has a strong negative effect.

Under Goal 7, Botswana listed 3 targets:

- To reduce by 50% the proportion of people without sustainable access to safe drinking water by 2016
- Reduce conflict between population growth, land usage and environmental and natural resources degradation

- Promote environmental education and awareness necessary to reduce contamination and achieve sustainable development

In the 2010 review, the following assessment of the first Goal 7 target was made:

- Proportion of population using an improved drinking water source (% of population)
  - 1990:93
  - 2009:96
- Proportion of population using an improved to improved sanitation facility (% of population)
  - 1990: 38
  - 2008: 60 (74% urban, 19% rural)

No information was given on the other two Goal 7 targets.

In terms of contributions from the 2007 NBSAP, activities under the following two Strategic Objectives would be relevant:

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

Poverty: CBNRM provides a direct link between environmental conservation and poverty alleviation. During the last NBSAP phase, the CBNRM Policy was finalised and approved, and CBNRM products were diversified. However a series of activities related to veld product use, which is a key part of livelihoods of the rural poor, were not implemented.

Environment: Key areas of success in this regard have been the development of the Okavango Delta Management Plan and Makgadikgadi Framework Management Plan, which emphasise integrated land use zoning, and promote environmental sustainability in two critical areas where human-environment interactions have the potential to undermine long-term ecological functioning.

**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**

Poverty: Under this objective, biodiversity guidelines for CBNRM were meant to be developed. The community monitoring of environmental and social variables under MOMS has been a positive step in helping rural communities to take on responsibility for ecological wellbeing in their areas.

Environment: The ongoing activities of the National Environmental Education Committee have helped increase public awareness. Botswana’s participation in two GEF-funded projects, BioKavango and BioChobe, have made significant contributions to ensuring biodiversity is incorporated in decision-making and land use planning at the local government level.

**Objective 7 – Fair Access to Biological Resources and Equitable Sharing of Benefits Arising from the Use of Biological Resources**

Poverty: A key tool in sustaining the link between environmental conservation and poverty alleviation would be the finalisation and adoption of the Veld Product Policy. Unfortunately, this policy has yet to be finalised. Most of the activities under this objective were focused on policy development.



## 4. PROGRESS TOWARD THE 2015 GOALS AND THE 202 AICHI TARGETS

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Due to the need to align with budgetary and planning cycles, Botswana is only now in the process of adopting the Aichi Targets, and devising a new set of actions through which the domesticated versions of these targets will be met. These actions will not be implementable without making the necessary resources available, and to this end, a resource mobilisation plan has been developed as part of the NBSAP revision.

### 4.1 DOMESTICATION OF THE CBD GOALS AND AICHI TARGETS

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The first step in contributing toward the goals of the CBD Strategic Plan and the Aichi Targets has been to prepare national goals and targets that are in line with these. This process has recently been completed, as detailed in Section 4.3 below. These 'domesticated' goals and targets comprise the backbone of the revised NBSAP, and a Presidential Directive / Cabinet Memorandum is being pursued in order to ensure cross-sectoral commitment to the NBSAP.

### 4.2 EXISTING INITIATIVES THAT ADDRESS THE AICHI TARGETS AND BROADER CBD GOALS

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The tables below represent existing activities that already speak to the Aichi Targets – before formal adoption in the revised NBSAP. It is noted that this list is not exhaustive, but is indicative of on-the-ground progress toward the broader CBD goals.

**Table 23: 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.	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. National tree planting activities, woodland management and bushfire management Development of national symbols e.g. national flower, tree, grass, bird and animal Backyard gardens, woodlots and plantations establishment Awareness and legislation enforcement Conservation of agricultural genetic plant and animal material Heritage tourism e.g. monument project

No.	Target	Existing Activities
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.	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.
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.	Ensuring that the environment is a cross cutting issue in development of NDPs/DDPs and this has greatly helped in reducing / managing harmful incentives. Intensified awareness creation and educational campaigns, value addition promotes conservation 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.	

