Botswana Biodiversity Strategy and Action Plan

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Ministry of Environment, Wildlife and Tourism

Biodiversity Vision for Botswana

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 recognize 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.

FOREWORD

As a party to the Convention on Biological Diversity (CBD), Botswana has an obligation to develop a Biodiversity Strategy and Action Plan (BSAP). Article 6 of the Convention calls upon each Contracting Party to "Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia,* the measures set our in this Convention relevant to the Contracting Party concerned;" and "Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies."

In partial fulfilment of this obligation the Ministry of Environment Wildlife and Tourism, through the National Conservation Strategy Coordinating Agency, has thus developed the BSAP. This was achieved with financial assistance from the United Nations Development Programme – Global Environment Facility. Ecosurv and IUCN were engaged to undertake the consultancy.

The project started in July 2002. Stages in the development of the BSAP included a National Stocktaking exercise, community consultations and two National Stakeholder Workshops. Through this nationwide consultation process, the following Biodiversity Vision for Botswana was developed:

"*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 recognize 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*"

The BSAP is based on 11 Strategic Objectives, which are designed to fulfil the Biodiversity Vision. These objectives call for:

(a) Better understanding of biodiversity and ecological processes;

(b) Long-term conservation and management of Botswana's biodiversity and genetic resources;

(c) Efficient and sustainable utilisation of all components of biodiversity in Botswana through appropriate land and resource use and management;

(d) An institutional environment, including human capacity, conducive to effect biodiversity conservation, sustainable use and management;

(e) Coping with environmental change and threats to biodiversity;

(f) Appropriate valuation/appreciation of biodiversity and raised public awareness on the role of biodiversity in sustainable development and public participation in biodiversity related activities and decision making;

(g) Fair access to biological resources and equitable sharing of benefits arising from the use of these resources;

(h) Safe industrial and technological development and other services based on national biodiversity resources for future prosperity;

(i) Improved availability and access to biodiversity data and information, and promotion of information exchange;

(k) Recognition of Botswana's and the Southern African Region's roles with regards to biodiversity; and

(l) Implementation of this Biodiversity St.ategy and Action Plan.

Implementation of this strategy requires commitment and active engagement by all stakeholders. The best way to ensure active participation in this respect is to equip people with an awareness and understanding of the importance of maintaining biodiversity and why it is crucial that biodiversity components are used in a sustainable manner. Awareness raising and implementation activities have therefore been incorporated as important parts of the strategy. While the Ministry of Environment Wildlife and Tourism played a leading role in the development of the BSAP, its implementation belongs to all of us since the protection of our biodiversity is our responsibility as a nation. I therefore urge all of us in playing our individual and collective roles in implementing the BSAP for the sake of our beautiful and varied biodiversity and consequently for the overall protection of our environment for the benefit of both the present and future generations.

Onkokame Kitso Mokaila

Minister for Environment, Wildlife and Tourism

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ABS	Access and Benefit Sharing
ARB	Agricultural Resources Board
BCA	Botswana College of Agriculture
BD	Biodiversity
BNTSC	Botswana National Tree Seed Centre
BRIMP	Botswana Rangeland Inventory and Monitoring Project
BSAP	Biodiversity Strategy and Action Plan
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CHM	Clearing House Mechanism
CITES	Convention on International Trade in Rare and Endangered Species of Flora and Fau
CPR	Common Property Resources
CSO	Central Statistics Office
DMS	Department of Meteorological Services
EIA	Environmental Impact Assessment
EPP	Environmental Planning Programme
GMO	Genetically Modified Organisms
GOB	Government of Botswana
IAS	Invasive Alien Species
IBA	Important Bird Areas
IK	Indigenous Knowledge
IPA	Important Plant Areas
IPR	Intellectual Property Rights
IUCN	International Union for the Conservation of Nature
MCST	Ministry of Communications, Science and Technology
MEWT	Ministry of Environment, Wildlife and Tourism
MFDP	Ministry of Finance and Developing Planning
MLHA	Ministry of Labour and Home Affairs
MMEWA	Ministry of Mineral, Energy and Water Affairs
MOA	Ministry of Agriculture
MOE	Ministry of Education
MSP	Ministry of the State President
NBSC	National Biosafety Committee
NBSF	National Biosafety Framework
NCS	National Conservation Strategy
NCSA	National Conservation Strategy Coordinating Agency
NDP	National Development Plan
NGO	Non Governmental Organisation
PR	Public Relations
RD	Red Data
RDL	Red Data List
SADC	Southern African Development Community
SEA	Strategic Environmental Assessment
SOER	State Of the Environment Report
TAC	Technical Advisory Committee
TOR	Terms of Reference
UNCCD	United Nations Convention to Combat Desertification
WCMC	World Conservation and Monitoring Centre

Acronyms used in the Action Plan are listed separately in Chapter 5.

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Biodiversity Strategy and Action Plan consultancy team

Ms M. Madzwamuse	IUCN Botswana (Project Director)
Ms B. Farrington	Ecosurv (Pty) Ltd (Technical team leader)
Dr. S. Maphanyane	Tantalum (Pty) Ltd
Dr K Alexander	Eco-logic Support Services
Dr. J. Arntzen	Centre for Applied Research
Mr David Parry	Ecosurv (Pty) Ltd
Dr. O Tshosa	University of Botswana

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Biodiversity Strategy and Action Plan Steering Committee

Mr T. Tsheko	Mokolodi Nature Reserve - Chairperson
Mr G. Chimbise	Agricultural Resources Board
Mr L. Dikobe	United Nations Development Programme
Mr H. Hester	BirdLife Botswana
Mr R. Kwerepe	Department of Crop Production
Mr D. Lecholo	Botswana Community Based Organisation Network
Ms. D. Malepa	National Conservation Strategy Coordinating Agency
Dr. M. Manthe-Tsuaneng	Department of Agricultural Research
Mr E. Mitchell	United Nations Development Programme
Mr T. Mmopelwa	Department of Wildlife and National Parks - Fisheries
Ms R. Mojaphoko	United National Development Programme
Mr F. Mosothwane	Department of Water Affairs
Ms L. Motoma	Forestry Association of Botswana
Mr D. Mughogho	Department of Wildlife and National Parks
Mr P. Mutakela	Forestry Division
Mr H. Okuda	United Nations Development Programme
Dr B. Raseroka	Department of Biological Sciences, University of Botswana
Mr D. Thamage	Veldproducts Research and Development

National Biodiversity Authority

Mr S. Baruti	Rural Development. Coordinating. Division, Ministry of Finance an Development Planning
Ms S. George	Department of Lands
Mr B. Gopolang	Department of Meteorological Services

National Biodiversity Authority

Ms D. Malepa	National Conservation Strategy Coordinating Agency
Dr M. Manthe-Tsuaneng	Department of Agricultural Research, Ministry of Agriculture
Mr C. Matale	Air Pollution Control Division
Mr F. Monggae	Kalahari Conservation Society
Mr N. Mosesane	Natural History Division, National Museum and Art Gallery
Mr F. Mosothwane	Department of Water Affairs
Mr D. Mughogho	Department of Wildlife and National Parks
Mr E. Naane	Department of Sanitation and Waste Management
Mr E. Otsogile	National Conservation Strategy Coordinating Agency
Mr B. Podisi	Department of Agricultural Research, Ministry of Agriculture
Mr R. Sebego	Department of Environmental Science, University of Botswana
Ms P. Segomelo	National Conservation Strategy Coordinating Agency
Dr G Sekgororwane	Department of Biological Science, University of Botswana
Mr S. Tiroyakgosi	Attorney General's Chambers
Mr L. Tshukudu	National Conservation Strategy Coordinating Agency

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EXECUTIVE SUMMARY

Biodiversity – *the variability within and among living organisms and the systems they inhabit* – is the foundation upon which human survival exists.

Botswana's ecosystems, species and genetic diversity represent a huge asset, of which we, the current generation are the custodians. The value of biodiversity, although not always easy to quantify in economic terms, cannot be under estimated. Local communities depend on biodiversity directly for their livelihoods. The nation depends on it as it forms the very basis for most of the country's tourism industry. Botswana's biodiversity is also of global importance, as some of the unique ecosystems and endemic species do not occur anywhere else in the world. Without these biological resources and linked knowledge, the future of Botswana and its people would be rather bleak.

Environmental change and evolution are natural phenomenon and ecosystems are not static, but the rate of biodiversity loss at a global level is today increasing at an unprecedented rate (WCMC, 2000). Environmental change can be a result of long-term natural processes, which we cannot control, or it can be caused by human actions, which can be prevented and mitigated. Human induced changes in biodiversity levels can have profound impacts on the functioning of ecosystems, and ultimately affect the ecosystems that we depend upon for livelihoods, economy and survival. Our understanding of ecosystems functioning is still fairly basic, and as we are not entirely sure of the long-term implications of species extinctions and changes in biodiversity levels, it is therefore wise to apply the precautionary principle (CBD&UNEP, 2003).

It is difficult to generalise or prioritise threats to biodiversity at a national level, as the threats and level of threats vary according to the type of organism and species but also by geographical location. It is however generally agreed that one of the main threat to Botswana's biodiversity is habitat destruction and reduction (MEWT, 2003, BSAP Stocktake). Habitat destruction and habitat degradation can be caused by a variety of factors ranging from direct destruction through construction of houses, roads and other infrastructure, to damage caused by pollution, unsustainable land and resource use, including unsustainable rangeland management (localised overgrazing and bush encroachment), over harvesting and excessive water abstraction.

