



P.O. Box 70180
Gaborone
Botswana
Tel/Fax: +267 3903401
www.car.org.bw
E-mail: info@car.org.bw

FINAL REPORT

Livelihoods and biodiversity in the Okavango Delta, Botswana

**Report prepared for the PDF-B stage of the GEF project
'Building local capacity for conservation and
sustainable use of biodiversity in the Okavango Delta'**

**by
Jaap Arntzen**

April 2005

Table of Contents

Table of Contents

Acronyms

List of tables and Figures

1	Introduction	5
2	Biodiversity and management	6
3	The project area	8
4	Stakeholders in the Okavango delta	12
4.1	The stakeholders	12
4.2	Roles and needs of stakeholders	13
5	Levels of resource use	15
5.1	Arable farming	16
5.2	Livestock farming	16
5.3	Fisheries	18
5.4	Hunting	19
5.5	Tourism (non-hunting)	21
5.6	Collection of veld products	22
5.7	Water abstraction	23
6	Livelihoods in the delta	23
6.1	Introduction	23
6.2	The delta population	24
6.3	The 'livelihood environment'	25
6.3.1	Trends	25
6.3.2	Shocks	28
6.4	Assets and access	29
6.5	Livelihood sources and activities	29
6.5.1	National surveys-statistics	30
6.5.2	Area-specific studies	31
6.6	Coping and adaptive strategies	33
6.7	CBNRM and local livelihoods	34
6.8	Synopsis of livelihoods in and around the delta	35
7	Threats to the Okavango delta	37
7.1	Threats to the delta	37
7.2	Threats to the delta and livelihoods	39
8	A work plan for livelihoods, agriculture and biodiversity use and conservation	40
	References	47
Annex A:	Past development proposals for the delta	
Annex B:	Land use options and economic activities in Ngamiland District	
Annex C:	Livelihood sources in northern Botswana	
Annex D:	Livelihood assessment of natural resources	
Annex E:	CBNRM activities in Ngamiland District	

Acronyms

ARB	Agricultural Resources Board
BD	Biodiversity
BDSAP	Biodiversity Strategy and Action Plan
CAR	Centre for Applied Research
CBO	Community-Based Organisation
CBPP	Cattle lung disease
CKGR	Central Kalahari Game Reserve
DANIDA	Danish International Development Agency
DDC	District Development Committee
DDP	District Development Plan
DLUPU	District Land Use Planning Unit
DWA	Department of Water Affairs
DWNP	Department of Wildlife and National Parks
GEF	Global Environmental Facility
GoB	Government of Botswana
HATAB	Hotel and Tourism Association of Botswana
HIES	Household Income and Expenditure Survey
HOORC	Harry Oppenheimer Okavango Research Centre
IUCN	International Union for the Conservation of Nature
LB	land Board
MGR	Makgadikgadi Game Reserve
MWET	Ministry of Wildlife, Environment and Tourism
MMEWA	Ministry of Minerals, Energy and Water Affairs
NGO	Non-Government Organisation
NWDC	North West District Council
ODMP	Okavango Development Management Plan
OKACOM	Okavango Commission
RIDS	Rural Income Distribution Survey
SADC	Southern African Development Community
SIDA	Swedish International Development Agency
ToR	Terms of Reference
UB	university of Botswana
UNCBD	United Nations Convention on Biodiversity
UNCCD	United Nations Convention to Combat Desertification
WAB	Water Apportionment Board
WMA	Wildlife Management Areas

List of tables

<i>Table 1:</i> BDSAP objectives and actions and possible links with the GEF project	2
<i>Table 2:</i> Delta resources and their use	11
<i>Table 3:</i> Identified stakeholders in the delta.	13
<i>Table 4:</i> The roles and needs of stakeholders.	14
<i>Table 5:</i> Fish catch in and around the delta (tonnes).	19
<i>Table 6:</i> Trend in single game species quota in Ngamiland (1996-2002).	20
<i>Table 7:</i> Arrivals, departures and air passenger movements Maun airport	21
<i>Table 8:</i> Number of visitors to and revenues from Moremi Game Reserve	22
<i>Table 9:</i> Frequency of use of natural resources (for own consumption and/or sale; % of households).	23
<i>Table 10:</i> Inhabitants by settlement (1981-2001).	25
<i>Table 11:</i> Guidelines for Service Provision according to the National Settlement Strategy	27
<i>Table 12:</i> Shocks, livelihoods and adaptations	28
<i>Table 13:</i> Frequency and importance of livelihood sources	32
 <i>Figure 1:</i> Trend in cattle and goat numbers in Ngamiland (1980-2002)	 17
<i>Figure 2:</i> Calving and mortality rates in Ngamiland (1980-2002).	17

1 Introduction

This report contains the findings of livelihoods-agricultural work done for the PDF-B stage on the GEF Okavango project on '*Building local capacity for conservation and sustainable use of biodiversity in the Okavango Delta*'. The GEF project is based on the concept note by Murray-Hudson, 2003.

The aims of the overall project would be to:

1. build local capacity among resource users and regulators for the sustained use of natural resources and biodiversity of the Okavango delta;
2. Contribute towards the full integration of biodiversity concerns into local land use and development plans;
3. Develop the monitoring and evaluation capacity of local resource users; and
4. Develop the capacity of regulators to interpret the monitoring and evaluation data and to take informed decisions and action.

According to the ToR for the livelihood component, the livelihood-agriculture specialist will assess the different stakeholder groups in the Delta from the perspective of their needs and current roles in natural resource use and biodiversity conservation. The specific objectives are:

1. To determine and assess different stakeholder groups on the Okavango Delta resources (section 4 of this report);
2. To assess stakeholder needs and current roles in natural resource use and biodiversity conservation in the Delta (section 4);
3. To examine levels of resource use (both commercial and subsistence; section 5);
4. To assess the contribution of natural resource use to livelihoods (section 5 and particularly 6);
5. To discuss sustainability of current types and levels of use (section 5 and 6);
6. To identify potential threats to biodiversity conservation due to identified livelihoods activities (section 7);
7. To design a work plan for the project inventory stage, detailing scope of work at project sites (section 8).

The work would also include assistance to the External Biodiversity Advisor to determine the sustainability of the various forms of resource use in the Delta, and close liaison with the Natural Resource Economist (External) in determining levels of dependence on wetland resources

In consultation with the project coordinator (Dr.N.M.Moleele), a work plan was drawn up. Subsequently, the work was carried out during the months of January and February 2005. The literature review was carried out in Gaborone (CAR and UB libraries) and at HOORC(17-19th of February). Preliminary findings and the direction of the workplan (task 7) were discussed with the project coordinator during a visit to HOORC. During the same visit, the level of resource use was discussed with the natural resource economist (Mr.M.Murray). Discussions were also held with relevant HOORC staff, but there was no time for interviews with other local stakeholders (covered through the comprehensive consultations with stakeholders by the HOORC project staff).

2 Biodiversity and BD management¹

The final draft of the Biodiversity Strategy and Action Plan (BDSAP) develops the following vision for biodiversity management in 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.*

This Vision links the future of biodiversity in Botswana squarely with equitable sharing of biodiversity benefits and livelihood improvements. Moreover it assigns a key role in BD conservation to the agricultural sector as one of the primary users of rural biological resources.

Biodiversity is defined as '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" (UNCBD).

The Strategy has eleven strategic objectives, which are highly relevant to the GEF Okavango delta project:

- 1 Better understanding of biodiversity and ecological processes
- 2 Long-term conservation and management of Botswana's biological diversity 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

The BD Strategy identifies several actions areas to prevent loss of biodiversity:

1. Policy, legal and institutional framework protecting biodiversity and related knowledge

¹ This section is based on the final draft of the National Biodiversity Strategy and Action Plan (BDSAP) that has been submitted by Ecosurv and IUCN to the NCSA. The author of this report contributed the environmental economic and policy parts of the BDSAP report.

2. Awareness and understanding of biodiversity, ecological processes and environmental economics
3. Data collection and management framework (baseline information, reference collections and long-term monitoring) to measure sustainability
4. Research and management framework to comprehensive conserve ecosystems, species, genes and indigenous knowledge
5. Environmental assessment and enforcement procedures to limit physical threat to biodiversity
6. Issues surrounding resource access and benefit sharing
7. Availability of government and non-government funding for biodiversity conservation

The Okavango delta is a species-rich area with a species richness index of 2-5.6² (BDSAP, p.5), similar to the Central Kalahari Game Reserve (CKGR), but less than the Chobe (up to 15 species). Therefore, it is critical for Botswana to maintain species diversity of the Okavango, and the GEF should play an important role in implementing the BDSAP.

The following BDSAP actions are particularly relevant for the GEF project:

Table 1: BDSAP objectives and actions and possible links with the GEF project.

Strategic objective	Actions	Key actions for GEF project-livelihood/ agricultural components
1 Better understanding of biodiversity and ecological processes	1.National BD-inventories 2.National BD reference collections 3. BD research programme, especially BD trends 4. Better understanding of the BD impacts of socio-economic issues	1.3 and 1.4. Geared towards local users and regulators Contribution to 1.1-2.
2 Long-term conservation and management of Botswana's biological diversity and genetic resources	1. Prioritisation of conservation efforts at national and district level 2. Comprehensive Protected Area network 3-5 effective ecosystem management practices 6. Conservation of agricultural BD 7. Develop and implement methods for resource rehabilitation 8. Record and conserve indigenous knowledge	Livelihoods: 2.1, 2.3-5 and 2.8. Agriculture: 2.6 and 2.7.
3 Efficient and sustainable utilisation of all components of biodiversity in Botswana through appropriate land and resource use practices and management	1 Incorporation of BD in land use and resource planning 2. Promotion of BD compatible forms of land/ resource use 3. Increase participation and IK in land and resource management processes 4. Sustainable use and management of various resources (wood, wildlife, rangelands, wetlands (3.6), veldproducts	Livelihoods: All, especially sustainable use of wetlands (3.6.) Agriculture: Sust. use of agr. BD (3.8) and rangelands/ drylands (3.5)
4 An institutional environment, including human capacity, conducive to effective biodiversity conservation, sustainable use and management.	1. Cross-sectoral, coordinated approach to BD 2. Comprehensive BD-protective legal framework 3. Enhanced institutional BD capacity 4. Strengthening in-situ and ex situ conservation capacity 5. Funding for BD related activities	Livelihoods: 4.3 (local users and regulators), 4.5 and 6. Agriculture: 4.1, 4.5 and 6.