**Table 24: 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.	Awareness raising among stakeholders on the importance of sustainable habitat utilization; the EIA is a tool which assists in reducing degradation and habitat fragmentation Development and promotion of eco-tourism in forest reserves
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.	Development of 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.	National Inventory and monitoring, management plans

No.	Target	Existing Activities
8	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	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) Development and promotion of legislation to control pollution. Promote clean power.
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.	Research and eradication activities undertaken Identification of invasive alien species, communities sensitised about them 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 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.	International and collaborative efforts e.g. KAZA and Makgadikgadi Management Plan, ODMP Developing a climate change policy. The policy will also have an implementation strategy which will include adaptation among others

**Table 25: 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.	Development of integrated management plans. Botswana is a part of key transfrontier conservation areas and this promotes the linkages and conservation goals 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.	Inventories of plants and animals are prepared, classification according to status done, Conservation measures applied e.g. habitat restoration Rehabilitation / restoration of degraded rangelands
13	By 2020, the genetic diversity of cultivated	National Genetic Resource Conservation both



No.	Target	Existing Activities
	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.	<i>in situ</i> and <i>ex situ</i> conservation of plant species. Conservation of animals in ranches and also their genetic material (embryos, semen)

**Table 26: 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 into account the needs of women, indigenous and local communities, and the poor and vulnerable.	The EIA process Support to CBNRM MFMP, ODMP and yhe Biochobe project Ecosystems of cultural value – Monument development and management in collaboration with community trusts e.g. Mogonye, Goo Moremi Trust 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)
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.	Mosu Land Rehabilitation Project Botswana is promoting REDD and activities which include conserving forests 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.	Botswana has acceded to the Nagoya Protocol and at the present domestication processes are ongoing.

**Table 27: 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.	The NBSAP is being reviewed and will be completed before 2015, and then implementation of the same will effect.

No.	Target	Existing Activities
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.	Domestication of the Nagoya Protocol will ensure the realisation of this target Adoption of treaties and conventions is being undertaken Working with communities and other stakeholders on the production and sale of local arts and crafts based on sustainable utilisation of natural resources Implementation of the National Eco Tourism Strategy Implementing projects that get traditional knowledge from people
19	By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	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.	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. Resources have been mobilised from the GEF and private companies to fund biodiversity related projects.

## 4.3 REVISED NBSAP AND ACCOMMODATION OF THE AICHI TARGETS

### 4.3.1 Revised NBSAP vision

The revised NBSAP is guided by the following vision:

**By 2025, ecosystem, species and genetic diversity is valued, protected, and used sustainably and equitably, through the involvement of all sectors of society and the provision of sufficient resources for its sound management.**

This vision follows that of the CBD. It encapsulates the key points that give rise to the five goals that Botswana aims to achieve within this iteration of the NBSAP.

### 4.3.2 Revised NBSAP goals

The Botswana goals are aligned to those of the CBD strategy in terms of their focus (see Table 28 for side-by-side comparison). As with the CBD strategy, these goals provide the framework for the 20 national targets.

**Table 28: Botswana’s national biodiversity goals, shown in comparison to those of the current CBD strategy**

	<b>Botswana National Goals</b>	<b>CBD Goals</b>
1	<b>Biodiversity is mainstreamed and valued across all sectors of society</b>	<i>Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society</i>
2	<b>The pressure on biodiversity is reduced and natural resources are used sustainably</b>	<i>Reduce the direct pressures on biodiversity and promote sustainable use</i>
3	<b>Ecosystems, species and genetic resources are protected through sound management</b>	<i>To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity</i>
4	<b>Fair and equitable access to the benefits of biodiversity is secured</b>	<i>Enhance the benefits to all from biodiversity and ecosystem services</i>
5	<b>Participatory planning, knowledge management and capacity-building are in place to support NBSAP implementation</b>	<i>Enhance implementation through participatory planning, knowledge management and capacity building</i>

### 4.3.3 Revised NBSAP national targets

As with the Aichi Targets with which they are aligned, the 20 Botswana National Targets are grouped under the 5 national goals so that these can guide and direct appropriate strategies. The national targets are also aligned with the Aichi targets. The Botswana targets are strong but realistic statements of what must be achieved in order for the 5 goals to be realised. These are presented, below in tabular form with the Aichi Targets for comparison, to show how the latter are accommodated. In order to ensure that action is galvanised, the targets are set for a realistic 10 year period. This assumes that the next revision of the NBSAP could be considered a mid-term assessment of these goals and their related targets.