The Strategy

As a signatory to the Convention on Biological Diversity (CBD), the Government of Botswana has committed itself and its citizens to actively ensure that its biodiversity resource is maintained for generations to come. The goal of this Biodiversity Strategy and Action Plan is therefore to contribute to the long-term health of Botswana's ecosystems and related species, and to encourage sustainable and wise use of resources through the provision of a framework of specific activities designed to improve the way biodiversity is perceived, utilised and conserved. The Strategy builds on and complements the National Conservation Strategy, and forms part of the Government's effort to achieve Vision 2016.

The Biodiversity Strategy has 11 strategic objectives, designed to reach the BSAP guiding 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 recognize 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

The Strategic objectives are:

1 Better understanding of biodiversity and ecological processes:

Sound planning and development rely on sound data. Our understanding of ecosystems functioning is currently fairly limited and more research, data collection and inventories are needed. In order to know if our actions and activities are sustainable and to calculate environmental costs and benefits and long-term effects of different land use options we need reliable biological base-line data and long-term monitoring of the status of our genetic resources. Reference collections and taxonomic research are essential tools in identifying organisms, species and varieties

2 Long-term conservation and management of Botswana's biological diversity and genetic resources

For successful long-term conservation of biological resources it is important to take a holistic approach. The latest directives from the CBD are to adopt more of an ecosystems approach, i.e. to conserve habitats, of which species are the components.

With limited resources conservation activities need to be prioritised, and activities to do so form an important part of the BSAP. Development of district level biodiversity strategies to guide district planning and actions is a key component of the national strategy.

Conservation of Botswana's endemic species is especially important. It is also vital to protect and conserve the knowledge and traditions, which are related to biodiversity use. The younger generations are quickly losing interest in traditional knowledge and practices, and it will only take a few generations for this knowledge, built up over generations, to disappear if we don't make an effort to preserve it.

3 Efficient and sustainable utilisation of all components of biodiversity in Botswana through appropriate land and resource use practices and management

Sustainable use of biological resources is the key to development. The nation's wealth is built on its natural resources. The current population of Botswana are custodians of this natural heritage, and it is the responsibility of this generation to make sure that we don't erode the capital we have been given, leaving our children and grand-children the same resources and opportunities that we were given.

Sustainable use of components of biodiversity requires a combination of legal, policy and economic incentives, a change in attitudes, i.e. a realisation of the value of biodiversity (See objective 6), education and providing people with sustainable livelihoods opportunities and options.

4 An institutional environment, including human capacity, conducive to effective biodiversity conservation, sustainable use and management.

An institutional environment conducive to effective biodiversity conservation, sustainable use and management refers to an institutional climate and set-up which includes cross sectoral coordination, political will, appropriate economic incentives, adequate institutional structures and capacity, and a legal system to support and encourage conservation and sustainable use and management of Botswana's biological resources

5 Coping with environmental change and threats to biodiversity

Prevention is usually a much better and cheaper solution than cure. Addressing threats to biodiversity before they happen will therefore be cost effective in the long-term.

Of all the threats, climatic change poses the greatest challenge as its effects are still not sufficiently known and as it cannot be addressed directly. Rangeland degradation and hydrological change provide more direct and tangible threats to biodiversity, although also affected by climate change to some extent. We have the means and technologies to reduce the effects of these threats, and the main challenge is to find solutions, which are biologically, politically and economically acceptable.

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

This is an extremely important objective as the way we think of and value biodiversity form the foundation on which to build sustainable use and management of this natural resource. There is still a major need to raise general awareness levels of the value of Botswana's biodiversity capital to society and the ecological services it provides from primary school to government decision making.

Public participation in decision-making involving the use of biodiversity will encourage public support and participation and is vital to achieve sustainable solutions, be it for land use, or use of components of biodiversity

7 Fair access to biological resources and equitable sharing of benefits arising from the use of biological resources

Fair access to biological resources and equitable sharing of benefits deriving there from is one of the three key components of the CBD. There is an urgent need for Botswana to develop a specific Biodiversity Access and Benefit Sharing (ABS) strategy, which will address access to the actual resources as well as to related indigenous knowledge. The strategy should also identify means of encouraging fair benefit distribution. The ABS strategy would subsequently need to be supported by appropriate legislation, strengthened import and export regulations and enforcement in order to encourage use of biodiversity components and to discourage bio-piracy and un-equitable sharing of benefits.

The right to utilise components of biodiversity is often taken for granted, but with that right comes a responsibility to ensure that the resources are used sustainably and not wasted or depleted. One important concept of the Strategy is therefore to link the right to access to resources with the responsibility of sustainably using and monitoring of the same resource.

8 Safe industrial and technological development and other services based on national biodiversity resources for future prosperity

Botswana has so far applied the precautionary principle when dealing with biotechnology and Biosafety. New technologies based on genetic resources can however offer scope for economic diversification through research and development and participation in technical joint ventures.

There is a need for a structured approach to biotechnology and related Biosafety issues, which takes into consideration the requirements of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. The Ministry of Agriculture is already in the process of developing a national Biosafety framework and protocol, which links in with this strategy. There is also a need to raise public awareness about biotechnological opportunities and risks.

9 Improved availability and access to biodiversity data and information, and promotion of exchange of information

Information and data are essential components of responsible and informed decision making. There is a need facilitate the access and use of existing biodiversity data and to generate new data where there are gaps in our knowledge. The proposed model for streamlining the access to national biodiversity data include a computerised biodiversity Clearing House Mechanism (CHM) and the appointment of national focal-point institutions responsible for the recording, safe-keeping and maintaining records and data related to specific groups of organisms.

10 Recognition of Botswana's and the Southern African Region's roles with regards to Biodiversity

Botswana shares a lot of its natural resources with neighbouring countries and some of the identified eco-regions and eco-systems stretch across the national borders. Regional collaboration is therefore important for the long-term success of conservation programmes. Regional collaboration, cooperation and consistency are also important when setting standards and developing legal and policy frameworks, and to increase markets and for sharing resources, and thus reduce costs. To efficiently conserve biodiversity in the region it is important that access regulations (to wild medicinal plants for example) and management standards (including Biosafety and management of Invasive Alien Species) are harmonised

and Botswana needs to ensure that biodiversity related legislation and practices are not trailing behind those of the other countries in the region.

11 Implementation of this Biodiversity Strategy and Action Plan

It is important for the future health of Botswana's biodiversity that the Biodiversity Strategy and Action Plan is implemented together with the existing National Conservation Strategy without delay. A critical prerequisite for successful implementation is to achieve political and high-level support and will to implement the strategy. This will help to drive the process. Public support and acceptance are also of key importance.

In addition, efficient coordination is a key requirement. It is proposed that a BSAP implementation office be established within the Ministry of Environment, Wildlife and Tourism, with the specific task of coordinating, monitoring and evaluating Biodiversity Strategy and Action Plan activities. To achieve full effect, the Strategy also needs to form an integral part of the national planning process and through appropriate interventions at the national level filter down to the users of biodiversity.

The BSAP process and the way forward

This Biodiversity Strategy and Action Plan is the end product of an 18 month long process and has involved the participation of a great number of people from around the country. The process has included a biodiversity stocktaking phase, covering a basic evaluation of biological resources, and related social, legal and policy and Biosafety issues, as well as options for a biodiversity Clearing House Mechanism (CHM).

Implementation of the Strategy requires commitment and active engagement by all stakeholders. The best way to ensure active participation in this respect is to equip people with an awareness and understanding of the importance of maintaining biodiversity, and why it is crucial that biodiversity components are used sustainably. Awareness raising and implementation activities have therefore been incorporated as important parts of the strategy and action plan.

Implementation of the Strategy and Action Plan has been build into the Strategy under strategic objective 11. The Ministry of Environment, Wildlife and Tourism will play a major role in Coordinating, monitoring and evaluating implementation of the Strategy and Action Plan

Timeframe and budget

The implementation timeframe of the BSAP is 5 years in general. A few activities however have a 10-year timeframe. Initially the BSAP was intended to coincide with NDP 9, i.e. to run from 2003/04 to 2008/2009. Due to various delays, the starting date for implementation of the strategy and action plan has slipped, and it is now likely that implementation of the BSAP will overlap with NDP 10. This is in fact an advantage as it means that the BSAP can be used directly to ensure that activities are incorporated in the next national development-planning phase.
Most activities can fit in under National Development Plan 9 (NDP9).

NDP9, makes good provision for environmental activities and most of the activities listed in the action plan can be linked to provisions under NDP9, and thus funding sources for government implemented activities. Funding for NGO and civil society implemented projects is however more difficult as there is currently little donor funding available for biodiversity projects.

Final words

Biodiversity is a subject that cuts across sectors and activities. There are no easy solutions to ensure successful biodiversity conservation and sustainable use, and Strategy activities therefore span over a wide variety of sectors, from policy and legal frameworks at national level to practical solutions on the ground, and over national and district borders and institutions. The Biodiversity Strategy and Action Plan is therefore by virtue a long document, which, to get the full picture, should be read in its entirety. However, to ensure implementation, the strategy will be broken down into manageable units by sector. If

all sectors implement their part we should by 2009 have taken a big step towards long-term conservation and sustainable use of Botswana's biodiversity.