² Species richness can be considered as an indicator of biodiversity, but not necessarily of the ecosystem. There is need for in-depth assessment to appreciate the biodiversity of ecosystems.

	6. Economic valuation of ecosystems, resources and environmental losses	
5 Coping with environmental change and threats to biodiversity	1. Early warning mechanisms and mitigation plans for BD losses 2. Conservation strategies for BD threats 3. Study impact of GCC on BD 4. Reduce habitat destruction 5. Sust. Water use to maintain BD. 7. Reduce pollution to maintain BD; 8. Better understanding of BD threats	Livelihoods: 5.1, 5.3-5, 5.7-8 Agriculture: 5.2, 5.4-5, 5.8
6 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	1. Public awareness raising about the importance of BD 2. Use of indigenous species in public places and resource rehabilitation projects 3. Better appreciation of BD for QoL 4. Greater community participation in BD activities 5. Gender mainstreaming in BD planning	Livelihoods and agriculture: Mostly 6.4-5. Contribute towards 6.1-2.
7. Fair access to biological resources and equitable sharing of benefits arising from the use of biological resources	1. Fair access to BD resources and benefit sharing 2. Linking access and management responsibilities 3. Legal protection of IK and innovations	Livelihoods and agriculture: <i>All are critical</i>
8 Safe industrial and technological development and other services based on national biodiversity resources for future prosperity	1. Strengthen capacity to deal with biotechnology and bio safety 2. Safe use of biotechnologies 3. Raise BT and BS awareness 4. Promote bio prospecting	Livelihoods: 8.3 Agriculture: 8.1-4
9. Improved availability and access to biodiversity data and information, and promotion of exchange of information	1. Standards for BD data collection 2. Key inventories and meta data 3. Easy access to BD relevant data 4. Safeguarding BD research in Botswana	Livelihoods/ agriculture: 9.3-4, use 9.1 and contribute to 9.2
10. Recognition of Botswana's and the Southern African Region's roles with regards to Biodiversity	1. Review and sign relevant agreements etc. 2. Compliance with BD relevant conventions 3. Enhanced regional collaboration 4. BD front runner 5. Bio trade and biotechnology	Livelihoods: 10.2-3 (e.g. RAMSAR, UNCCD and ODMP). Contribute to 10.4 and possibly 10.1
11 Implementation of this Biodiversity Strategy and Action Plan	1. Establish political will 2. Ensure sufficient institutional resources 3. Streamline NBD SAP components into development planning/ processes 4. Funding for BDSAP	Livelihood: 11.1-4 at district level. Contributes towards District BDSAP.

Source: final draft of BDSAP report

The livelihood component of the GEF project will address in particular strategic objective 3 (efficient and sustainable resource use), 5 (coping with change and threats) and 7 (fair access to and equitable sharing of net resource benefits), but make contributions to most others.

For agriculture, maintenance of agricultural biodiversity (C 2, biotechnology and safety (component 8) are also essential. The GEF project would ultimately contribute to a BD plan for the Delta and thus component 11.

The BDSAP finalisation and implementation as well as the Okavango Development Management Plan (ODMP) offer valuable opportunities for the GEF Okavango delta project to ensure BD integration into land use and development planning.

3 The project area³

The Okavango delta is located in the northern Ngamiland District of Botswana.

³ This brief description is confined to the factors that are relevant to livelihoods and related resource use.

The delta is a *globally* unique ecosystem that contributes towards livelihoods of the *local* population. Consequently, the population is clustered in a band of settlements around the delta. In national terms, the delta and district are remote, as the distance to eastern Botswana where more than 80% of the Batswana live, is 500 km. and to the economic hub of Gaborone almost 1 000 km.

The area has a very low population density (less than 1 person/km²), but locally, particularly on the fringes of the delta, the population density can be high. During the peak tourism seasons (June-August and December), the population density increases, but the impacts are mostly local (e.g. around camps, in the Park and in Maun).

The population is multi-ethnic and includes Batawana, Bayei, Hambukushu, Basarwa, Bakgalagadi, Baherero, Bagcereku and several other smaller groups (Tlou, 1976 in Botswana Society (1976). Each group has its own fairly distinct livelihood strategy. For example, Bayei tend to engage in fishing while Basarwa hunt and gather. In contrast, Batawana and Baherero are 'typical' livestock farmers. Bambakushu are more involved in arable farming.

Outside the delta, the natural resource base is marginal. Soils are generally poor, rainfall is low and unreliable and no known economically significant mineral deposits exist. Given the soils and rainfall, the arable potential is considered to be marginal, with the exception of flood recession farming around the delta. Livestock production has been the major rural activity, but the sector was badly hit by the cattle lung disease in 1995, when all cattle were killed in a successful effort to control the disease.

The proposed project area follows the ODMP and RAMSAR site. Figures for the size of the RAMSAR- area differ slightly. The RAMSAR file mentions the area of 68 640 km² while the ODMP states that the current area is 61 683 km², and it will probably be reduced to 55 374 km² (i.e. a 10 to 20% reduction). The RAMSAR site covers the following land tenure categories (important for livelihood options!):

- *Purely protected areas (9%)*. These areas are controlled by DWNP, and access and resource use is strictly controlled under the Wildlife Conservation and National Parks Act. No *direct* livelihood benefits are derived from protected areas. Community zones (National Parks and Game Reserves regulations 2000) and a Park and People's Strategy offer opportunities to benefit more directly, but these tools have not yet been utilised in Botswana;
- *Wildlife management areas (40%)*. Wildlife utilisation is the primary form of land use and 'local' source of livelihoods (Wildlife Utilisation Policy 1986). Other land uses such as agriculture are permitted provided they are not in conflict with wildlife utilisation and conservation. Livestock boreholes are not permitted inside WMAs. Critical issues for livelihoods include the designation of the WMA (hunting, photo safaris and/or multipurpose), the hunting quota for WMA that determine the value of the area and its economic potential and the control of the user rights (i.e. allocated to communities or companies);
- *Communal land (51%)*. Allocation and use of communal land is controlled by the Tawana Land Board, which allocates residential plots inside settlements, arable land and livestock boreholes. Most veld products and grazing resources are inadequately managed and protected and suffer from open access.

The delta (around 16 000 km²) itself constitutes around a quarter of the RAMSAR site, and consists of permanent swamps (4 887 km²), seasonal swamps (3 855 km²), seasonal grassland (2760), intermittent flooded land (2 502 km² and dryland (1 842 km²). NRP (2001) makes the following distinction for the delta area:

- *Panhandle*: permanent water source in the Okavango river. Water levels vary greatly between and within years (up to 2 mt. NRP, 2001)
- *Permanent upper swamps*: permanent water source, but the depth and the variation in water level is much smaller than in the pan handle area;
- *Seasonal lower swamps*: these swaps are only flooded intermittently depending on the season and flood level;
- *Sandy tongue or island* stretching deep inside the delta.

Water and water-based resources dominate the delta and the livelihood opportunities that it offers. However, a considerable part of the delta is dry or only seasonally or intermittently flooded offering opportunities for land based activities, including agriculture. The largest part of the RAMSAR site is dryland, and half of that communal, making it essential that *resource conservation and improvements of livelihoods are pursued simultaneously. Resource conservation cannot be achieved without proper understanding of the livelihood strategies, constraints and opportunities for the local population.* The livelihood threats posed by the necessity to secure and improve livelihoods need to be identified and addressed in conservation and development efforts. In this respect, the proposed GEF project should support and facilitate the implementation of the BDSAP for the Okavango delta (identified as one of the few high value BD areas) as well as with the preparation of a comprehensive conservation and development plan, as required under the RAMSAR Convention.

The future resource base of the delta depends on the *water inflow* from Namibia and Angola, the *internal dynamics* within the delta that still require further analysis, *local uses* of the delta's resources and on the effects of *global environmental change*. Increased upstream water abstraction and pollution form the major threats from neighbouring countries. Local uses could alter the resource base and biodiversity due to growing commercial and subsistence use of the delta and its resources. Concerns have been expressed about the depletion of some veld products, overgrazing and land degradation and the environmental impacts of the growing number of tourists. Global climate change will lead to higher temperatures and faster evaporation, resulting in faster drying up of the swamps. The increase in CO² concentrations may alter the composition of the vegetation, and increase the woody biomass. Finally, changes in rainfall levels and variability will have an impact on the inflow, but the nature of the impact is not known at the moment (see section on threats).

Deltas are complex, fragile and many planning mistakes have been made in the past (Botswana Society, 1976). 'Near sighted planning together with the all-too-common failure to learn from the mistakes of others, ..., almost always provoke serious long-term problems (Botswana Society, 1976, p. 9). Thus, it is necessary to learn from past mistakes and to use local knowledge about the delta and failed past interventions.

Table 2 summarises some of the information about the delta's resources and their use

Table 2 Delta resources and their use

Type of resource	Variety and use	Comments
Water	Annual inflow varies between 7 to 15 000 M m ³ /a; Rainfall amount around 5 000 M m ³ /annum. Inflow originates fully from Angola (50% Cuito and 50% Cubango); Gradual shift of water towards eastern parts of the delta (DDP6). Current abstraction from the Okavango and its feeders are mostly in Namibia (irrigation); Botswana abstraction for settlements by DWA Current average use of delta water: Evaporation: 97% Human use: less than 0.0% Outflow: around 3%	Threat of abstractions from Angola and further increases in Namibian abstractions threatening the delta inflow.
Birds	Over 650 terrestrial and water bird species Two globally threatened species (Wattle Crane and Slaty Egret) Nationally conserved species: Cranes, Eagles, Egrets, Falcons, Goshawks, Harriers, Herons, Ibis, Jacanas, Kites, Sparrowhawks, Storks Vultures, Fish Owl, Hammerkop, Secretary Bird and Spoonbill	
Fish	More than 70 species Fish categories: resident species, migrant species that come and go with the floods and lateral species that are found in isolated water pockets Fish popular for: <i>Subsistence</i> : Tilapia, sharp tooth and blunt tooth cat fish <i>Commercial fishing</i> : cat fish, silver robber and dashtail Barb <i>Recreational fishing</i> : tiger fish, tilapia and tilapia	Potential sustainable yield of 5 000 (Merron) and 8 to 12 000 (NORAD, considered overestimate)
Large mammals	Delta is stronghold for antelope and wild dog. Globally threatened species (IUCN): Wild dog, African elephant, Cheetah, leopard, Nile crocodile and Brown hyena. Nationally conserved species: Hippopotamus, Puku-Puku, Roan antelope, waterbuck and Python. <i>Aquatic species</i> : crocodile, hippo, situtunga and lechwe <i>Surface water dependent species</i> : zebra, wildebeest, elephant, tsessebe, puku, busk buck, impala and buffalo <i>Less water dependent</i> : other species	Changes in water inflows and water flows within the delta affect aquatic and water dependent species.
Plants	1060 different plants 208 aquatic species 1 special orchid 195 woody species 675 herbs, grass or reeds	Problem of invasive species (salvinia) Mokola palm and dye trees in decline
Scenery	Unique landscape of swampy areas and dry areas as well as seasonally flooded ones.	Sensitive to water flows-availability

Sources: RAMSAR file, NRP, 2001, Botswana Society 1976.