By aligning the national goals and targets as closely as possible to those of the current CBD strategy and Aichi Targets, the national activities will be able to contribute to the global efforts as it meets its own national objectives.

**Table 29: Goal 1 - Biodiversity is mainstreamed and valued across all sectors of society**

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
1	<b>By 2025, all people in Botswana appreciate how biodiversity contributes to their lives, and are aware of steps they can take to conserve and use it sustainably.</b>	<i>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.</i>
2	<b>By 2025, planning processes at all (district, urban and national) levels, and national accounting and reporting systems in Botswana contain explicit actions to promote biodiversity conservation.</b>	<i>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.</i>

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
3	<b>By 2025, incentives and subsidies across all sectors are revised, designed or introduced to improve support for sustainable consumption and production and promote biodiversity conservation.</b>	<i>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.</i>
4	<b>By 2025, at all levels, policy and regulatory instruments are in place to ensure production and consumption by government, industry and society are kept within sustainable levels and safe ecological limits.</b>	<i>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.</i>

**Table 30: Goal 2 - The pressure on biodiversity is reduced and natural resources are used sustainably**

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
5	<b>By 2025, the rate of natural land conversion is at least halved, and degradation and fragmentation are significantly reduced.</b>	<i>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.</i>
6	<b>By 2025, animal and plant resources in Botswana's wetlands, woodlands and savannas are sustainably managed using the ecosystem approach, so that the impacts of harvesting remain within safe ecological limits.</b>	<i>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.</i>
7	<b>By 2025, wetlands, woodlands and savannas, particularly where used for use for range or crops, are managed sustainably, ensuring conservation of biodiversity.</b>	<i>By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.</i>
8	<b>By 2025, levels of air, water and soil pollution are maintained below levels that would threaten ecosystem functioning and biodiversity.</b>	<i>By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.</i>
9	<b>By 2025, key invasive alien species are identified and controlled or eradicated, and pathways for their spread are managed to prevent further introduction and establishment.</b>	<i>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.</i>

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
10	<b>By 2025, the anthropogenic pressures on wetlands, woodlands and savannas are minimised, so that the impacts of climate change and other external perturbations on their ecological integrity and functioning can be managed.</b>	<i>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.</i>

**Table 31: Goal 3 - Ecosystems, species and genetic resources are protected through sound management**

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
11	<b>By 2025, at least 25 percent of all Botswana's ecoregions, particularly the wetlands, rivers and pans in them, are effectively conserved through an ecosystem approach that integrates their management with that of the surrounding landscapes and involves resident communities.</b>	<i>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.</i>
12	<b>By 2025, the conservation status of species in Botswana that are listed as threatened has been improved or sustained.</b>	<i>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</i>
13	<b>By 2025, the genetic resources of traditional agricultural species and their wild relatives are protected, and strategies for minimizing genetic erosion and safeguarding their genetic diversity have been implemented.</b>	<i>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</i>

**Table 32: Goal 4 - Fair and equitable access to the benefits of biodiversity is secured**

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
14	<b>By 2025, ecosystem services are identified and restored or maintained in all Botswana's ecoregions, and contribute to livelihood improvement through strategies that enable equitable access by all vulnerable groups, including women, the poor and local communities.</b>	<i>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 into account the needs of women, indigenous and local communities, and the poor and vulnerable.</i>
15	<b>By 2025, ecosystem integrity in all Botswana's ecoregions will be conserved through the adoption of ecosystem-level management approaches built around key ecological processes, so that they contribute to climate change mitigation and to combating</b>	<i>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.</i>

	desertification.	
16	<b>By 2025, the Nagoya Protocol is domesticated and operational, and specific actions that ensure fair and equitable access and benefit sharing are implemented.</b>	<i>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.</i>