1 INTRODUCTION

1.1 Botswana and its biological heritage

Botswana is a country of extremes with regards to biodiversity. With ecosystems varying from some of the driest and most biologically hostile areas in the Kalahari Desert and the Makgadikgadi salt pans to the lushest of the Okavango Delta, the variety of habitats and species is immense, each providing its own important and spectacular characteristics. These ecosystems represent a huge asset, both to the local communities as well as nationally, forming the very basis for much of the tourism industry in Botswana. Botswana's biodiversity is also valuable to the global community providing specific ecosystems, some of which are home to species not found anywhere else in the world.

Biodiversity needs to be properly managed in order to maintain genes, species and productive ecosystems. Unfortunately, there are no easy solutions to biodiversity management as biodiversity includes a wide variety of organisms, which are affected by a variety of factors in different ways, and sustainable use of all components of biodiversity therefore requires a combination of measures and activities.

Botswana is fortunate in being one of the few countries with much of its biodiversity still fairly intact. If we are complacent, this situation will however change and now is the time to "put the house in order" to ensure that these important biodiversity resources will be around for future generations to enjoy and benefit from. There are many areas relating to the sustainable use and conservation of biodiversity, in need of urgent attention, as identified through the Biodiversity Stock take Report (MEWT: 2003). Climate change is today a reality, which in the long-term will affect all biodiversity components, not just in Botswana, but around the world. While it is difficult to stop climate change, we can help prevent the effects of climate change by, for example, putting mitigation measures and *ex situ* conservation structures in place to limit the negative effects. Habitat destruction from construction or mismanagement is another important area, which must be addressed to avoid unnecessary biodiversity loss. This includes rangeland degradation, which has already been identified by the National Conservation Strategy as an area of major concern to the country. The list of potential threats is much longer (A summary of threats to biodiversity in Botswana is found in Annex 1.).

While the effects of these threats may vary what they have in common is that they threaten biodiversity levels and that a reduction of the levels of threat will require a number of measures, spanning across sectors, ministries and individuals. Botswana needs to strengthen its policy, legal and institutional framework with regards to biodiversity. A better understanding of biodiversity and ecological processes, together with baseline data is the necessary starting point on which to base management and policy decisions. The issue of access and benefits arising from biodiversity components is of key importance when promoting sustainable use, while availability of funding to carry out conservation, research and maintenance of information and collections is essential for driving activities. All the above will contribute to a framework guiding biodiversity management.

To achieve long-term sustainable management and use of biodiversity the most important factor however is to improve awareness and understanding of the importance and value of maintaining biodiversity, and the will to do so among Batswana.

Summary of areas needing action to prevent loss of biodiversity[1]

- **Policy, legal and institutional framework** protecting biodiversity and related knowledge
- **Awareness and understanding** of biodiversity, ecological processes and environmental economics
- **Data collection and management framework** (Baseline information, reference collections and long-term monitoring) to measure sustainability
- **Research and management framework** to comprehensively conserve ecosystems, species, genes and indigenous knowledge
- **Environmental assessment and enforcement procedures** to limit physical threat to biodiversity
- Issues surrounding resource **access and benefit sharing**
- **Availability of government and non-government funding** for biodiversity conservation

[1] for details of threats to biodiversity see Annex 1

1.2 The Nation's commitment to conserve biological diversity

Botswana is a signatory to the Convention on Biological Diversity (CBD). The objectives of the Convention are conservation of biological diversity, sustainable utilisation of components of biodiversity and equitable sharing of benefits arising from such utilisation.

By signing and ratifying the convention, Botswana has shown firm commitment to its environment, habitats and biodiversity, and has undertaken to develop and adapt national strategies, plans or programmes for the conservation and sustainable use of biological diversity and to achieve specific biodiversity conservation targets.

1.3 Goal of the Strategy

The goal of the Biodiversity Strategy and Action Plan is to contribute to the long-term health of Botswana's ecosystems and related species, and to encourage sustainable and wise use of resources through the provision of a framework of specific activities designed to improve the way biodiversity is perceived, utilised and conserved. The future of Botswana and its people is rather bleak without its biodiversity, natural resources, cultural traditions and related knowledge. This strategy is therefore an essential component in making sure that this national heritage and resource base is maintained.

The Strategy should form an integral part of the national planning process and, through appropriate interventions at the national level, filter down to the users of biodiversity. While the Strategy is relevant to all citizens it will directly affect those in charge of planning, biological research, conservation, users of components of biodiversity and enforcement authorities who apply the rules and regulations related to biodiversity.

Raising biodiversity awareness and appreciation of the true value of biodiversity are key components of the strategy, as these are crucial for the long-term conservation and sustainable use of Botswana's biodiversity.

2 MAINTAINING BIODIVERSITY FOR FUTURE GENERATIONS

2.1 Biodiversity – what is it and why is it important?

Biodiversity – *the variability within and among living organisms and the systems they inhabit* – is the foundation upon which human survival exists. In addition to its intrinsic value and contribution to sound ecosystem functioning, biodiversity provides goods and services essential for life on Earth, such as the provision of fresh water, soil conservation and climate stability, food, medicines and material for industry, and thus underpin sustainable development in many important ways and contributing to poverty alleviation. Finally biodiversity is at the heart of many of our values across different cultures and religions.

Biodiversity
"The variability among living organisms, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this include diversity within species (genetic), between species and of ecosystems"
CBD, 1992

The maintenance of biodiversity is therefore a necessary condition for sustainable development. It is a process, which requires awareness and active participation by all citizens. The challenge for Botswana is therefore to become a nation where each citizen has a basic understanding of the value of biodiversity and thus is pro-active in ensuring the conservation of genes, species, communities, and ecosystems on a variety of scales, so as to make sure that environmental goods and services are provided in a sustainable manner and not compromised for future generations. Making people aware of the importance of biodiversity and ecosystems functioning is a big step towards wiser use and thus sustainability.

2.2 Biodiversity in Botswana

Botswana is rich in faunal and agro-biodiversity species, while the flora, in terms of numbers of known species, is quite low in comparison with other countries in the region. The number of known species per group of organisms is summarized in Table 1, together with the number of endemic species and Red Data (RD), or rare and endangered, species in Botswana.

The purpose of the map in Figure 1 is to give an indication of species rich areas in Botswana, but it is not to be used as the basis for prioritization of conservation efforts, as this will be done at a much finer scale at District level taking district ecosystems and priorities into consideration. The map has been compiled, through combining available spatial data for wildlife and flora, but also taking into account biodiversity important habitat areas such as wetlands, pans, and kopjies. Additional survey work is required to refine the map, since agro-biodiversity, micro-organisms and insects are not included in this analysis, as there is limited spatial data. Agro-biodiversity would however normally be low in areas of high natural biodiversity, reflecting land-use rather than ecological conditions. Limited or lack of relevant spatial data is not a condition specific to Botswana and many countries around the world have based their biodiversity priority areas largely on vertebrates and woody plants for that reason.

According to this basic analysis, areas which stand out as high (darker colour) in biodiversity are located along the northern border, the Okavango delta, the Makgadikgadi Pans, the northern Kalahari, the northeast and the southeast borders. The small triangles indicate locally important areas such as pans. . The biodiversity species richness index combines coverages from the fauna and flora assessments of species richness on an equal ranking i.e. same maximum values (BSAP appendix 2 and 3, 2003). The plant biodiversity species richness coverage was generated from National Botanical Institute in Pretoria historical herbarium distribution data combined with landforms and habitats known for high plant diversity, such as wetland areas including rivers, pans and dams, and hills and rocky outcrops

It is important to note that there might be a slight bias towards areas where collection and survey have taken place, although the inclusion of important biodiversity habitats will compensate for some of that.

Table 1: Summary of species inventory

Organism	No Species	Endemic	RD species
Mammals	150	3	112
Birds	570	1[1] (near endemic)	15[1]
Fish	82	1?[2]	0
Reptiles	131	Not known	2
Insects	Not known	Not known	NA
Other invertebrates	Not known	Not known	NA
Vascular Plants	Est. 2,150-3,000	15	43[3]
Fungi	Not known	Not known	NA
Micro-organisms	Not known	Not known	NA
Main livestock species	10	Not known	NA
Common crop species	28	Centre of endemism for *Cucurbitaceae* family and *Vigna* species	NA