4 The stakeholders in the delta and BD conservation

This section addresses task 1 and 2 of the ToR, i.e.:

- To determine and assess different stakeholder groups on the Okavango Delta resources;
- To assess stakeholder needs and current roles in natural resource use and biodiversity conservation in the Delta;

4.1 The stakeholders

There are many holders of a direct or indirect stake or interest in the delta. The main groups are categorised below:

1. *Direct users* such as the local population, CBOs, tourists and commercial companies, livestock producers and game ranchers;
2. *Indirect users* such as the international community that represents and protects the existence value of the delta;
3. Natural resource managers and regulators. These include the Government of Botswana both local and central government, and traditional authorities;
4. The international community through RAMSAR convention bureau, UNCBD, UNCCD, OKACOM and the Shared Water Resources Protocol that represent agreed or emerging international resource management commitments that the Botswana government has ratified;
5. *External direct water users* in Angola and Namibia, which directly influence the water inflow into the delta;
6. *External indirect users*, mostly in developed countries, which are primarily responsible for global climate change, that indirectly impacts on water availability and destination;
7. *Support organisations* in Botswana, southern Africa and globally. Support may cover research and better understanding of the delta's dynamics, advice and support to direct users and resource managers.

Table 3 lists the identified stakeholders of the Okavango delta. Given its objectives, the GEF needs to concentrate on resources users (local population, CBOs and commercial companies) and national and local regulators. For example, CBOs could be involved in monitoring of local wildlife resources feeding into the annual quota setting system of DWNP (this does not happen at the moment). Moreover, local knowledge about resources and the delta system could be integrated in the evaluation of development plans.

Table 3: Identified stakeholders in Botswana and abroad.

Stakeholders	Botswana	External
Direct resource users	Crop farmers (<i>molapo</i> and <i>dryland</i>) CP and livestock ranchers Fisheries Gatherers of veldproducts Hunters Tourists	Water abstractors in Namibia and Angola
Indirect users	All Batswana	Global community Countries responsible for global climate change
NR Managers	Central government ministries, especially DWNP, DoLands, Dep. of Tourism, Local Government, DWA. NWDC Tawana Land Board DDC and DLUPU	RAMSAR Convention SADC Protocol on Shared Water Courses OKACOM UN Convention to Combat Desertification UN Convention on Biodiversity
Support	NGOs ORC-UB Consulting and research institutions	Donors (UN, SIDA, DANIDA, USAID, GEF) International research institutions

It is necessary to recognise *heterogeneity* within stakeholder groups, particularly among the direct users. For example, the local direct users groups need to take into accounts the following crosscutting factors:

- *Gender*, natural resource access, use and conservation. For example, basket makers are typically women, while men are mostly involved in livestock operations. Fishing appears is more gender balanced (44% of women);
- *Ethnicity*, natural resource access, use and conservation. The cultural and ethnic diversity of the delta area is greater than elsewhere in Botswana. While ethnic diversity is often seen as a 'problem' it poses opportunities to learn relevant alternative livelihood activities and coping/adaptive strategies from each other;
- *Income*, natural resource access, use and conservation. Low-income groups tend to depend more on free natural resource use, and activities such as subsistence hunting and gathering have a low social status.
- *Age*. Most youth have lost interest in traditional agriculture, and prefer formal employment in urban areas or large villages such as Maun.

Stakeholders have different interests in parts of the delta. For example, commercial tourism companies operate primarily on State Land and land that is leased to them, either by the State or a CBO. In contrast, the local population primarily depends on communal land and WMAs or State Land where they have been granted the user rights. Support organisations have targeted the local population and CBOs because of their constraints. However, the assumption that the private sector needs support (albeit of another nature than communities) is debatable.

4.2 Roles and needs of stakeholders

An inventory has been made of the roles of stakeholders as well as their broad needs (based on the literature). The results are summarised in Table 4. The group of stakeholders is large and diverse. While the types of direct resource users are limited (local population, companies and tourists), the number and types of regulators is large, divided over central and local government, traditional authorities and international organisation that monitor compliance with international conventions.

Table 4: The roles and needs of stakeholders.

Category	Type	Roles	Needs
Direct resource users	Local population	Farming, hunting, gathering, fishing, etc.	Achieving better and secure livelihoods
	Companies	Commercial fishing, hunting, tourism and farming	Profit maximisation
	Tourists	Recreational hunting and tourism	Resources for leisure
Indirect users	All Batswana	Appreciation of Okavango delta	Conservation of the delta irrespective of direct use
	Global community	Support BD conservation of the delta	
NR Managers	<u>Local government:</u> NWDC/ DDC	District development planning, primary schools, health care, social welfare Implementation local development Land use planning and implementation Allocation of communal land and tourism concessions Management of communal land Land use planning	Training Coordination Expanded capacity
	Tawana Land Board		
	DLUPU (central and local government)		
	Village Development Committees	Village development planning; inputs into DDPs etc.	
	Traditional authorities	Sign consent forms for land allocations and tourism concessions	Capacity building and training Clarification of its current roles Meaningful integration in modern institutional structures
	CBOs-Trusts	Manages wildlife and selected other resources in designated areas	Capacity building in terms of management, organisational development, book keeping and administration Clarification of resource rights
	<u>Central government:</u> NCSA-MEWT	Design and implement nation-wide development and conservation policies Coordination of environmental policies and programmes; implementation of global conventions and international treaties Land use policy and planning; Management of State land outside Parks	Coordination of government programmes and policies Holistic delta management (a good ODMP) Implementation and coordination of CCD, CBD, RAMSAR
	Dep. of Lands-MLH DWNP-MWET	1. Setting and allocation of wildlife hunting quota; 2. Park management; 3. Wildlife conservation	
	ARB-MWET	1. Granting of harvest rights, trading and export permits for selected veldproducts, 2. Rangeland resource management through stock control and stock and conservation orders. Support for tourism development	
	Dep. of Tourism-MWET	Granting of water abstraction rights Village water supply	

	WAB-MMEWA DWA-MMEWA		
	<u>International regulators</u> such as SADC, RAMSAR, UNCBD and UNCCD	Encourage and verify compliance of delta development with the international conventions and treaties	Monitoring and evaluation mechanisms, data and reports
Support	Financial agencies-donors	National and international funding sources	Multilateral financial support (to compensate for drying up of bilateral assistance.
	Research and information	Carry out relevant short and long term research on the Okavango delta	Capability and funds to carry out relevant research Research needs from regulators Ability to integrate research findings in resource management and development (regulators)
	Extension and training	Strengthen the capacity of groups of stakeholders and that of the entire system	Linking direct users, regulators and research community
External stakeholders (direct users and regulators)	Angola and Namibia	Coordinate development and resource conservation with Botswana through OKACOM and SADC	Sharing of data and information between countries Basin-wide understanding of the key development and resource issues

5 Levels of resource use

This section addresses task 3 of the ToR, i.e. it reviews the level of resource use (commercial and subsistence).

The delta and its surroundings are used to support the livelihoods of the local population (e.g. arable and livestock farming, hunting and gathering) and for commercial purposes such as fishing and tourism. The delta's resources are further used by CBOs as a mixture of livelihood and commercial activities.

The major forms of resource use include:

- Arable farming: flood recession and drylands;
- Livestock farming (cattle and goats);
- Fishing;
- Hunting;
- Tourism;
- Gathering of veldproducts; and
- Abstraction of water.

They can be subdivided into:

- Aquatic: fisheries, certain veldproducts (e.g. reeds) and water abstraction
- Strongly surface water dependent: molapo farming and tourism; and
- Less (or regular) water dependent: hunting, livestock, veldproducts

Each activity will be briefly discussed below. The traditional agricultural sector has been in decline in the district, as evidenced by the fact that the number of agricultural holdings decreased from 10 400 in 1981 to 9 500 in 2001. The reasons for the decline are different for the arable and livestock sectors, as will be shown below.

5.1 Arable farming⁴

Although around 85% of the households are involved in arable farming, the sector is small and has a low productivity in comparison to the national average.

A total of 48 900 ha of Ngamiland District is cleared for arable farming: 75% for dryland and 25% for molapo farming (Bendsen and Meyer, 2003). In 2001, the estimated arable land was 10 200 ha, of which 7 900 ha was planted. The average field size is small (2.1ha and only 10% of the households are considered self sufficient in food (Bendsen and Meyer, 2003). The average area planted is below 2 ha per farm or less than half of the national average (4.36 ha in 2001). Less than half of the potential molapo area (7635 ha) is annually cultivated. Maize is the main crop for molapo farming; sorghum and millet for dryland farming (Bendsen and Meyer, 2003). Yields are very low, but molapo yields are roughly double that of dryland farming.

The arable land and area planted vary from year to year based on rainfall patterns but production is almost always (far) below 1 000 tonnes. There is no evidence that the sector is growing or developing; most likely the sector is declining. Arable activities are mostly found in western Ngamiland among the Bambukushi.

Molapa farming is constrained by tenure problems and by drying up of parts of the delta (western parts). While land for dryland farming is allocated and registered by the Land Board, the Land Board does not get involved in allocation of molapo land (considered to be part of the riverbed). It appears that molapo farm land remains under traditional authority of the Chiefs, and those who have once acquired land rights (even though they no longer use the land). The molapo land issue needs to be resolved as it suppresses food production around the delta.

Small irrigation schemes exist south of Shakawe totalling 137 ha (Bendsen and Meyer, 2003; Kgathi *et al*, 2004). These are the only form of commercial arable farming around the delta.

5.2 Livestock farming⁵

The traditional livestock sector has been hard hit by the cattle lung disease (CBPP; cf. Townsend and Sigwele, 1998). After the outbreak, and estimated 310 000 cattle were killed⁶. Restocking took place in 1997-2000, and the subsequent natural growth has led to a district cattle herd of around 175 000; this is less than half of the level of 1981, and well below the pre-CBPP level. In contrast, the number of goats has rapidly expanded, similar to the national trend. Figure 1 shows the trend in livestock numbers since 1980.