Goal 5 - Participatory planning, knowledge management and capacity-building are in place to support NBSAP implementation

	<b>Botswana National Targets</b>	<b>Aichi Targets</b>
17	<b>By 2015, Botswana's revised NBSAP has commenced implementation with the full support of all sectors and levels of governance.</b>	<i>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.</i>
18	<b>By 2025, the indigenous knowledge of Botswana's various communities, as it relates to the conservation and sustainable use of biodiversity in all the country's ecoregions, will be documented, assessed and legally protected, and - where relevant - integrated into programmes and projects supporting biodiversity conservation.</b>	<i>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.</i>
19	<b>By 2025, information and techniques relating to the biodiversity and its value in all Botswana's ecoregions are efficiently documented, stored, shared, disseminated and used by all sectors and levels of society.</b>	<i>By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.</i>
20	<b>By 2017, at least 80% of the required budget for the revised NBSAP, generated from diverse sources, is made available for its implementation.</b>	<i>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.</i>

#### 4.3.4 Expected contribution of strategic actions to achieving national targets

**Contributions of Strategic Actions to Target 1: By 2025, all people in Botswana appreciate how biodiversity contributes to their lives, and are aware of steps they can take to conserve and use it sustainably**

The four strategic actions under this target speak directly to awareness raising. Targeted campaigns, school curricula, public seminars and rural projects are planned to increase national acknowledgement of the importance of biodiversity to their lives.



**Contributions of Strategic Actions to Target 2: By 2025, planning processes at all (district, urban and national) levels, and national accounting and reporting systems in Botswana contain explicit actions to promote biodiversity conservation**

Most of the actions under this target address Government approaches to planning. They specifically call for ecoregion reporting, and ecosystem approaches to management. Specific actions also focus on bringing biodiversity into the national accounts through valuation exercises.

**Contribution of Strategic Actions to Target 3: By 2025, incentives and subsidies across all sectors are revised, designed or introduced to improve support for sustainable consumption and production and promote biodiversity conservation**

Under this target, the actions call first for an assessment of the existing subsidies in key sectors such as agriculture and trade, followed by a revision of subsidies to ensure that they support biodiversity conservation and sustainable development.

**Contribution of Strategic Actions to Target 4: By 2025, at all levels, policy and regulatory instruments are in place to ensure production and consumption by government, industry and society are kept within sustainable levels and safe ecological limits**

The key action under this target relates to the finalisation and adoption of the Environmental Management Act. This legislation is seen as critical both to the political framework for national conservation activities and to the structural arrangements related to its enforcement.

**Contribution of Strategic Actions to Target 5: By 2025, the rate of natural land conversion is at least halved, and degradation and fragmentation are significantly reduced**

This target pulls together a series of studies and assessments designed to increase understanding of current status and trends in ecosystem functioning. In addition, key projects designed at protection, restoration and rehabilitation of key areas are included.

**Contribution of Strategic Actions to Target 6: By 2025, animal and plant resources in Botswana's wetlands, woodlands and savannas are sustainably managed using the ecosystem approach, so that the impacts of harvesting remain within safe ecological limits**

The actions here relate to the establishment and operationalization of long term monitoring of species, particularly those that are key natural resources. Related to this are a series of proposed projects to farm those plant resources which are heavily used by rural households.

**Contribution of Strategic Actions to Target 7: By 2025, wetlands, woodlands and savannas, particularly where used for use for range or crops, are managed sustainably, ensuring conservation of biodiversity**

The actions under this target bring together a combination of policy changes, inventories, and management practices designed to make biodiversity conservation explicit in the broader environmental management framework.

**Contribution of Strategic Actions to Target 8: By 2025, levels of air, water and soil pollution are maintained below levels that would threaten ecosystem functioning and biodiversity**

Focus here is on understanding the contributions of industry to pollution levels, through conducting studies and instituting monitoring programmes. In addition, there is an action relating to the development and enforcement of legislative guidelines on discharge and emission of key pollutants.