Source: BSAP Stock take Report. 2004

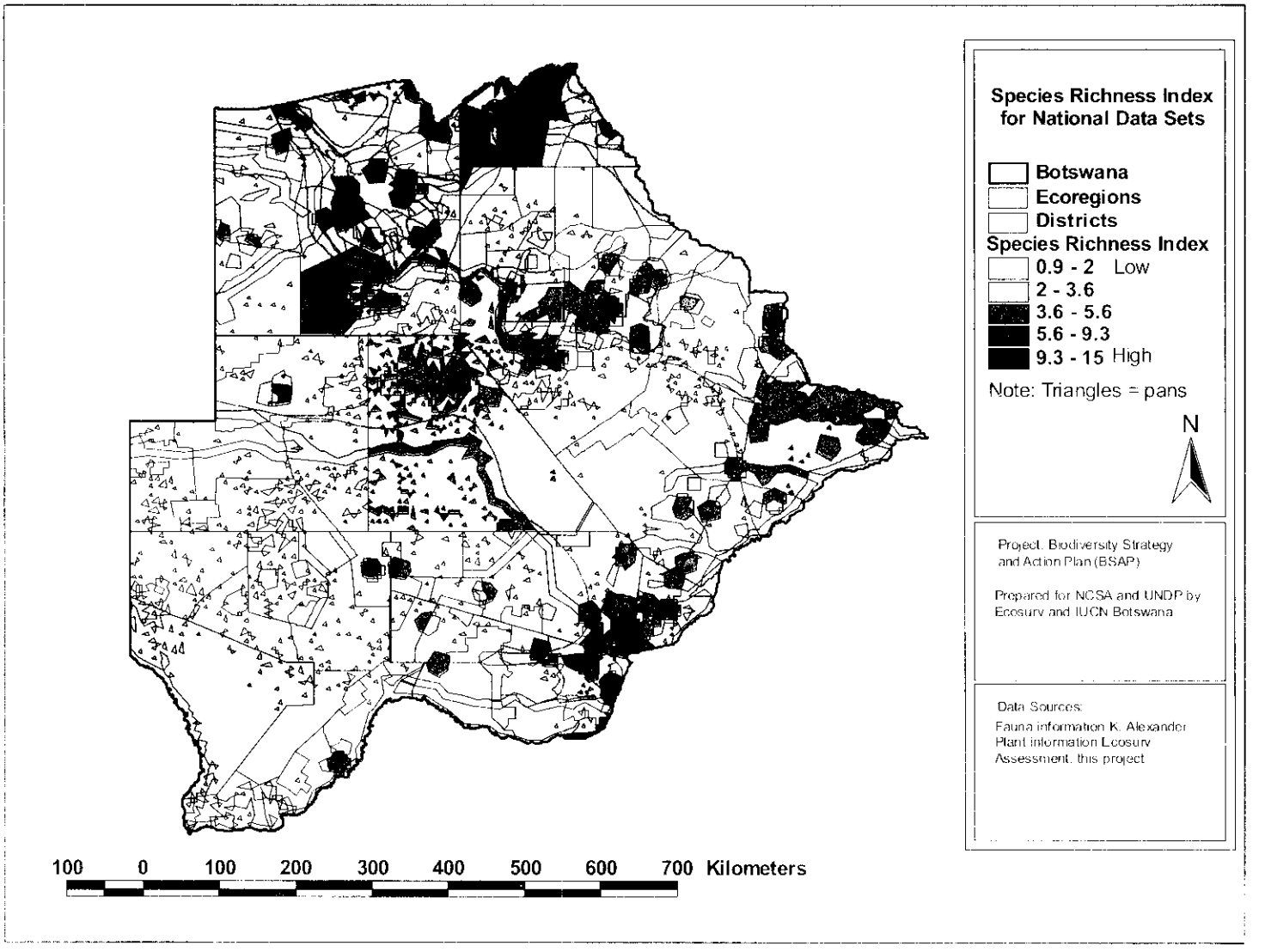
[1] Preliminary figure. Red Data List for birds is still being compiled

[2] One Aplocheilichthys species found in the Okavango Delta has not yet been named and could be endemic to Botswana.

[3] According to Golding ed. 2002. Many of the listed plants are data deficient and a recent review by RBG Kew suggests that the actual number is somewhat lower.

Figure 1: Botswana Species richness index for national datasets

(according to available national datasets)



There has been a lot of scientific debate about the relationship between the number of species in an ecosystem and ecosystems functioning. Consensus is however emerging among researchers that history, geography and local climate are primary factors governing ecosystem performance. Changes to biodiversity – such as the loss of dominant or "keystone" species, the loss or addition of complementary species, or the addition of invasive species – can affect how an ecosystem works, and while some of these impacts can be predicted, others cannot. Disruption to an ecosystem can often be reduced by maintaining biodiversity as closely as possible to its historical levels (Naeem, 2004).

In the absences of data measuring functional diversity, species richness can serve as a proxy measure. Figure 1 should therefore be seen as a general guide to biodiversity richness at a national level. It is however, still very important to further evaluate biodiversity and ecosystems functioning at local and District levels to set conservation priorities.

Botswana share a lot of its natural resources with neighbouring countries and some of the identified eco-regions stretch across the national borders. Regional collaboration and standards are therefore important for the long-term success of conservation programmes.

2.3 Biodiversity and livelihoods

2.3.1 *Major uses of biodiversity*

In Botswana, biodiversity contributes to livelihoods in several ways, through generation of cash and in-kind income from products derived from biological resources, and directly through provision of food, building materials, medicines etc. Although recent national surveys indicate a reduction in income contribution from biodiversity to rural livelihoods, the BSAP fieldwork found that in some parts of the country, biological resources remain central to subsistence livelihoods, and provide communities with opportunities to derive further benefits. Biodiversity is particularly central to the livelihoods of the rural communities in Kgalagadi, Chobe, Ngamiland and Ghanzi Districts, in providing raw materials and food sources, but it still plays an important part in the lives of most Batswana, providing fuelwood, herbal remedies, food, shade, clean water etc.

Income from CBNRM in 2002

Area	%	Million Pula
Subsistence use of natural resources	50	12.4
Trophy hunting	28	7.0
Total	100	24.8

Rozemeijer, 2003

Biodiversity use varies according to season and often corresponds with times of good rains. Poorer groups, mostly widows, the elderly and orphans *generally* have a higher dependency rate on wild biological resources, or veld products, for their livelihood. Wild biological resources are also an important source of livelihood for certain ethnic groups, such as the San communities. Veld products are mainly used to meet household needs (building poles, thatching grass, firewood), for consumption, for medicinal purposes, and to a lesser extent for income generation. The knowledge and use of plants for medicinal purposes is widespread.

Biodiversity provides business opportunities. In 2002, Community Based Organisations (CBOs) generated P8,450,,000 through biodiversity based Joint Venture Agreements with the private sector. The biodiversity related economic activities in the Chobe and Ngamiland District are relatively better developed than in other parts of the country (CBNRM Status Report, 2003).

2.3.2 *Cultural practices and norms*

There is sufficient evidence that many traditional/local practices are relevant for biodiversity conservation. Myths, sacred chants, stories and proverbs, rites, cultural taboos and religious beliefs reflect a genuine concern for the environment and contribute indirectly to biodiversity conservation (Prescott, et. al. 2000). With rapid development and urbanisation of Botswana, the younger generations are showing less interest in traditional knowledge and skills, and there is widespread concern that these practices are slowly disappearing. This would be a tragedy for Botswana, as knowledge and experiences, assembled over

centuries, would then be lost forever, limiting our culture, traditions and options. This, in turn, would also have implications on the use and conservation of biodiversity.

2.4 Access to biodiversity

Allocation of suitable land is a major issue in Botswana, and although the total land area is large at 581,730 km^2, and the average population relatively small (3 persons per km^2 (NDP 9), there is strong competition for land suitable for agriculture and developments. Figure 2 shows the increase in cattle distribution, i.e. agricultural land-use, in southern and western Botswana between 1991 and 2003. The maps are based on data from Department of Wildlife and National Parks' aerial surveys. Despite the long-term ecological and economical consequences and costs, initiatives aimed at maintaining biodiversity and sustainable land management are not always given priority and short-term economic solutions tend to win. There is therefore a need to strengthen the mechanisms for maintaining and actively conserving important biodiversity areas.

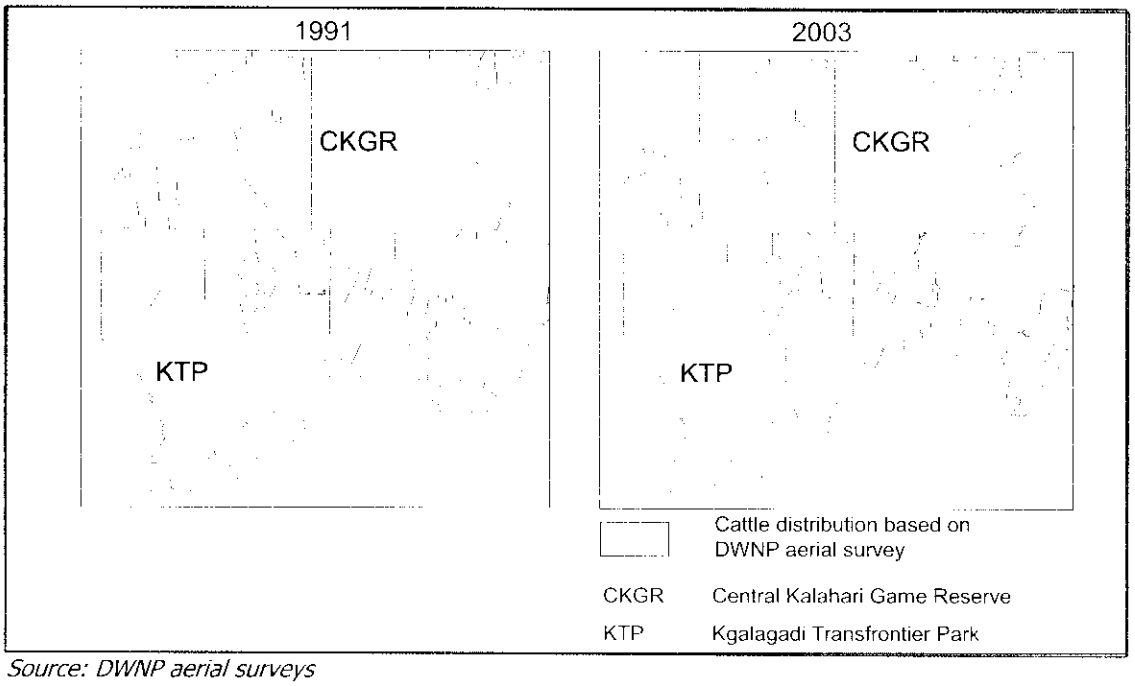
Land tenure in Botswana

Tribal or customary land	70%
State land	25%
Freehold	5%

Source: NDP9

Closely related to the issue of access to biodiversity, is the issue of fencing. The fencing of communal land through the Agricultural Policy of 1991 and the Tribal Grazing Land Policy is a major issue of concern among many Batswana, as it prevents access to areas which were previously open to the communities. Veterinary fences also have a major impact on wildlife access to surface water in some areas.