The trend analysis shows two large events with a profound impact on the livestock sector. Firstly, the 1980s drought led to a strong decline in cattle numbers and a similar increase in goats. This phenomenon is common during periods of drought. Secondly, the 1995 CBPP outbreak led to the eradication of the entire cattle herd. As a result, the

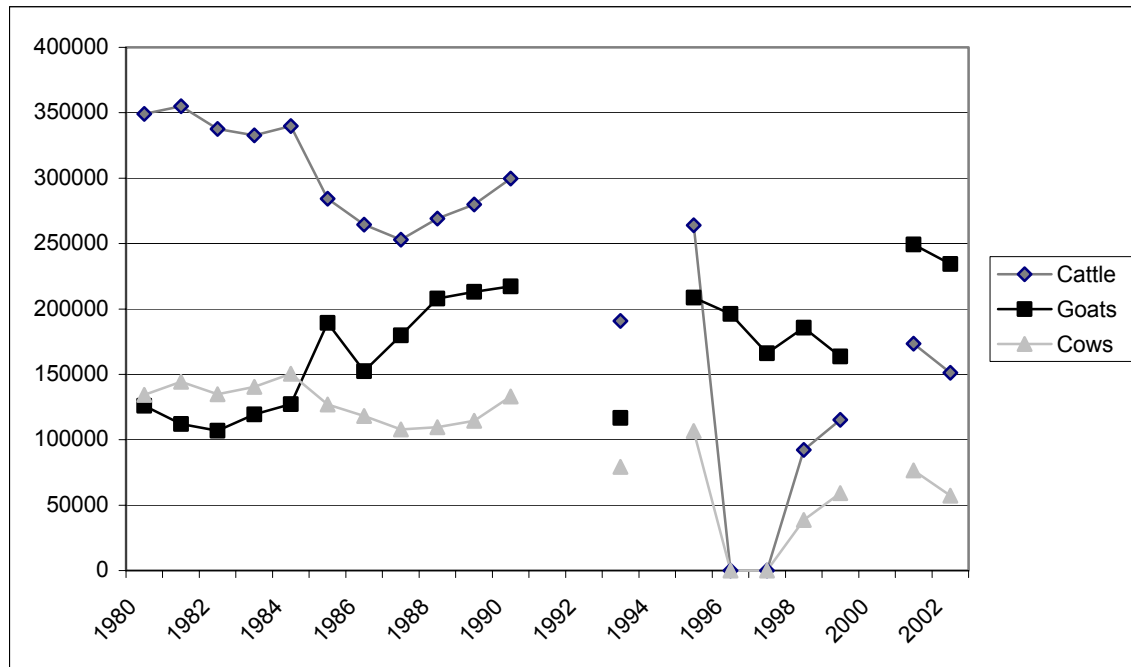
⁴ Figures from the Agricultural Statistics refer to the Ngamiland District East and West. No specific figures for the delta exist.

⁵ Figures from the Agricultural Statistics refer to Ngamiland East and West.

⁶ Source: Townsend and Sigwele (1998). This figure is much higher than the 1995 estimate (244 000) for Ngamiland and cast some doubt about the reliability of the Agricultural Statistics for Ngamiland.

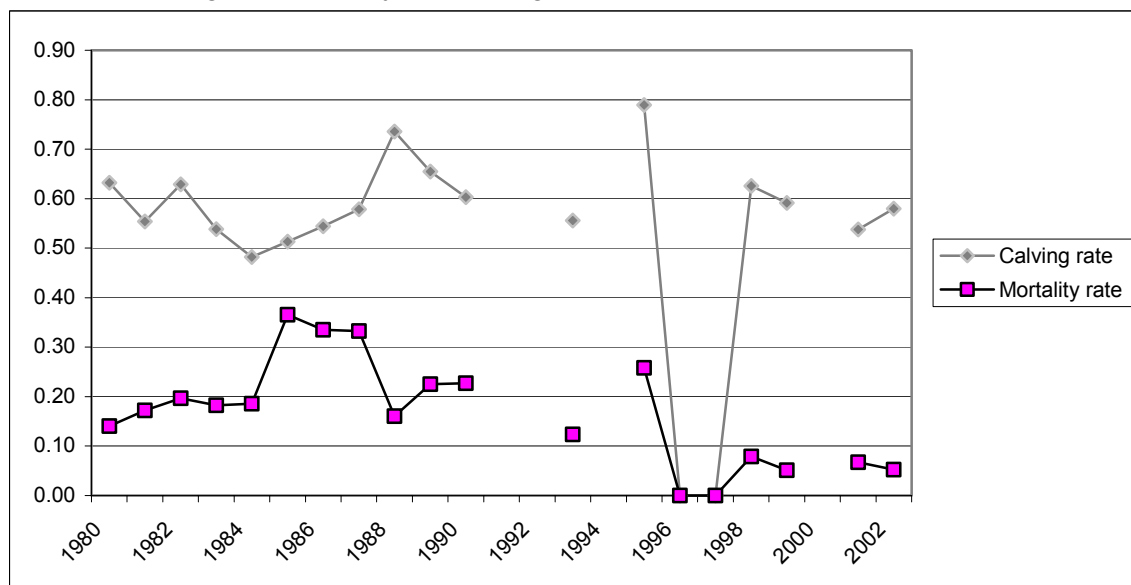
number of goats now exceeds cattle. While numbers are recovering, they are still half of the pre-CBPP period. In addition, cattle distribution has become more skewed, implying that fewer livelihoods benefit from livestock farming. Cattle ownership had declined to 29% of the households in 1999 compared to 70% before CBPP (Ndozi *et al*, quoted by Bendsen and Meyer, 2003).

Figure 1: Trend in cattle and goat numbers in Ngamiland (1980-2002)



Source: Based on Agricultural Statistics.

Figure 2: Calving and mortality rates in Ngamiland.



Note: mortality rate: death/total number of cattle; calving rate: births/cows.

Source: based on Agricultural Statistics.

Cattle distribution is critical to livelihood benefits, and therefore growing skewed ness in the cattle distribution would restrict the livelihood benefits of the sector. This issue requires further work and monitoring during the rebuilding phase.

The analysis of the herd performance shows that cattle mortality (mortality/ total herd) in Ngamiland is above average and that commercial transaction (sales and purchases/total herd) are lower. Birth rates (birth/cows) are similar to the national average. The lower sales and purchases are related to limited market access, also following closure of the Maun abattoir (with a slaughtering capacity of 20 000 cattle per annum). Calving rates have not increased in time, but mortality rates are lower in the late 1990s, presumably because of restocking with young and healthy cattle.

The livestock sector has diversified slowly, and piggeries and poultry have been reasonably successful (DDP6).

The distinction between commercial and subsistence livestock farming is blurred in Botswana. The tendency to equate ranches with commercial livestock farming and subsistence livestock farming with communal areas is misleading, as many large cattle owners operate inside communal areas. Large communal cattle owners are usually found around boreholes at considerable distances from villages, i.e. in western dry parts of the district where groundwater can be accessed. Cattle in and around the delta are likely to belong to small herds, and tend to be used for livelihood/ subsistence. The District's ranches are located in the southern parts of the district at some distance from the delta. In this sense, they are not important for the project. However, their establishment may have forced small herd owners to relocate to the delta area. This aspect needs to be incorporated in the project.

We conclude that:

1. The direct environmental threats of the livestock sector has not increased over the last twenty years, and almost certainly decreased. However, local concentrations of cattle could cause rangeland degradation;
2. The current decrease in livestock numbers is temporary, and land use conflicts between the livestock sector and wildlife are likely to recur in future after the sector has been rebuild. The key issues for this rebuilding phase include:
 - a. How will the numbers and cattle distribution recover? What will be the contribution to livelihoods?
 - b. Where will cattle be kept and how will cattle compete and conflict with tourism and arable farming?

5.3 Fisheries

Fishing is concentrated in the panhandle with permanent water. Fisheries resources are widely considered to be under-utilised (e.g. DDP6), and the sector appears under-valued. Data on catches and the number of fishers are fragmented, and there is need for regular data collection and analysis of this sector.

The number of fishermen in 1989/90 was estimated at 750 full-time (half of them around the panhandle and Jao/Jedibe area) and up to 4000 part time fisher(wo)men⁷, mostly Bayei and Bambukushu (Scudder *et al*, , p. 202). Mosepele (2001) found that in the

⁷ Mostly for home consumption.

northern part (Shakawe, Etsha and Xhahaba) 65% of the population benefits from fishing. He estimates the number of fishers at 3289, of which 44% are females. If these participation figures are correct and comparable, the level of catch is unlikely to have increased. Mosepele (2001) estimate the number of commercial fishers at 41, most of them using gillnets.

Figures about the harvest vary substantially, making it difficult to draw firm conclusions. The current harvest is estimated in the order of 1850 tonnes/annum: 900 tonnes or half for subsistence, 600 tonnes for recreational and 350 tonnes for commercial purposes). Mosepele (2001) estimates total catch at only 385 tonnes, of which 263 tonnes are for subsistence (using baskets and hooks/ lines) and 114 tonnes using gillnets (subsistence and commercial). This figure is close to the estimated catch of 400 tonnes/annum in 1976 (Botswana Society, 1976), suggesting little development in the sector. While the off-take figures differ greatly, there is agreement that *most of the total catch goes directly towards livelihood support*.

Catch data from the Fisheries Unit are summarised in Table 5. The figures are much lower than above, and show a decline from 152 tonnes in 2000/01 to 92 tonnes in 2003/04. This is too short a period to indicate a resource decline. Further research is needed into the long-term trend in fish harvest, broken down into harvest for subsistence, recreational and for commercial purposes. The results should be analysed in livelihood terms.

Table 5: Fish catch in and around the delta (tonnes).

Species	2000	2001	2002	2003
breem	87.2	85	89.8	61.1
barbel	51.6	18.2	19.1	23.7
s barbel	1.7	1.6	0.9	1
tiger fish	9.4	5.4	3.8	4.2
others	2.1	0.9	0.8	1.8
total catch	152	111.1	114.4	91.8

Source: Fisheries unit data.

Fisheries development is constrained by the small market. A government market for dry salty fish was discontinued in the early 1990s. Other reasons for the lack of development may be the lack of interest (government assistance may be more attractive) or resource decline (fewer permits). There have been allegations that the upper delta is over fished for recreational purposes, but this is unproven.