**Contribution of Strategic Actions to Target 9: By 2025, key invasive alien species are identified and controlled or eradicated, and pathways for their spread are managed to prevent further introduction and establishment**

The actions here are a tightly focused two-stage process – identification and mapping; followed by control and eradication programmes.

**Contribution of Strategic Actions to Target 10: By 2025, the anthropogenic pressures on wetlands, woodlands and savannas are minimised, so that the impacts of climate change and other external perturbations on their ecological integrity and functioning can be managed**

This target is supported by actions directly related to formal protection for areas of high biodiversity significance, and by ecological monitoring.

**Contribution of Strategic Actions to Target 11: By 2025, at least 25 percent of all Botswana's ecoregions, particularly the wetlands, rivers and pans in them, are effectively conserved through an ecosystem approach that integrates their management with that of the surrounding landscapes and involves resident communities**

There are several different actions under this target. Two key activities are the revision, adoption and implementation of the national Wetlands Policy, and increasing the functionality of the fledgling online Environmental Information System, so that it can more properly serve as the biodiversity clearing house mechanism.

**Contribution of Strategic Actions to Target 12: By 2025, the conservation status of species in Botswana that are listed as threatened has been improved or sustained**

Several of the actions under this target are policy-related, so that enabling environment for managing threatened species is improved.

**Contribution of Strategic Actions to Target 13: By 2025, the genetic resources of traditional agricultural species and their wild relatives are protected, and strategies for minimizing genetic erosion and safeguarding their genetic diversity have been implemented**

The actions here are related primarily to implementation of the Cartagena Protocol and the Kuala Lumpur Supplementary Protocol.

**Contribution of Strategic Actions to Target 14: By 2025, ecosystem services are identified and restored or maintained in all Botswana's ecoregions, and contribute to livelihood improvement through strategies that enable equitable access by all vulnerable groups, including women, the poor and local communities**

Because reliance on direct harvesting of natural resources is still high in Botswana, the actions under this target are set up to ensure sustainable offtake of such resources, which ensuring benefits still reach poor rural households.

**Contribution of Strategic Actions to Target 15: By 2025, ecosystem integrity in all Botswana's ecoregions will be conserved through the adoption of ecosystem-level management approaches built around key ecological processes, so that they contribute to climate change mitigation and to combating desertification**

The actions here are for most part focused at the ecosystem level. While some actions focus on restoring and maintaining ecosystem condition, others focus on two key ecological drivers in the country: fire and elephants.

**Contribution of Strategic Actions to Target 16: By 2025, the Nagoya Protocol is domesticated and operational, and specific actions that ensure fair and equitable access and benefit sharing are implemented**



Botswana has recently ratified this protocol; therefore the sole action here is to develop the legislative framework for its domestication and implementation.

**Contribution of Strategic Actions to Target 17: By 2015, Botswana's revised NBSAP has commenced implementation with the full support of all sectors and levels of governance**

Apart from improving political support for the NBSAP, the main activity is to monitor and report on the NBSAP activities to ensure full participation across all sectors in Government.

**Contribution of Strategic Actions to Target 18: By 2025, the indigenous knowledge of Botswana's various communities, as it relates to the conservation and sustainable use of biodiversity in all the country's ecoregions, will be documented, assessed and legally protected, and - where relevant - integrated into programmes and projects supporting biodiversity conservation**

The actions here are to finalise and implement the Indigenous Knowledge Systems Policy and Action Plan, and to maintain a database of plants and their traditional uses.

**Contribution of Strategic Actions to Target 19: By 2025, information and techniques relating to the biodiversity and its value in all Botswana's ecoregions are efficiently documented, stored, shared, disseminated and used by all sectors and levels of society**

Given the challenges faced with data collection and dissemination under the previous iteration of the NBSAP, it is not surprising that there are several actions under this target that will help set up and populate the biodiversity clearing house mechanism, ensuring that it contains information not only on biological aspects, but also on usage and valuation. An important action that encompasses many different sub-activities is the implementation of the communication strategy for the NBSAP.