Figure 2: Cattle distribution in 1991 and 2003



Source: DWNP aerial surveys

According to Botswana law, the ownership and control of biodiversity belongs to the State, except on private, or *freehold land,* and *customary land (tribal land*). However, wildlife moving across freehold land or customary land still belongs to the State and hunting or killing wildlife requires permission or a license from the Department of Wildlife and National Parks.

While the tribal land areas are administered by local authorities (Land Boards), landholders have the exclusive right of use, but not ownership of the biodiversity resources on the land, except in the case of communal grazing, where the resources belong to the whole community. Land under the control of a local authority can in specific cases be given or acquired by the State, and the biodiversity resources situated in

them would then be transferred to the State, examples include Moremi Game Reserve, and the mining areas around Orapa and Jwaneng.

State land includes towns and cities, which are covered under both the State Land Act and the Town and Planning Act. Access to biodiversity resources on *State Land*, be it for commercial or scientific purposes, is regulated through a licensing system, where the licences are granted by the responsible Ministry. On *Freehold Land*, as on all other land, the right of use is limited when it comes to protected species as these are subject to the general law of Botswana, which prohibits unlawful removal of resources from their natural habitat areas. Any use or removal therefore requires a permit from the responsible authority.

It is widely accepted that existing laws concerning legal rights to access and use of genetic resources are un-coordinated and fragmented, be it *in situ* or *ex situ*, and that an update and harmonisation of the legal framework is urgently needed to bring it into line with current biodiversity sustainable use demands.

A complicating factor is that the line between commercial uses versus traditional use of natural resources has never been properly established, and there is a perception, rightly or wrongly, that the profits generated from Botswana's biological resources do not benefit the majority of Batswana currently. There is limited value-adding industry and initiatives and many communities feel the impact of low market prices for veldproducts and other raw materials. At the same time there is acknowledgement that there is a need to develop new markets and to improve utilisation, quality and marketing capacities in order to enhance benefits derived from biodiversity resources. The first step should therefore be to establish access and benefit sharing strategies, which must be linked with adequate legal and policy frameworks for protection of the resources as well as providing incentives for innovation and development. From a biodiversity conservation perspective there is a need to establish traditional use levels in order to distinguish between traditional and commercial use. An effective monitoring and licensing programme for species in which the commercial value may encourage over-exploitation is also essential. A few veld product species, such as Devil's claw (*Harpagophytum* spp.) and Kalahari truffle (*Terfezia pfeilii*) currently fall into this category.

2.5 Coping with environmental change

Environmental change and evolution is a natural phenomenon and ecosystems are not static. Environmental change can be a result of long-term natural processes, which we cannot control, or it can be caused by human actions, which can be prevented and mitigated. Some of the threats to Botswana's biodiversity, such as global warming and climate change are difficult to address at national level and require international engagement, while many others can be reduced or eliminated by positive action at national and local level.

Human induced changes in biodiversity levels can have profound impacts on the functioning of ecosystems, and ultimately affect the ecosystems that we depend upon for livelihoods, economy and survival. Our understanding of ecosystems functioning is still fairly basic, and as we are not entirely sure of the long term implications of species extinctions and changes in biodiversity levels, it is therefore wise to apply the precautionary principle (Convention on Biological Diversity, 2003), and try to reduce the level of threats as much as possible.

2.5.1 *Current levels of sustainability*

The rate of biodiversity loss at a global level is increasing at an unprecedented rate (WCMC, 2000). Compared to many other countries, Botswana is currently fortunate in that due to its large land area, low population density and the fairly high percentage of protected land, the level of threat to biodiversity to the country as a whole is still relatively low. However, unless a concerted effort is made to maintain this situation, national biodiversity levels are likely to slowly erode.

Rural populations often end up recipients of both the benefits and the costs of maintaining biodiversity. Despite traditional biodiversity management and conservation practices, current national biodiversity conservation activities sometimes clash with local community priorities. This is often a result of a lack of understanding or communication from both quarters.

The poverty-biodiversity loss cycle is mitigated in Botswana by government welfare policies and some limited non-natural resource management based economic opportunities, which reduce dependency on biodiversity resources. This situation which may not be permanent, may cause subsistence and poverty pressures on biodiversity to intensify in future

The long-term success of the strategy, therefore, depends on good communication between the resource users, managers, researchers and conservationists. It also requires community participation in decision-making around policy and action.

2.5.2 *Main threats to biodiversity in Botswana*

It is difficult to generalise or prioritise threats to biodiversity at a national level, as the threats and level of threats vary according to the type of organism and species but also by geographical location. It is however generally agreed that the main threat to Botswana's biodiversity is **habitat** destruction and reduction (MEWT, 2003, BSAP Stock take). Habitat destruction and degradation can be caused by a variety of factors ranging from direct destruction through construction of houses, roads and other infrastructure, to damage caused by pollution, unsustainable land and resource use, including unsustainable rangeland management (localised overgrazing and bush encroachment), over harvesting and excessive water abstraction.

Loss of habitat

1,952 km of new roads and 6,872 km of bituminised roads were constructed during NDP8, the biggest road construction programme hitherto undertaken by Government. The trend is set to continue.

Source: NDP 9

Economic development is unfortunately often linked with an increase in construction of infrastructure and in consumption levels (water, cars, packaging, building sand etc), waste and **pollution** levels, and thus contributing to habitat destruction. With foresight and wise planning, many of the negative effects of development on biodiversity and unnecessary losses could be avoided or mitigated. Restoration and rehabilitation of habitats can be done, but are usually very expensive options. Solutions provided by the Strategy include improved land-use and biological resource planning and management, enhanced cross-sector collaborations, strengthening of the legal framework and capacity for enforcement and management of Environmental Impact Assessments, strengthening of environmental standards, improved awareness and accountability levels.

Wildlife vs. livestock systems in Ngamiland

Ngamiland wildlife systems have higher economic (i.e. to society at large) returns than small or large-scale livestock production, although financial returns (i.e. to the investor) of small scale livestock production is higher or similar to wildlife utilisation systems. Without agricultural subsidies, wildlife utilisation would have a clear comparative advantage

Barnes et al, 2001

National statistics suggest that human population density *per se* is not a threat to biodiversity in Botswana, but that in some areas the activities related to increases in population pressure are. For example, excessive harvesting of fuel wood is starting to emerge in the eastern corridor of the country. In many parts of the Kalahari settlements and ranches compete with natural ecosystems for grazing and water, threatening certain species and ecological processes. Solutions to these problems include a strengthening of the protected area network, establishment of wildlife corridors, biodiversity issues adequately included in district land-use planning, availability of affordable alternative energy sources and establishment of fuel wood plantations, to mention a few.

Climate change is today a reality, but mitigation of its effects is complicated, as the changes are not yet clearly understood. However, global long-term predictions are that rainfall patterns will get more erratic and that dry-land countries can expect to get drier and hotter (Pers. com. DMS 2003). Botswana is already considered a dry-land country, so this scenario will have serious long-term implications on the country's biodiversity, and may affect distribution of species and habitats, and influence livelihoods based on agriculture and rangelands. An increase in the frequency of droughts and floods will also seriously affect agro-biodiversity activities. Solutions to dealing with climate change include establishment of, early warning mechanisms, breeding of drought tolerant breeds and varieties, research into climate change trends and establishment of mitigation and conservation measures accordingly, such as for example long-term *ex situ* collections.

Water is a key commodity sustaining biodiversity. Water is already a scarce resource in many parts of Botswana and with climate changing, the need for wise **water management** is even more important. This does not only include reaching sustainable consumption levels, water accounts and hydrological monitoring, but also implementation of Environmental Impact Assessment mitigation activities, such as regular release of dam water, reducing water pollution levels and improving water conservation awareness levels.

There are many other potential and actual threats with various effects on biodiversity, such as invasive species, fire, over-harvesting etc. We still don't know the full effect of some of these threats and continued research and adaptive land management tools are therefore essential.

The root causes leading to biodiversity loss are often quoted as being related to poverty, inequality, economics and demographic change. Poverty results in forced overuse of resources, while the general increase in development levels often results in an influx of people into towns and villages adding pressure on fuel wood resources etc. and changes in attitudes towards traditional methods and knowledge. In the case of Botswana, one of the root causes affecting biodiversity is land allocation and associated land-use. The promotion of the cattle industry, with associated issues such as grazing rights and fencing continues to be an issue of contention, not only between the agricultural and environmental sectors, but between the communities and cattle owners as well (BSAP consultation process). An important part of the Strategy and Action Plan is therefore to improve cross sectoral planning and collaboration, to review and harmonize existing and new policies affecting the environment and biodiversity and to reduce perverse incentives which lead to loss of biodiversity. In this respect, the raising of biodiversity awareness levels in general and about the long-term economic value of biodiversity and ecological processes are of key importance.