5.4 Hunting

Hunting is done for subsistence (meat), leisure and commercial purposes. Hunting quotas are indicative of the legal level of hunting⁸. The annual quotas are in principle⁹ determined by the sustainable off-take in controlled hunting areas. In 1976, the number

⁸ Compliance monitoring is difficult, particularly for leisure hunting.

⁹ This requires regular wildlife resource counts and assessments. In practice, it is often unclear what changes in hunting quotas reflect resource declines. It appears that they are primarily based on the previous year's quota.

of hunters was estimated to be 1 500 hunters, including 200 recreational hunters. The current number is not exactly known but quotas are lower, hence legal hunting has decreased.

Quota levels

For most species, quotas remained stable or have declined significantly (Table 6). However, quotas increased for a few species, i.e. baboon and elephant. The quota for lion increased until a total ban was declared in 2002. Quotas for seventeen species have declined and for eleven species the quotas remained fairly stable. The overall number of quotas (not the subsistence or commercial value!) decreased from 16 235 in 1996 to 4 802 in 2002: a decrease of over 70%! In comparison, in 1976 quotas for the hunting of 8 000 animals were issued (Botswana Society, 1976).

Table 6 shows the trend in single game licenses for Ngamiland for the period 1996-2002.

Table 6: Trend in single game species quota in Ngamiland (1996-2002).

Species	1996	1997	1998	1999	2000	2001	2002
Baboon	130	130	190	270	280	280	255
buffalo	175	144	146	116	140	140	133
bushbuck	0	0	0	0	0	0	0
caracal	0	0	0	0	0	0	0
wild cat	10	40	55	50	55	55	55
crocodile	13	13	15	13	16	16	17
duiker	2495	2490	2185	1130	1195	1095	275
eland	34	34	34	26	29	29	20
Elephant	59	63	126	120	126	120	153
Fox bat	0	0	0	0	0	6	0
fox silver	0	0	0	0	0	0	0
gemsbok	112	112	117	74	75	75	45
Hare, cape	10	100	110	100	110	110	110
Hare, scrub	10	100	110	100	110	110	110
Hartebeest	130	130	130	55	55	45	25
Hyena, spotted	120	125	135	270	280	280	59
Impala	2265	2232	2402	1093	1176	1176	866
Jackal, side striped	45	50	55	50	55	55	34
Jackal, side striped	102	120	22	20	22	22	16
Kudu	1040	935	1160	710	725	725	350
Lecher	3465	3395	3415	849	919	879	460
Leopard	64	58	62	65	73	73	36
Lion	13	11	13	14	31	31	0
Monkey, vervet	45	50	55	50	55	55	55
Ostrich	196	192	188	168	167	147	116
Pig, wild	0	0	0	0	0	0	0
Porcupine	5	50	55	50	55	55	50
Reedbuck	176	175	174	144	147	147	0
Sable	16	14	16	14	17	17	0
Stating	12	9	9	9	10	10	0

Springbok	100	100	100	75	85	85	72
Steenbok	3315	3195	3465	1500	1540	1540	640
Sessile	773	772	773	472	487	487	389
Warthog	1078	1077	1093	662	683	683	227
Wildebeest, blue	129	138	154	138	160	160	138
Zebra	98	93	98	95	108	108	96
Total quota	16235	16147	16662	8502	8986	8816	4802

Source: DWNP files.

Quota distribution

Quotas are allocated to communities, hunting companies/concession holders and individual citizens. In 2002, 26.5% of the quota went to communities, 52.2% to concession holders (private operators) and 21.3% to citizen hunters. The share of the communities has declined from 31.5% in 1996, mostly in favour of concession holders (41.9% in 1996).

As a result, the economic benefits from hunting, either meat for subsistence or revenues from sub-leasing to hunting companies, have declined. It must be noted however that the share in overall quotas may be misleading, as it is more important to have access to valuable species (for commercial and subsistence use). Communities have quotas for valuable species such as elephants, buffalo, leopard and crocodiles and for a variety of antelopes, especially gemsbok, eland and hartebeest. Concession holders have quota for the same valuable species, but their antelope quotas relate to zebra, wildebeest and tsessebe. Over a fifth of the quotas are raffled off to citizen hunters at low charges.

In view of the overall decline in quotas, consideration should be given to phasing out citizen-hunting licenses, and redistributing the 'freed' licenses to communities and concession holders. This would boost rural development.

5.5 Tourism (non-hunting)

The tourism sector has rapidly grown in terms of tourism numbers, facilities and economic importance. According to the DDP6 (p 17), around 50% of the district's workforce is formally or informally employed by the tourism sector. The statement does not specify whether this is seasonal or full time employment, but clearly tourism is highly significant to the district's economy.

Number of tourists

The number of tourists has grown dramatically during the last three decades. The Botswana Society (1976) estimated the number of tourists at 2 000 in 1976. Numbers have now increased to at least 40 000. Mbaiwa (2002) estimates the number of tourists at 50 000.

The growth of the tourism sector is illustrated by the growth in arrivals/ departures from Maun airport and tourism movements. Air passenger movements have increased by over 60% since 1993 (Table 7).

Table 7: Arrivals, departures and air passenger movements Maun airport

	Arrivals	Departures	Air passenger movements
1986	5739	7807	

1993	8854	11670	86284
2002	17960	15720	143077

Source; Tourism statistics.

The number of visitors to Moremi Game Reserve grew rapidly to over 40 000 in the 1980s but dipped and subsequently stabilised since 1995. This trend could reflect the vulnerability of tourism to international conditions such as the political situation in Zimbabwe that kept international tourists temporarily away from the region.

Fowkes (1985) states that 8136 visitors went to the Moremi Game Reserve in 1985, but the number had increased more than quadrupled by the late 1990s (see table 8). Revenues increased from P 2.4 million to P 8.1 million in the period 1995-2002 mostly due to the increased entrance fees.

Table 8: No of visitors to and revenues from Moremi Game Reserve

	No. of visitors	Revenues
1995	36074	2448316
1996	38204	2945307
1997	42987	4182848
1998	49556	4373462
1999	46707	4175048
2000	30835	6591044
2001	31073	6341865
2002	39734	8088936

Source: DWNP files.

Tourism facilities

Tourism facilities have also greatly expanded. In 1985, 17 tourism facilities were listed for the Okavango area. In 1993 there were 38 camps, hotels and lodges and in 2004 HATAB records 64 Maun-based tourism operations among its members. During the 1990s, a rapid increase occurred in the number of CBOs, virtually all of which have a tourism component. Currently, Ngamiland has 28 CBOs in which 20% of the district's population is involved. These figures clearly show that tourism number and facilities have greatly expanded despite the low volume high cost tourism strategy. The environmental impacts of tourism are expected to have grown, particularly in areas without adequate resource management control.

Tourism market

The delta and its resources are the primary tourist attraction; hence tourism will visit the delta provided:

- The delta remains unspoilt and attractive;
- Political stability and good governance prevail;
- Consumer preferences do not change, i.e. tourists remain interested.

As observed above, tourism is vulnerable to international trends and turmoil.

Access to the delta has improved considerably with tarred road up to and around most of the delta, and regular air links with Johannesburg and other major tourist destinations (Cape Town, Kasane and Windhoek).

5.6 Veldproducts collection

Two thirds of the local population uses veldproducts for their own consumption or for sale (ARD, 2001). A wide range of veldproducts is commonly used for food, medicine, building material, fuelwood and as inputs for local industries such as the basket weaving industry. Due to the richness in biodiversity, the local population has a wider range of veldproducts available than in most other parts of Botswana (e.g. reeds, papyrus, tswii).

Data on veldproducts are fragmented and incomplete. It is therefore impossible to assess the level and trend in the use of veldproducts.

The ARD survey of twenty delta settlements shows widespread use of veld products, but does not provide data on the level of use. The use of grass, river reed and the mokola palm is most common (Table 9). Fish is widely used in Maun and the panhandle; wild fruits are commonly used but less frequent in the panhandle.

Table 9: Frequency of use of natural resources (for own consumption and/or sale; % of households).

Resource	Maun	Range in other villages around the delta
Birds	0.9	1.2 (Shorobe) -11.5% (Gudigwa)
Papyrus	9.8	1.9 (Ngarange) -61.1 (Xaxaba)
Wild fruits	36.8	3.3 (Sepopo) -61.1 (Khwai)
River reeds	61.3	48.4 -96 (Ditshiping)
Wildlife	1.2	1.2 (Maun) - 38.7% (Seronga)
Fish	60.2	13.8(Motopi) - Jao (99.4%)
Palm tree	58.0	27.8 (Gudigwa) - 87% (Etsha 6)
Grass	62.3	58.0 (Xakao) - 100 (e.g. Khwai)

Source: adapted from ARD, 2001, p.44.

It can be argued that population growth increases the use of veldproducts and reduces their availability through land clearing, but several other factors are expected to have slowed down the growth in use. The population increase and clustering, other factors being equal, increases the pressure on the veldproducts such as mokola palm around settlements (Terry, 1986 and 1999). Where resources have become scarce, collectors have to travel large distances, settle for poorer quality veldproducts or purchase the products at higher prices. Rising incomes, the cultural stigma of veldproducts as poor man's food and significant government transfer are expected to have eased pressure on veld products. Therefore, it is not expected that most veldproducts be under threat of depletion. In the literature, concerns are only raised with respect to the mokola palm and trees used for the dye of palms.

5.7 Water abstraction

Water is abstracted for village supplies, irrigation (137 ha) and for individual riparian households. Most riparian households use river water for their livelihood needs. In addition, DWA abstracts a total of 2.7 M m³ for water supplies of villages (ODMP, 2004). The water abstractions for the irrigation schemes are unknown. Therefore, total

abstractions, including those of households are not known, but they are considered very small.

6 Livelihoods in the delta

6.1 Introduction

The concept of livelihoods need to be defined and understood before the contribution of natural resources to livelihoods can be assessed. This is done in this introductory section. The analysis is based on Chamber's early work, that of Ellis (2000) and the sustainable livelihood approach of DFID (DIFD, 1999 and Carney, 2003).

According to Ellis (2000, 10) livelihoods 'comprises the assets (financial, natural, physical, human and social), activities and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household'. In other words, livelihood strategies concern:

- The operational environment, in which livelihoods have to be made;
- Assets and access to assets, needed to engage in livelihood activities;
- Livelihood activities, divided into natural resource based and non-natural resource based activities.