**Contribution of Strategic Actions to Target 20: By 2017, at least 80% of the required budget for the revised NBSAP, generated from diverse sources, is made available for its implementation**

A resource mobilisation plan has been prepared. In addition, the timing of this NBSAP will allow activities to be integrated into the budgets of the national, district, and urban plans.

## 4.4 WAY FORWARD - PRECONDITIONS FOR SUCCESS

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Success in implementing the NBSAP requires a multiple-prong approach. Not only is it important to actively promote conservation activities, but it is also necessary to ensure that support for such conservation is widespread, and that it is given a tangible value at the national level.

### 4.4.1 Preconditions for mainstreaming biodiversity

One of the findings of the Fourth National Report was that future iterations of the NBSAP should be simplified in order to facilitate dissemination and uptake. As noted above, coordination is a key precondition, and both funding and institutional arrangements must be put in place to facilitate this process.

Funding and institutional arrangements are dependent on broad-based political will, and wide-spread sense of ownership of the NBSAP. These are perhaps the fundamental

pre-conditions to success. Ownership in turn should be linked to broad stakeholder participation.

In order for biodiversity to be mainstreamed, it first has to be valued. In this regard awareness programmes need to be given priority, but so are tighter, more explicit links between revenues from wildlife-based tourism and what such revenue is spent on. Public and CBO support is critical.

It is also critical to establish cooperation between stakeholders. Most of the threats to biodiversity are due to cross sector-impacts or cumulative impacts. Cooperation between ministries and departments to allow for sustainable development is necessary. Similarly, there needs to be a clear alignment between responsibility for the strategic actions and the mandates of the department(s) to whom the responsibilities are assigned.

#### 4.4.2 Preconditions for valuing biodiversity

##### Economic valuation

The importance of biodiversity in a resource dependent economy like Botswana is obvious (e.g. tourism and agriculture) but nonetheless, the value of biodiversity is often not recognised in development planning. While government has carried out several valuation studies of specific ecosystems, the value of biodiversity at the national level is not yet fully appreciated.

Ecosystems and most environmental goods do not have monetary value as they are not marketed nor sold and are often freely available (e.g. fuel wood, veld products and communal land). Economic valuation therefore addresses this shortfall by assigning values to these goods by measuring the society's preference for environmental goods and services. Economic valuation of biodiversity in Botswana is confined to the northern ecoregions (Zambezi flooded grasslands and Zambezi halophytics).

Comprehensive valuation studies need to focus on the dryland ecosystems and the woodlands. Existing valuation exercises have largely focused on the direct use values of biodiversity while indirect and non-use values are limited. Understanding and valuation of other ecosystems goods and services is critical while the option and existence values also need to be explored to further enhance sustainable use and conservation of biodiversity.

There are data inadequacies in the biodiversity sector and thus this impedes proper valuation of the resources. There is need to improve data collection, analysis, access, storage and management especially in relation to veld products harvesting, processing and trade, hunting, CBO statistics as well as quantified ecosystems' services. Furthermore, data should be collected and organised by specific ecoregion.

Biodiversity is the lifeline of most rural communities and therefore important for poverty alleviation and improved livelihoods. Linkages between natural resources dependency and use as well as income and livelihoods need to be explored and captured in the Botswana core welfare indicator surveys. This would help in verifying and interpreting the role and dependency of communities on biodiversity in economic terms and inform poverty eradication and welfare initiatives. It is only through a clear understanding of the contribution of biodiversity to rural livelihoods that its value can be mainstreamed and appreciated throughout the nation.

CBNRM generates significant socio-economic and environmental benefits and over the years the programme has benefited northern ecoregions as opposed to those in the

dryland areas. There is need to review the performance of CBOs in the country and assess their contribution to biodiversity management.