Range degradation during the 1994/95 wet season

Category	Km^2	% of total land area
Potentially degraded areas - bare soil	28,592	4.9
Partial potentially degraded areas	35.159	6.1
Possible bush encroached areas	37,141	6.4

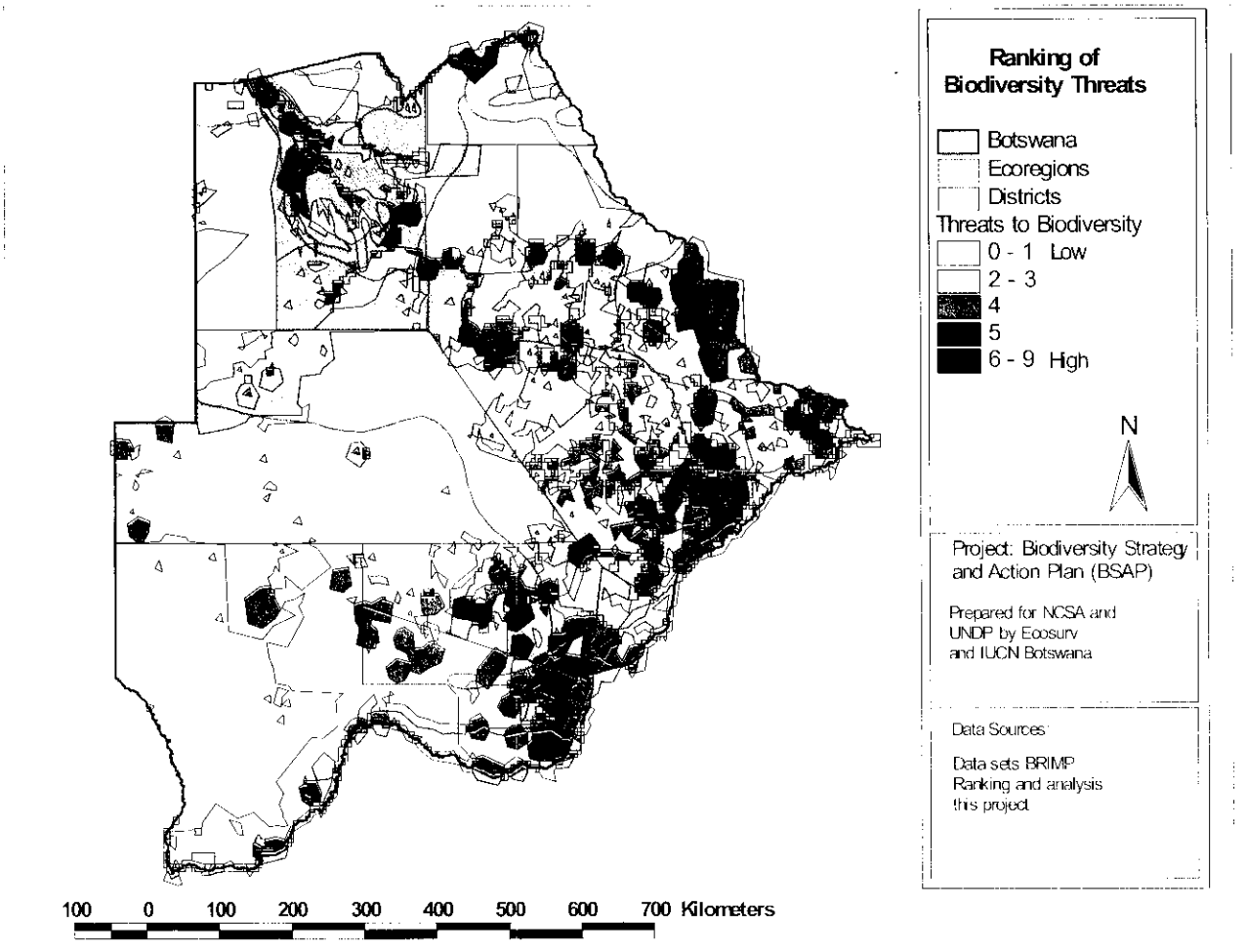
Further work is required to establish long-term trends and analysis at district level.
(Ringrose et al 1997)

Management of the biodiversity resources and related knowledge depend on the capacity and health of people, and in this respect the long-term effects of HIV/AIDS on the management of biological resources and knowledge cannot be understated. Continued training programmes and collection and recording of traditional crops, breeds and knowledge are therefore very important.

Figure 2 is derived from the biodiversity stock take process and provides a quantitative overview of threats to biodiversity in Botswana, i.e. the number of threats to components of biodiversity by area. The analysis includes the following perceived threats: population and livestock pressure from settlements, livestock and tourism activities, hydrological change through water abstraction, areas prone to high numbers of wild fires and high elephant populations. While some activities, such as habitat destruction for example, have an overall negative effect on biodiversity; other perceived threats might have a substantially negative effect on certain species or components of biodiversity, but not necessarily on overall levels of biodiversity. Examples of such threats include fire, damage to vegetation by elephants and climate change, and further research is needed to establish their true effect on Botswana's biodiversity.

The map indicates that the highest pressures on overall biodiversity are in the eastern parts of the country and in and around the Okavango delta, with smaller pockets in other parts of the country. This is mainly a result of population pressure and hydrological changes.

Figure 2: Threats to biodiversity in Botswana



Source: BSAP Stock take Report, 2004

The conclusion is that for successful and cost effective reduction and elimination of threats to biodiversity, inventories of threats and mitigation plans need to be brought down to the district level. Although some threats overarch all biodiversity components, reduction of threat and mitigation activities need to be driven by the relevant biodiversity component (flora, wildlife, birds, fish, insects, indigenous knowledge etc.) in collaboration with the relevant sectors to successfully reduce threats to biodiversity. At national level, these processes need to be supported through the provision of a conducive policy, legal and financial framework. The development of District Biodiversity Strategies and Action Plans are included in the national Strategy and Action Plan.

2.6 Conservation of resources

Maintaining the genetic diversity of a species is crucial for the long-term future of that specific species. Genetic diversity can be accomplished through maintaining large population levels, which can be achieved *in situ* if the habitats are large enough and the species levels high enough. Genetic diversity can also be maintained in *ex situ* storage. Ecosystems conservation is normally the preferred biodiversity conservation option, but it needs to be complimented by genetic and species conservation schemes. Species can often serve as indicators of the health of the whole system.

Definition of a protected area. The definition adopted is derived from that of the workshop on Categories of Protected Areas held at the IVth World Congress on National Parks and Protected Areas:

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

According to this definition, 45 % of Botswana's land area is protected (Pers. com DWNP, 2004). The different types of protected areas are listed in Table 2:

Table 2: Types of Protected Areas in Botswana

Type of area	Km^2	% of tota	Legal constitution	Level of protection[a]
National Parks			Wildlife Conservation and National I No 28 0f 1992	Ib No hunting
Game Reserves			Wildlife Conservation and National I No 28 0f 1992	Ib No hunting
Private Wildlife & Natur			No act deals with this	IV No hunting
Wildlife Management A (WMA). Gazetted.			Wildlife Conservation and National I No 28 0f 1992	V Controlled hunting
Wildlife Management A (WMA). Ungazetted.				
Forest Reserves			Forest Act, 1968	II -Protection of Trees
National Monuments			Monuments and Relics Act 1970	III – Botanical monum

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)

This protected area network provides good *in situ* protection for most of the eco-regions and many wildlife species, except in the north-eastern part of Botswana. While the vegetation in national parks and game reserves is protected and the Forest Reserves offer protection of certain tree species, the protected

area network offer less protection for Botswana's rare and endangered plants as most of these occur outside the protected area network (Balding, 2003).

Specific species management plans exist for certain groups of organisms, especially some of the bigger mammals and birds (Crocodile, ostrich and elephant).