The *objective* of livelihood strategies is to improve the well being of the household or individual. According to DFID's handbook on sustainable livelihoods (1999), in most traditional studies, several livelihood aspects are undervalued such as the role of seasonality, gender biases, importance and role of local knowledge and non-conventional products, such as veld products (DFID, 1999). Sub-sets of the livelihood strategy include:

1. Coping strategies, i.e. the ability to respond to unexpected, sudden, changes or shocks;
2. Adaptive strategies, i.e. the ability to adjust to long-term changes and trends);
3. Seasonal strategies, i.e. the ability to adjust livelihoods to seasonal variations in natural resources and livelihood opportunities.

Diversity and *security/vulnerability* are central elements in livelihood strategies. Rural livelihood diversification is the 'process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standards of living' (Ellis, 2000, p.15). Diversification is often employed to reduce vulnerability, particularly in semi-arid areas. Livelihood security is achieved if households or individuals are able to sustain their well-being and improvements therein. Security and vulnerability are opposites.

Below, we discuss the key component of livelihood strategies, i.e. the operational environment, assets and access and livelihood activities.

6.2 The delta population

In 2001, the population of Ngamiland was 122 024, and an estimated 90 000 lived in and around the delta. The population has more than doubled since 1976 (district population: 53 870 and delta around 40 000).

The population has steadily grown since 1981, but growth has been concentrated in Maun. The growth of Maun accounted for over half of the district's population growth (table 10). Several large villages have also grown such as Gumare and Shakawe (over 7 000). Sehitwa is the only other village with more than 5000 inhabitants, but its population has declined since 1991 due to the drying up of Lake Ngami.

Unless the majority of 'new people' have found employment in the formal sector, the growth in population will have increased the pressure on the local natural resources.

Table 10: Inhabitants by settlement (1981-2001).

	1981	1991	2001
Ngamiland East			
Maun		34324	49822
Sehitwa		6329	5290
Matlapana		974	1169
Tsao		2872	2767
Shorobe		3449	3333
Toteng		2588	3391
Jao		497	
Others		6778	6610
Ngamiland West			
Gumare	2987	5682	7478
Shakawe		6635	7874
Nokaneng		3090	3075
Etsha		4867	7588
Sepopa	1241	2368	2308
Seronga		2730	3043
Mohembo		1534	2306
Ngarange		1292	1987
Nxamasere		915	
Beetsha			2832
Xakao			1777
Kauxwhi			1631
Others		7610	
Ngamiland District			
	68063	94534	122024

Sources: population census 1981,1991,2001

6.3 The 'livelihood environment'

Trends and shocks are the key components of the livelihood environment. Each is discussed below.

6.3.1 Trends

The following trends have occurred over the last decades:

Growth in formal employment in tourism and government sectors

According to DDP6 (p. 17), around half the workforce is formally or informally employed in the tourism industry, but no specific figure is given. Assuming a labour force of around 30 000, the figure would be over 15 000 (cf. agriculture employs 3 373 people). At least 30% of the households could be formally or informally employed by the tourism sector.

The 2001 Population Census recorded 25 027 employed persons in the district, most of them as employees (around 80%). The detailed breakdown in employment is as follows (DDP6, p. 13):

- | | |
|----------------------------------|---------|
| • employees: | 19 165; |
| • self employed: | 2 891; |
| • unpaid family helper: | 451; |
| • work on own land or cattlepost | 1 507; |
| • not known: | 8. |

Self-employment and agricultural employment are low; the latter is due to the agricultural decline in the district and the aftermath of the CBPP outbreak that reduced agricultural employment. Employment inside the delta amounted to 1 322 jobs.

Improved infrastructure

The infrastructure linking the district with the rest of Botswana and southern Africa has improved dramatically. However, inside the district and delta many areas remain difficult to access. Most main roads have been tarred or gravelled. Maun airport has been upgraded, and has direct links with Johannesburg and Cape Town. Therefore the district has good access to the international tourist market.

Private sector investment in tourism has increased, and consequently the tourism capacity has grown.

Human capital

Investments in education have led to improved literacy and skills levels of the local population. In addition, expertise in tourism has grown due to private sector training as well as the growth in CBOs.

Social capital

Social capital has changed in time. It has expanded through the formation of community-based organisations, including community trusts and farmers associations, and growing linkages between government, civil society and the private sector. Social capital has contracted through the decrease in traditional practices and mechanisms such as the extended family system, the decline in traditional authority and welfare sharing and self help mechanisms.

Erosion of traditional authority and institutions

Most resource management and development authority has been transferred to the District Council and the Land Board. Chiefs play locally an important role, but their

formal power has diminished. As in other parts of the country, 'modern' institutions have been successful in resource allocation, but less successful in resource *management*. Consequently, resources in communal areas are exposed to open access.

Tsetse-free area and fencing

Spraying campaigns have been mounted to reduce the size of the tsetse-infected area, but it is not clear how much land is now tsetse free, and open to livestock. The buffalo fence has contained livestock expansion, but conflicts between livestock and wildlife are expected to intensify around villages and water sources in the absence of effective land use and development planning.

Government dependency

Government employment and transfers have become major livelihood sources throughout Botswana. Because of the compensation scheme for the killed livestock, extra drought relief efforts and the restocking exercise, transfers are expected to be more important in Ngamiland and the delta.

Control of settlements pattern

According to the NSP, the district has one primary centre (Maun), no secondary centre, one tertiary centre 1 (Gumare), eleven tertiary centres 2 (1 000 to 4 999 inhabitants) and 3 each (500-999 inhabitants) and seventeen tertiary centres 4 (250-499 inhabitants). The associated level of public services is summarised in Table 11. It must be noted that in reality settlements may have more services if they serve a large hinterland.

Table 11: Guidelines for Service Provision according to the National Settlement Strategy

Infrastructure	Primary Centre Pop. 20 000+	Secondary Centre Pop. 10 000-19 999	Tertiary I Pop. 5 000-9 999	Tertiary II Pop. 1000-4 999	Tertiary III Pop. 500- 999	Tertiary IV Pop. 250-499
Health	National Referral Hospital District Hospital	Primary Hospital (Mainly Villages and remote areas depending on area's needs)	Clinic with maternity	Clinic without maternity	Health Post	Health Post
Education	Post Secondary Institutions	Senior Secondary School	Community Junior Secondary School	Primary School (radius 5 km)	Primary School (radius 5 km)	Primary School (radius 5 km)
Water	WUC supply for town DWA for villages	DWA supply in villages Council water supply in other villages	Council water supply	Council water supply	Council water supply	Council water supply
Power	Full service	Full service	Full service	Full service	Service where technically and economically feasible	Service where technically and economically feasible
Telecommunication	Full service				Public telephone where technically and economically	Public telephone where technically and economically

Road	Primary	Primary	Secondary	Secondary (villages with a population of .> 2000	feasible Tertiary	feasible Tertiary
------	---------	---------	-----------	--	----------------------	----------------------

Source: Adapted from NRP, 2001

6.3.2 Shocks

The delta is ecologically and socio-economically sensitive, and has been exposed to major shocks in the distant and recent past. Hydrogeological changes and droughts are inherent to the delta, and have major consequences for the water inflow and distribution within the delta. Several rivers such as the Gomoti River have dried up in the past (Bernard *et al*, n.d) and the eastern side of the delta has become wetter at the expense of the western part, including Lake Ngami. Changes in water amounts and distribution have profound impacts on livelihoods.

The outbreak of the cattle lung disease has, however, been the one of the largest shock in the 1990s. The eradication of cattle meant that one of the livelihood pillars suddenly disappeared. Switching to arable farming and dependency on government transfers were the major coping strategies. Most farmers went for 100% cash compensation (Ndozi *et al*, 1999), and used the cash for consumption. Consequently, the CBPP outbreak led to a great loss of household assets that has not been made up to-date.

HIV/AIDS has been another major shock that has had severe impacts on livelihoods and productive activities such as agriculture. As other parts of Botswana, the Okavango delta has been hit by the HIV/AIDS pandemic. According to DDP6, HIV prevalence 13.9% (17 381 persons). This has diverted government revenues from other development projects, and has become a serious constraint for people's livelihoods, as the labour productivity decreases and cash health expenditures increase.

The major recent shocks, their livelihood implications and the coping strategies that have been employed are summarised in table 12. Households have not been able to cope with the livestock losses, and are more vulnerable as a result. Households that are experiencing drying up of the delta are trying to cope through migration and livelihood diversification.

Table 12: Shocks, livelihoods implications and documented coping strategies

Shock	Livelihood implications	Coping strategies used
Recurrent droughts	Reduced security Gives advantage to non-drought dependent livelihood sources	Diversification of livelihood sources, especially formal employment
HIV/AIDS	Decrease in productive resources Increase in health expenditures	Changes in household expenditure patterns Government assistance
Hydro geological changes- dessication of the western part of the delta	Reduced water-dependent and aquatic livelihood opportunities	Migration Switch towards less surface water dependent activities such as dryland and livestock farming
Cattle lung disease 1995 and subsequent destruction of all cattle (1995) followed by restocking in 1996-2000	Destruction of livestock sector as a source of livelihood and asset base Household asset destruction (compensation at half of the animals'	Greater dependency on arable farming and government transfers.

	economic value to households) Temporary boom in consumption expenditures- little saving and asset storage Reduced use options and benefits	
Closure of Maun abattoir 1996 (slaughtering capacity of 20 000 animals per annum)	A decrease in local selling opportunities Increased marketing costs for BMC-F town	Increased cattle sales to local butchers Sale to Ftown abattoir with higher transport costs.
Buffalo fence (southern and northern) and CBPP fences	Limits mobility and flexibility of animals and persons Reduced risk of wildlife-livestock conflicts	Finding alternative areas for cut-of livelihood sources Replacement of livelihood sources where no alternative sites were found
Damage to crops by livestock and livestock predation by game	Income and livelihood losses	Seeking compensation
Political instability in region- down turn tourism market (e.g. Moremi Game Reserve visitors in the late 1990s)	Reduced wildlife and tourism income and employment	Households cannot easily cope Enhanced marketing from government

Sources: Botswana Society, 1976, Townsend and Sigwele, 1998, SMEC, 1991.

6.4 Assets and access

Livelihood assets are the source of capital of an individual, household or region, as the right combination of assets generates income or contributes in kind to livelihoods. Changes in assets and access to assets therefore directly impact upon livelihoods.