### **Biodiversity and national accounting**

Biodiversity currently does not adequately feature in the national accounts. Botswana has experienced with natural resources (capital) accounting since the 1990s. Further accounts are however required for ecosystems and these should be constructed by ecoregion. Tourism satellite accounts exist but need regular updating and analysis to inform policy and decision making. The 'natural resources' category needs to be re-introduced in the national accounts. Currently natural resources are subsumed within the agricultural sector and perhaps other sectors as it is not clear in the statistics.

However, it is anticipated that the Wealth Accounting and Valuation of Ecosystem Services (WAVES) initiative by the World Bank and the Government of Botswana will escalate the previous work on the valuation of ecosystems that was done in northern Botswana by constructing ecosystem accounts. This initiative will go further to contribute to the on-going reforms to improve the country's System of National Accounts to incorporate the values for natural capital under the guidance of the with the UN Statistical body.

### **Biodiversity funding**

It is currently impossible to identify in more detail how much the Government of Botswana is spending on biodiversity conservation. It is recommended that a detailed analysis of DWNP and DFRR annual expenditures is conducted and that possible biodiversity expenditures and revenues of other departments (also outside MEWT) are identified and included. Furthermore, biodiversity expenditures and revenues of the private sector need to be documented with the assistance of the private sector (e.g. Botswana Wildlife Management Association, Botswana Wildlife Producers Association, HATAB and BOCCIM). Opportunities for increased private sector investments in biodiversity management need to be explored and utilised (e.g. co-management of Parks). The NEF needs to have a dedicated window for biodiversity, and to provide finance to non-state parties for biodiversity-related activities. CBNRM revenues have been stagnating for some time now and adequate funding for CBNRM is necessary. This could include payment for ecosystem services provided by communities. The BioFin project that Botswana is participating in represents an opportunity to address some of these issues.

### **Biodiversity incentives and dis-incentives**

The current structure for incentives/dis-incentives for biodiversity conservation is fragmented and ineffective. Environmental economic instruments are hardly utilised. The following are necessary to improve the incentive structure for better and sustainable access, utilisation and management of biodiversity:

- Assessment and application of Payment for Ecosystem Services (PES) in Botswana. This is a market based approach for creating incentive measures for biodiversity management, addressing livelihood issues particularly for poverty eradication, and also provides sustainable funding for conservation efforts and protected areas. It is therefore based on the notion that those who conserve biodiversity or environmental services should be compensated by the beneficiaries of this service. The choice of PES scheme needs to be carefully discussed and agreed upon by the relevant stakeholders.
- Review of incentives for CBOs to manage biodiversity in their areas. The NEF has potential to encourage and finance conservation efforts and provide financial incentive for sustainable use of natural resources.

- Impact assessment of biodiversity-perverse subsidies with the view to restructuring them to support biodiversity conservation.
- Introduction of incentives supportive of biodiversity conservation
- Review the performance of current user charges for biodiversity and where possible adjust to reflect the real value of biodiversity.
- Acknowledge and encourage participation of the private sector in terms of funding for conservation of biodiversity and sustainable utilisation of resources.
- This would address not only the lessons about national implementation activities, but also about aligning activities to the CBD, and to other national planning cycles.

### 4.4.3 Preconditions relating directly to biodiversity conservation

Before biodiversity can be actively managed and protected, it needs to be understood. In this regard, the following preconditions are vital:

- Identification of species, habitats and ecological processes that are under threat (this is largely available from the updated stocktake)
- Improve understanding of the species diversity, population dynamics and threats so that management to protect biodiversity improves. This should follow an adaptive management approach and effective monitoring so that theories can be tested and solutions identified on small components of a population.
- Monitor biodiversity and provide feedback into adaptive management of resources.

At the same time, a commitment to radical changes in management style is also needed. Specifically, the following actions are needed:

- Implement an adaptive management approach to biodiversity by assigning roles and responsibilities and though effective monitoring of action plan implementation.
- Changes to management of protected areas to enhance management effectiveness.
- Institute reporting on the basis of ecoregions, not solely on district boundaries.
- Increased transboundary and transdistrict collaboration.
- Allow effective and open distribution of biodiversity data and information.

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