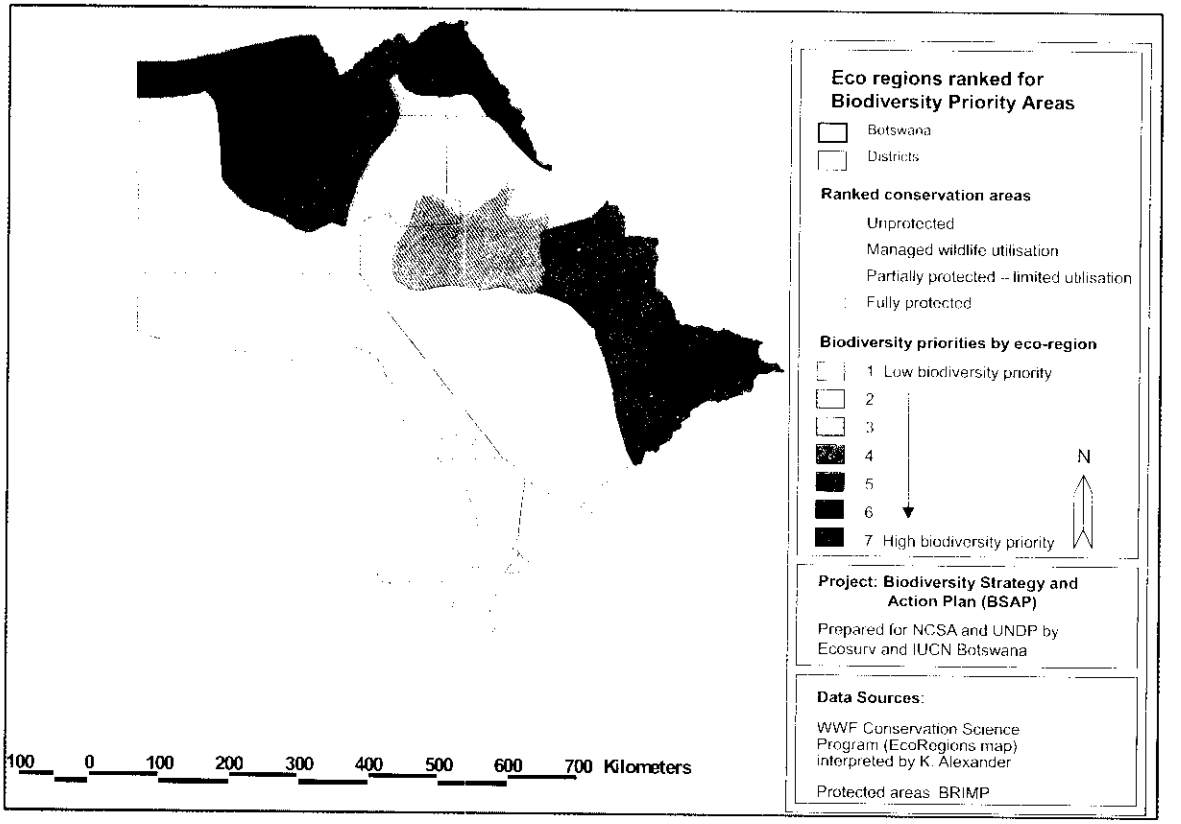
Ex situ conservation facilities and programmes are in place for crops and wild crop relatives. The National Plant Genetic Resources Centre holds seed collections of most of the major crops. These collections are duplicated at the regional Plant Genetic Resources Centre in Zambia. It is mainly the main crops that are being stored, although lately there has been an attempt to collect minor crops and wild crop relatives as well, but the collecting programme is still not comprehensive.

There are few *ex situ* conservation facilities for wildlife and conservation at genetic level is poor for al organisms. The genetic diversity is not known for most organisms, including animals.

Indigenous knowledge
The general knowledge about plants and their properties is still fairly broad, especially in the rural areas. With development has followed urbanisation and a general lack of interest in traditional methods and knowledge among the younger generations. This poses a great threat to indigenous knowledge, as it will only take a few generations for this type of knowledge to disappear completely.

Figure 3 shows conservation priority areas, based on analysis of species richness, levels of threats and current protection, together with an outline of existing protected areas.

Figure 3: Eco-regions ranked according to biodiversity and threats



Source: BSAP Stock take report 2004

2.7 Institutional capacity

There is no government institution with overall responsibility for biodiversity. Several Government ministries and institutions have a stake in biodiversity conservation and sustainable use, and it is not always clear who has the ultimate responsibility for certain organisms (See Table 3), as areas of responsibilities sometimes overlap. The recent (2002) creation of the Ministry of Environment, Wildlife and Tourism (MEWT) however, has brought the majority of departments involved with environmental management together under one umbrella, and with an assertive coordinating effort as proposed in the Strategy there is little need for any major institutional changes of responsibilities.

The National Conservation Strategy Coordinating Agency (NCSA), which was established as a result of the National Conservation Strategy, has so far proven to have limited legal authority to act as a government environmental watchdog. It is therefore important to re-establish the legal authority of the NCSA/environmental watchdog body and to develop and adopt an overarching environmental legislative framework, as discussed in Chapter 3, to support it.

Table 3: Government institutions directly responsible for use and protection of component of biodiversity

Government Ministry	Summary of Responsibilities
MINISTRY OF ENVIRONMENT, WILDLIFE AND TOURISM.	▪ Environmental Management Coordination ▪ Environmentally related research permits ▪ Veldproduct quotas ▪ Plant import and export licences ▪ CITES issues (plants) ▪ Agricultural Resources Act ▪ Forestry policy ▪ Forestry inventories ▪ Forestry conservation ▪ Forest reserves ▪ Collection and distribution of tree seeds ▪ Seed storage ▪ Propagation ▪ Conservation inside National Parks and game reserves ▪ CITES faunal species ▪ Protection of certain animal species throughout Botswana ▪ Wildlife Research ▪ Implementation of the NCS ▪ National Focal point for the CBD, UNCCD, Ramsar and Stockholm conventions ▪ Environment Impact Assessment Bill ▪ Environmental Research ▪ Environmental Education ▪ GEF Focal Point
MINISTRY OF AGRICULTURE.	▪ National Gene Bank ▪ Long term storage of seed ▪ Agricultural research, including germination and propagation ▪ Micro-organisms ▪ Agricultural herbarium ▪ Biosafety framework ▪ Wild crop relatives ▪ Micro-organisms ▪ Indigenous livestock species ▪ Control of pathogenic micro-organisms ▪ Research

Government Ministry	Summary of Responsibilities
	▪ Identification of pests and weeds ▪ Mapping of resources (BRIMP) ▪ Veldproduct research (BRIMP) ▪ Rangeland ecology and botany and inventories
MINISTRY OF LABOUR AND HOME AFFAIRS	▪ National herbarium collection ▪ Propagation of wild plants ▪ *Ex situ* collections of wild plants ▪ Vertebrate and invertebrate collections ▪ *In situ* conservation of Natural History Monuments (Botanical Monuments)
UNIVERSITY OF BOTSWANA	▪ Plant research ▪ Herbaria ▪ Fungi, Algae and micro-organisms ▪ Rangeland research ▪ Wildlife Research
MINISTRY OF MINERALS, ENERGY AND WATER AFFAIRS.	▪ Aquatic weeds control ▪ Aquatic plant herbarium (proposed) ▪ Sustainable water abstraction
MINISTRY OF FINANCE AND DEVELOPMENT PLANNING.	▪ Control and monitoring of Import and export of genetic Resources
MINISTRY OF COMMUNICATIONS, SCIENCE AND TECHNOLOGY	▪ Research ▪ Science research permits

Source: BSAP Stock take Report - Appendix 2

Table 4: Some environmental NGOs in Botswana, involved with conservation of biodiversity

Name of organisation	Area of expertise
Birdlife Botswana	▪ Bird counts ▪ Education ▪ Advocacy ▪ Bird related research
Caracal	▪ Wildlife conflict ▪ Natural resource management
CBNRM Forum and support programme	▪ Community based natural resource management
Conservation International (Botswana)	▪ Natural resource management
Forestry Association of Botswana	▪ Community forestry ▪ Indigenous trees
IUCN (Botswana)	▪ Natural resource management
Kalahari Conservation Society	▪ Natural resource conservation
Khama Rhino Sanctuary Trust	▪ Wildlife Conservation
Mokolodi Nature Reserve	▪ Nature Conservation
Permaculture Trust Botswana	▪ Agro biodiversity conservation ▪ Farming systems
Veld Products Research and Development	▪ Veldproducts research and marketing ▪ Natural resource management
Thusano lefatsheng	▪ Veldproducts research and marketing ▪ Natural resource management

Table 4 lists some NGOs involved with natural resource management and biodiversity conservation. This list is not exhaustive and more NGOs and CBOs involved in environmental conservation can be found in the Directory of Non Government Organisations and Community Based Organisations.

With biodiversity expertise and information divided between many different institutions there is a great need for general coordination of biodiversity efforts, a need for a holistic approach rather than sectoral planning and execution, to assign specific responsibilities and to strengthen biodiversity conservation facilities and human resources in general.

In addition to government agencies, Non Governmental Organisations have been, and are closely involved in environmental conservation and research activities, including community based biodiversity activities. From a biodiversity perspective it is important to bring the existing draft CBNRM policy in line with the BSAP, and to formalise it.

2.7.1 *Human capital*

With biodiversity awareness being crucial to the long-term sustainability of biodiversity, there is a major need to raise the general level of understanding of the importance of maintaining biodiversity, with campaigns from primary school to government decision making.

The main biodiversity expertise in the country is divided between University of Botswana (UB), Botswana College of Agriculture (BCA), and Government Departments and institutions involved with environmental and biodiversity issues ((See Table 2), environmental NGOs (See Table 3) and selected companies in the private sector. While University of Botswana is fairly strong in the environmental field there is still a great need to train students specifically in biodiversity conservation, and to increase biosystematics' expertise in the country. There has recently been a drain of competent people from the environmental NGOs due to funding problems and there is little funding available for the NGOs to attract new staff. Donor funding for environmental activities has decreased drastically in recent years and it is important that Government makes a decision very soon on how best to cover the void, as loss of expertise and resources related to biodiversity planning and management could have long lasting consequences.

Biotechnology refers to any technique that uses living organisms or compounds derived from living organisms to change or improve the quality of crops and food, drugs and health care products, vaccines, industrial chemicals and other substances. Botswana has very limited capacity to undertake so called modern gene manipulation techniques, but expertise exists in areas such as vaccine production, plant breeding and artificial insemination.