The principal types of assets are financial, environmental, human, physical and social (Ellis, 2000). Individuals, households and a region have the potential to improve their well-being if they acquire more assets or they use the assets more productively. Improving access to assets by households and individuals can also improve livelihoods.

Asset growth has taken place through:

- Education and training;
- Subsidies and credit facilitating financial capital. The use of cash compensation for cattle killed (see later) implies that the financial assets of households have not risen, as it could have. FAP support for fisheries has boosted the fisheries sector in the early 1990s.
- Infrastructure (roads, communication, etc.);
- Awarding of resource rights to individuals and communities;
- Social assets through the establishment of community institutions and growth of civil society.

The delta's environmental assets are highly variable, as they are closely associated with the water inflows and rainfall patterns. There have been changes in the amount of environmental assets, their location and their quality.

Access to environmental assets, particularly wildlife, has dramatically changed with the establishment of community wildlife hunting quota and tourism concessions. While communities do not become owner, they obtain exclusive access through user rights. In some cases, communities were also given tourism lodges (e.g. Santawani Lodge and Tsaro Lodge) after the LB-lease with the commercial occupant expired. This offers direct

livelihood opportunities for communities (provided they can bring together the right mixture of assets to ensure production).

Several other factors modify access to assets. These include resource tenure and planning, fencing, and socio-cultural attitudes and practices.

Resource conflicts have been reported for example in areas where concession holders have denied communities access to veldproducts and fish for subsistence purposes. Lack of adequate tenure system for molapo farming has curtailed the sector's development as well as livelihood opportunities of those who sought to use un-used molapo land.

6.5 Livelihood sources and activities

This section addresses task 4 of the ToR, i.e. assess the contribution of natural resource use to livelihoods. The findings are based on national surveys and statistics as well as area-specific studies. Natural resources can contribute to livelihoods in three ways:

- Use of natural resources for household production and consumption (subsistence);
- Sale of natural resources collected by household members; and
- Employment of household members in a natural resource-based activity (e.g. basket weaving and farm labour).

6.5.1 National surveys-statistics

Most livelihood strategies are driven by the desire to eradicate poverty and improve well-being. Past surveys (1974 RIDS and HIES 1984/85 and 1993/94) found that poverty levels in remote areas are higher than in urban areas. If this finding still holds today, the implications are that:

- The occurrence and intensity of poverty is higher than in eastern Botswana;
- Within the delta, poverty in Maun and the larger settlements is less than in the small, remote settlements;
- Natural resource use is most important for the livelihoods of the poor and marginalised groups. Income growth usually leads to a decline in gathering and subsistence wildlife utilisation.

BIDPA (2001) carried out a *nation-wide survey* for the 2001 Review of the Rural Development Policy. The survey showed that households used a wide range of resource-based and non-resource based sources of livelihoods. Nation-wide, employment, transfers and agriculture (both arable and livestock) are the most important livelihood sources. The northern region, which includes the delta, showed a slightly different picture. Firstly, employment is less important possibly due to its remoteness (transfers and agriculture are equally important). Secondly, non-agricultural natural resources only make a small contribution to livelihoods, but considerably more (less than 5%) than nationally (less than 1%). This reflects the relatively high biodiversity value of the area as well as limited employment opportunities.

The above has several implications for the GEF project:

1. Natural resource use needs to be analysed and compared with non-NR based activities. This sentiment is supported by Terry's 1988 study on basket weaving. She concluded that basket weaving is economically less attractive than beer brewing, agriculture and drought relief, and therefore the sector is inherently unstable and a marginal livelihood activity. The estimated gross margins (Pula/day) were as follows: beer brewing: P 9.68; agriculture: P 9.50; drought relief: P 4.50; basket making: P 2.57 (Etsha)- P3.24 (Danegu). Since formal employment and government support programmes have expanded since the 1980s, *non-natural resource activities are expected to have increased in livelihood importance*. This has led to a decline in pressure on non-agricultural natural resources, but this may change in future;
2. *Arable and livestock farming are central to livelihood strategies, and both activities need to be fully incorporated in the project design*. Possibilities include the strengthening of molapo farming, growing non-conventional crops, including the mokola palm, and rebuilding a sustainable, efficient and equitable livestock sector;
3. Due to the availability of alternatives, the development potential of local natural resources may be under-utilised. There is need to assess the productive potential of local natural resources that are sustainable and can compete with non-natural resource based activities.

The BIDPA-survey also investigated factors that weaken rural livelihoods. In *northern* Botswana, migration, unemployment and HIV/AIDS were listed as the primary factors affecting livelihoods; respondents listed environmental degradation and government as secondary factors.

6.5.2 Area-specific studies

Several livelihood studies have been undertaken specifically for the delta, the major ones being ARD (2001) and Kgathi *et al* (2004). In addition, several studies have assessed the livelihood impacts of the 1995 cattle eradication campaign and the subsequent restocking campaign (1996-2000).

A livelihood and resource use survey in 20 delta villages (ARD, 2001) showed that most household incomes are very low and poverty is common. ARD (2001) estimated the following income distribution for villages around the delta (excl. Maun). Almost half of the households (47.8%) have a monthly income of less than P 500. almost a third (32.8%) and only 20.3% earn more than P1 500.

The ARD survey further examined the household use of natural resources. Two-thirds of the households in and around the delta use a variety of natural resources (ARD, 2001). Most of the use is for own household consumption but some resources are sold (e.g. basket material, grass, reeds), but the contribution of natural resources to livelihoods was not assessed.

This has been done by Kgathi *et al*. (2004) who conducted a survey in five villages around the delta (Gudigwa, Etsha 6, Sehitwa, Seronga and Shorobe). They found that government assistance and agriculture are the most common sources of livelihoods (Table 13). No percentage is mentioned for formal employment, possibly reflecting the

scarcity of formal jobs. Interestingly 30% reported to benefit from CBNRM projects¹⁰. Ranked in terms of importance, formal employment and arable farming are the most important primary sources of livelihoods. Arable farming is most important as it benefits more households as secondary or tertiary source of livelihood. Livestock farming and government assistance (both transfers and productive subsidies) are the next important sources of income. Other sources of livelihoods are important supplements (e.g. drought relief, baskets), beer brewing and remittances) but few households can survive on those. The bulk of the income tends to come from non-natural resources (74%). Only 26% of the income was directly linked to local natural resources. These results are consistent with the BIDPA findings.

Table 13: Frequency and importance of livelihood sources

	Frequency of involvement (% of hh)	Av. monthly income (P)	Most important source (% of hh)	Second most important source (% of hh)	Third most important source (% of hh)
Natural resource-based					
Arable farming	64	38	23.3	17.1	7.0
Livestock farming	63		9.3	8.5	5.4
Basket making	46	83	1.6	7.0	4.7
Non-natural resource based					
Formal employment		1482	20.9	7.0	0.8
Government assistance	66%	264	9.3	10.9	9.8
Drought relief projects	19		4.7	1.6	3.9
Beer brewing	3??		3.9	10.1	5.2
Remittances	23		7.0	3.1	4.1
Others:		1107.36	11.6	5.4	7.8

Note: 1. fishing falls under other livelihood sources. 2. There is substantial variation in monthly income by source. Therefore averages are at best indicative. Hh = household.

Source: Kgathi *et al*, 2004.

No study has systematically analysed the income generated from natural resources. The following figures may give an indication about the livelihood importance of natural resources (Kgathi *et al*, forthcoming):

¹⁰ Some households want their special game licenses (SGL) back as they perceive the livelihoods benefits from CBNRM to be less than those of the SGL.

- Selling of river reeds and grass generates P 1595 and P 1992 per household per annum. This seems fairly high, but is realised in the panhandle;
- In 2000 and 2001, BCC and Botswana Craft bought for around P 700 000 of baskets. If one assumes that there are around 2 000 basket weavers, the average income from basket sales would be around p 350/weaver/annum.

There is need to systematically collect income data from natural resources, and to compare the returns with other activities.

We therefore conclude from the area-specific livelihood surveys that:

- Households use a large number of livelihood sources (over nine);
- Arable farming and transfers are the most important sources of livelihoods
- Natural resources contribute to livelihoods of around two-thirds of the population; but
- The contribution of natural resources other than agricultural ones is small;
- Substantial variation in livelihood strategies and sources exist around the delta depending on the available local resources and cultural background;
- Formal employment is considered to be a low-risk high-return activity but jobs are limited. Tourism could become the critical employment generator;
- Many households have become dependent on government.

Groups with distinct livelihood strategies

The following factors must be considered to identify groups with distinct livelihood strategies: ethnicity, location (riparian or not), gender and income. These factors need to be considered in the selection of field sites and groups.

6.6 Coping and adaptive strategies

The variation in livelihood sources and their importance shows that households adapt well to the opportunities offered by local natural resources. In the panhandle, aquatic-based activities such as fishing are important. In flood plains, molapo farming is important and offers higher return than dryland farming. Regarding veldproducts, people exploit the opportunities of local natural resources (e.g. reeds, hyacinth and mokola palm).

An example of a coping and adaptation strategy is briefly discussed below.

Coping with cattle eradication

The eradication of cattle in Ngamiland has had a profound negative impact on livelihoods. Government assisted the cattle farmers through compensation for the loss and extra support measures. The affected farmers had several options for compensation. Most (58%) opted for 100% cash compensation, while 24% and 13% opted for 0 and 30% cash compensation respectively (3.5% did not remember; Kgathi *et al.*, 2004). In addition, government made extra transfers available (e.g. drought relief projects) as well as donkeys for draughtpower. Despite the assistance, livelihoods were negatively affected and became less secure. Firstly, the user benefits of cattle exceeded the compensation. Townsend and Sigwele (1998) estimated the average use value of an

animal more than double the compensation paid (Pula 1160 and P 500)¹¹. Secondly, the cash boom that resulted from compensation payment was mostly spent on household consumer goods; only 19% put the money in a savings account (Kgathi *et al*, 2004). Consequently, household assets were negatively affected, and future livelihood sources reduced. Research is needed into the reasons why most affected farmers decided to spend the money instead of reserving it for future benefits. Thirdly, arable farming was affected as animal draught power diminished. The adverse impact may have been reduced by the donkey scheme of government.

Affected households coped with the shock by switching their livelihood sources towards (in order of importance) arable farming and government transfer. These coping strategies have been inadequate as households became more vulnerable due to the:

- Risky nature of arable farming;
- Increased government dependency;
- Lost household assets;
- Inability of many affected households to rebuild their herds.