2.7.2 *Data management capacity available services*

Sound planning and development rely on sound data. Our understanding of ecosystems functioning is currently fairly limited and more research, data collection and inventories are needed.

Easily accessible and user-friendly biodiversity data is essential to help promote conservation and sustainable use. Accessibility of biodiversity data and data formats, i.e. records not computerized, are today a constraint in Botswana, which often leads to duplication of data collecting and at worst not including important biodiversity data in analysis.

It is important to make key national databases and checklists easily available, while at the same time protect sensitive information, such as distribution data for rare and endangered species. It is also essential to ensure that information materials and data aimed at users at community level should be made available in Setswana.

2.7.3 *Status of biodiversity technology development and use*

Biotechnology is applying biological systems and organisms to scientific, agricultural and environmental processes or a technological application that uses biological systems, living organisms or their derivatives to make or modify products, such as GMO foodstuffs. Biosafety are measures (policy, legislative, administrative and enforcement) that are set in place to address safety for the environment and human health in relation to modern biotechnology.

Biotechnology is still a very minor sector in Botswana, although some of the activities currently taking place are of great importance, such as vaccine production, artificial insemination and plant breeding. There is currently limited modern biotechnology activity in Botswana, i.e. use of new recombinant nucleic acid or cell fusion techniques. As of 2004 Botswana has not knowingly allowed genetically modified crop use or field trials.

Although fairly untapped and unexplored, Botswana is likely to have genetic resources with potential value for the biotechnology industry. For example, the saltpans harbour some very specialised organisms which have developed salt and drought tolerance over the years. Botswana is also a genetic centre for the cucurbit family (melons and cucumbers) and for vigna species (cowpeas), and harbour a potentially valuable gene pool. The setting up of biotechnology-based enterprises, however, often requires major start-up investments in equipment and facilities. Few companies in Botswana have the capacity and capital to establish biotechnology-based production or to compete with the large international pharmaceutical companies. A better way forward would be to collaborate within the region and to set up biotechnology based joint ventures with international companies, provided that access and benefit-sharing arrangements have been made.

Any biotechnology-based activities require rigid safety measures as the consequences of accidents could have severe effects on people and the environment. Government, coordinated by the Ministry of Agriculture, is currently developing a Biosafety Framework to help guide decisions on biotechnology and Biosafety. Both biotechnology and Biosafety require human, financial and technological resources to implement. In particular, biotechnology requires financial resources to conduct research and develop the necessary technology.

3 BSAP DEVELOPMENT PROCESS

3.1 Strategy development process

This Biodiversity Strategy and Action Plan is the end product of an 18 month long process. This process has included a biodiversity stocktaking phase, covering a basic evaluation of biological resources, social, legal and policy issues related to biodiversity as well as Biosafety and Biotechnology, and options for a biodiversity Clearing House Mechanism (CHM). Out of the stocktaking exercise emerged a list of needs, gaps and opportunities (MEWT, 2004). These were subsequently turned into a long list of strategy statements, and used to develop the BSAP outline (BSAP Outline Report), 2004. The BSAP outline was then taken around the country for consultation through 7 workshops, addressing all 10 districts, held during a 3 month period in early 2004 Although these workshops were focused on seeking inputs into the development of the BSAP it was quickly realized that it was also necessary to provide an overview of the Convention on Biological Diversity (CBD), the BSAP Project and revisit some of the stocktaking issues to equip the participants with enough background to be able to prioritise the strategic objectives and targets and to provide input into the Action Plan. A summary of the workshop conclusions can be found in Annex 1.

Based on the consultation, the BSAP outline was streamlined into 11 main objectives, each made up of specific strategy targets and related action points and a draft strategy and action plan developed. The draft BSAP was presented and discussed at a National Workshop in July 2004. Comments from the national workshop were incorporated into a final draft, which was submitted for international review, before the process was completed. The result is the document you see in front of you.

3.2 Legal and policy framework and basic principles

Whilst the Convention on Biological Diversity (CBD) provides the inspiration and guiding principles for this Biodiversity Strategy and Action Plan, the Strategy is also guided by national environmental planning frameworks, and in particular by the overall long-term framework provided for the nation by Vision 2016.

The 2010 Biodiversity Target

"to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth."

CBD COP Decision VI/26

Vision 2016
Towards prosperity for all

This will be achieved through:

- An educated and informed Nation
- A Prosperous, Productive and Innovative Nation
- A Compassionate, Just and Caring Nation
- A Safe and Secure Nation
- An Open, Democratic and Accountable Nation
- A Moral and Tolerant Nation
- A United and Proud Nation

Other relevant planning documents, which have been considered while preparing the BSAP include:

- NDP9 Environmental keynote paper
- National Action Plan to Combat Drought and Desertification
- Environmental Planning Project (EPP)
- National Conservation Strategy (NCS)
- NCS Action Plan (1998)
- National Wetlands Policy (draft)

The NCS Action Plan is a very substantial document, which addresses policy, economic incentives, public awareness and legislative issues. It doesn't however directly address specific biodiversity issues, and the BSAP should therefore be seen as a complement to the NCS Action Plan. As the NCS Action Plan hasn't yet been fully implemented, some of the recommended activities with importance to biodiversity conservation and management are therefore repeated in the BSAP. To achieve maximum impact, the two strategies and action plans should ideally be implemented in tandem.

The format of the Biodiversity Strategy and Acton Plan for Botswana has been developed using the recommended international guidelines and methods (Miller *et al*, 1995, Prescott *et al*, 2000, Smith *et al*, 2003), while at the same time taking national needs, concerns and conditions into consideration. National concerns have been provided through the stocktaking process and workshops at national and technical levels (MEWT, 2003).

In accordance with Convention on Biological Diversity (CBD) Decision V/6, the strategy is also attempting to respond to the call to apply, as appropriate, the ecosystem approach, i.e. to adopt a more holistic approach to conservation across sectoral boundaries.

Ecosystems approach

as defined by the Convention on Biological Diversity (CBD)

"a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"

(CBD, 2003)

The twelve principles of the Ecosystems Approach are listed in Box 1. The ecosystem approach does not preclude other management and conservation approaches, such as species conservation programmes for example, but should be a tool to integrate all these approaches and other methodologies to deal with complex situation. This BSAP thus contains a mix of strategic aims and management approaches.

While these principles and the policy frameworks are important, the guidance for the detailed development of the strategy has been provided by the vision of where Botswana would like to be in the future with regards to biodiversity and associated guiding principles, which were developed during the First National BSAP workshop in October 2003.

Biodiversity Vision for Botswana

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 recognize 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.

Source: BSAP 1st National Workshop

Guiding Principles[4]

- All life forms have intrinsic value
- People have an intrinsic right to use biodiversity resources for subsistence and for income generation, provided this is done in a sustainable and equitable manner and not causing harm to other life forms.
- Biodiversity and ecosystem services are essential to sustainable development. An ecological approach (Ref. Ecosystems approach, Box 1) to resource management is therefore central to achieving biodiversity conservation and the sustainable use of biological resources.
- We are not the owners but the stewards of our biological resources. All Batswana depend on biodiversity and have a responsibility to contribute to biodiversity conservation and to use biological resources sustainably.
- A strong Government framework is essential to support and guide conservation and sustainable use of biodiversity. While all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical to the conservation of biological diversity
- Biological diversity is best conserved in the wild (*in situ*). Central to the conservation of Botswana's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems
- *Ex situ* conservation provides a complement to in situ conservation and thus serves as an insurance policy.
- Indigenous genetic resources and related knowledge, innovations and traditional practices should be respected, preserved, maintained, and used with the approval and involvement of those who possess this knowledge
- Processes for and decisions about the allocation and use of Botswana's resources should be efficient, equitable, transparent and objective
- Sound environmental and development planning is underpinned by good science and economics
- The Precautionary Principle should be applied and conservation of biodiversity should proceed on the basis of the best knowledge available and best practice experience, using approaches that can be refined as new knowledge is gained
- Prevention and preparedness is better than cure. Therefore, investment in sound ecosystem management and a systematic reduction of threats to biodiversity is much preferable and usually more economic than the difficult and inevitably incomplete restoration of damaged environments
- The conservation of Botswana's biological diversity is affected by regional and international activities and requires pro-active actions extending beyond national jurisdiction

[4] These guiding principles build on the experiences of a number of Biodiversity Strategy and Action Plan from a wide variety of countries from around the world. This approach was taken rather than starting from scratch with the development of the guiding principles due to the limited timeframe at the one day workshop.

Box 1: Principles of the Ecosystem approach

CBD Principles of the Ecosystems approach

Principle 1. The objectives of management of land, water and living resources are a matter of societal choice.

Principle 2. Management should be decentralized to the lowest appropriate level

Principle 3. Ecosystem managers should consider the effects (actual and potential) of their activities on adjacent and other ecosystems.

Principle 4. Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem –management programme should:
Reduce those market distortions that adversely affect biological diversity;
Align incentives to promote biodiversity conservation and sustainable use; and
Internalise costs and benefits in the given ecosystem to the extent feasible.

Principle 5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Principle 6. Ecosystems must be managed within the limits of their functioning.

Principle 7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Principle 8. Recognizing the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.

Principle 9. Management must recognise that change is inevitable.

Principle 10. Ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Principle 11. The ecosystem approach should consider all forms of relevant information, including scientific, indigenous, and local knowledge, innovations and practices.

Principle 12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Source: CBD and UNEP; 2003