Adapting to drying up of floodplains and lakes

The drying up process is generally attributed to natural factors, but human factors may also play a role (Bernard, not dated). The drying up of floodplains deprives households from aquatic and water-dependent livelihood sources such as fishing, molapo farming and the collection of 'wet' veldproducts.

Households use several adaptive strategies to adjust to the new circumstances:

- Migration to Maun and other large settlements or wet areas (e.g. away from Sehitwa);
- Switch towards livestock and dryland farming.

No research evaluates the adequacy of these strategies, and this could be a meaningful task for the GEF project.

6.7 CBNRM and local livelihoods

The CBNRM approach is important for the GEF project as it offers new livelihood opportunities through improved access to environmental assets, i.e. wildlife, and it involves the direct resource users.

Ngamiland district has the largest number of CBNRM projects (21) in Botswana, reflecting the resource richness, particularly wildlife, of the delta. CBNRM projects aim to:

- Contribute to livelihood improvements of villages and individual households by generating more local benefits; and
- Resource conservation through the establishment of effective local resource management systems.

In terms of the livelihood analysis framework, CBNRM has the potential to make at least four types of contributions:

¹¹ Livestock owners received compensation of P 500 per animal (irrespective of breed, quality, age sex), i.e. the average purchase price at Maun Abattoir at that time.

- Generation of income, employment and other material benefits to communities, households and individuals;
- Access to wildlife resources and other CBNRM resources. At the moment, CBNRM refers mostly to wildlife and tourism user rights. The draft CBNRM policy proposes to extend user rights to fish resources and veldproducts. Communities do not have land or water rights;
- New community-based natural resource management to replace 'open access' to grazing and veldproducts and to moderate government-led wildlife management system. This should contribute towards more sustainable resource use and maintenance of biodiversity; and
- Building of social and human capital.

The increased net resource is expected to curb illegal resource use, lead to greater resource appreciation, and encourage the community to actively manage natural resources.

Despite the significant livelihood potential of CBNRM, the actual livelihood benefits have been limited to-date. Particularly, the material benefits have been restricted and few filter down to individual households. Several Trusts have invested in productive assets (e.g. new project, buildings, vehicles). Board members and those who are employed by the Trusts or joint venture partners, benefit most in material terms.

It must be noted, however, that the generation of material benefits varies greatly among CBOs (Mvimi, 2000; Arntzen *et al*, 2003). The level of benefits is related to the following factors: 1. resource endowments, especially for wildlife; 2. age of the CBO and governance: older CBOs are generally better established and generate higher incomes; 3. Community-private sector partnerships have higher revenues due to complementarity of skills; 4. participation of community members. CBOs with genuine participation tend to realise higher benefits. The decline in hunting quota has led to a decrease in revenues of most CBOs in Ngamiland.

Many CBNRM projects have generated significant non-material benefits to communities and individuals, such as higher status of CBO members in the community, establishment of village based institution, local empowerment, pride and self confidence, reduced dependency on government, learning opportunities from the private sector through joint ventures and discouraging migration of young people to urban centres. Intra-village factions and conflicts are non-material costs that need to be minimised.

Human and social capital is enhanced, and in some cases physical capital also improves (e.g. construction of community facilities and toilets). The contribution of CBNRM to environmental capital is as yet less clear. The CBNRM review (Arntzen *et al*, 2003) suggests that illegal resource use is lower in CBNRM areas, but it also found that not a single CBO had invested in natural resource management. Resources are monitored, but the records do not appear to be used in the quota determination. Clearly, CBNRM is not yet a guarantee for maintenance and enhancement of natural capital. In fact, conflicts may occur between the community desire to increase its revenues through greater resource use and the sustainability of that resource. The GEF project could link up with CBOs to support their resource monitoring capacity and ensure that the results will impact on the quotas setting and regulators.

Communities face a large number of constraints that make it difficult to realise the potential of CBNRM. These include:

- Lack of skills, including administrative, organisational, management and entrepreneurial skills;
- Inadequate local investment opportunities due to market constraints;
- Lack of understanding of and trust in partner companies. This restricts the possibilities to learn from each other, and to complement each other.

In brief, there is need to ensure that CBNRM benefits livelihoods and that resources are conserved through holistic and pro-active management. The GEF project would 'naturally' link with CBOs to strengthen their capacity in livelihood improvement, monitoring and evaluation of resource use and conservation, and ensuring that the findings are used by the regulators, for example in the setting of quotas.

6.8 Synopsis of livelihoods in and around the delta

The operational environment, the assets and access to them and by livelihood sources determine livelihood strategies.

Capital or assets

Most assets have expanded and or improved in quality. These include human resources (education/ training), infrastructure (roads, communication etc.), social capital (community organisations, local institutions, civil society). Financial capital is available through CEDA support, private sector investment in tourism and cash compensations for cattle losses (mostly consumed).

The biggest change in household assets refers to the dramatic loss of household assets (i.e. cattle) and the inability to transform cash compensation into assets. The compensation was probably too low to prevent a decrease in household assets, even if the cash was converted into savings. The household losses have also affected the district's development (e.g. abattoir closure).

Changes in natural assets have also occurred. These are mostly natural, and they have had a profound impact on livelihoods. The water inflows into the delta have been decreasing, and are very volatile. Parts of the delta (Lake Ngami, the western part) are drying up, while the eastern part receives more water. The changes in water, aquatic and water-dependent assets have changed livelihood options, thus forcing households to adapt.

Access to capital assets

Access to assets has been strongly determined by the location of people and their ethnic background. Different ethnic groups are clearly identified with 'major livelihood activities such as fishing (Bayei, livestock (Batawana) and arable farming (Bambukushu). People living in the panhandle have distinct water-based livelihood sources due to perennial water availability. Location, gender and income/poverty also influence resource use and livelihood strategies.

The granting of user rights to communities (wildlife and tourism) is the most significant change in access, as it provided new opportunities to communities to benefit from natural capital. This has generated substantial revenues to some communities.

Access to molapo land remains restricted due to tenure issues as well as changes in land suitability for molapo farming. This needs to be resolved to unlock the productive potential and improve food security.

Trends and shocks

The following trends are most important for local livelihoods:

- Growing but still limited employment opportunities outside agriculture and resource use;
- Improved infrastructure that facilitates market access and reduces production costs;
- Government dependency has increased, particularly after CBPP. It will be difficult in future to reverse this situation;
- HIV/AIDS has affected households and government. The productive potential has decreased, and households and government resources were diverted towards HIV/AIDS care;

The largest shocks were:

- The CBPP outbreak and subsequent livestock kills;
- Droughts (recurrent);
- Drying up of parts of the Okavango;
- Erection of fences that control livestock and wildlife movement.

Livelihood strategies

The livelihood strategies comprise a wide range of natural resource based and non-natural resource based activities. NRM activities are common among households, but they contribute little to the livelihood level, particularly in comparison to agriculture, employment and government transfers. There are large differences in livelihood strategies and NRM dependency that need to be recognised. Households in the panhandle depend strongly on aquatic resources. There is an untapped potential for livelihoods to benefit more from NRM through fishing, molapo farming, and especially tourism. The tourism sector has boomed, involves more and more communities, but is yet to significantly benefit livelihoods.

Livelihood security has generally decreased due to the collapse of the livestock sector, drying up of parts of the delta and growing dependency on government.

Environmental sustainability

Livelihoods may pose biodiversity threats locally and for a few species (mokola and dye trees). Most NRM sectors have not significantly grown, agriculture has declined or stagnated and government transfers offer a more attractive alternative than hunting and gathering. However in general, livelihoods are not the major threat to the delta's resources and biodiversity.

The rapid growth of tourism, upstream water abstraction in combination with global climate change pose in our view larger threats.

7 Threats to the Okavango

This section addresses task 6, i.e. identification of potential threats to biodiversity conservation due to identified livelihoods activities;

First, the main threats to the delta will be reviewed followed by a discussion about the contribution of local livelihoods to those threats.

7.1 Threats to the delta

Wetlands across the world and in southern Africa share common threats (Masundire *et al*, RAMSAR web-site). However there are differences in details of threats and their importance.

Based on the consulted literature the following *direct threats* have been identified:

1. Water abstraction:
 - upstream in Namibia and Angola that reduces the inflow. Development of irrigation and hydro-electric power schemes in Namibia and Angola may threaten the current inflow;
 - in Botswana. The only real threat would be large-scale irrigation or water transfer schemes. However, plans for development of irrigation would imply substantial abstractions and threaten the water resources;
2. Global climatic changes. Little work has been done on the impacts of global climate change on the delta's water inflow and resources. On-going work at HOORC suggests that global climate change is expected to significantly magnify the impacts on changes of human interventions on the water resources in the delta.
3. Increased human activities in and around the delta:
 - Population growth, especially on the fringes of the delta, and insufficiently controlled settlement patterns;
 - Livestock encroachment. The sector's decline has reduced conflicts and resource pressure, but threats may re-occur during the sector's recovery process;
 - Increase in tourism. According to NRP (2001) the environmental impacts of boats have been underestimated in the past. Illegal roads, invasion of alien species (salvinia), waste, water pollution, disturbance of sensitive areas may result.
4. Vegetation clearing for arable land and clearing of reeds threaten the local vegetation and veldproducts such as mokola palm, reeds and tree resources, particularly on the delta's fringes. Reeds play an essential role in the delta dynamics of land and water and protect against erosion;
5. Poorly conceived development projects in the delta and upstream. Examples can be found in the past (see table A.1 at the back), and there can be no doubt that new plans will emerge in future. Plans have been mooted for large-scale irrigation, dredging of channels and large scale water transfers. Most recently, plans for irrigation in the delta were shelved in the early 1990s after an IUCN-review team established that most areas would be negatively affected. Plans exist in Namibia to abstract water and to build a dam for hydro—electric power generation.

6. Water pollution due to the use of fertiliser, pesticides and indiscriminate waste disposal. At present, pollution is minimal, but agricultural development (also upstream) could lead to increased loads of fertilisers and pesticides. Spraying with endosulphan against the tsetse fly has had a negative impact on the fish resources. Wastewater and waste from tourism camps may pollute water if not properly disposed off;
7. The change in water inflow and loss of species due to changes in water flows and/or over harvesting would lead to a loss of biodiversity in terms of the entire ecosystem as well as at species level;
8. Bush fires. Bush fires are allegedly caused by safari operators (to clear the view for tourists) as well as by livestock farmers. Some bush fires can be accidental;
9. Extraction of river sand and gravel in the major (e.g. Thamalakane river).

The *indirect* threats may actually be more important, as they determine the ability to prudently manage the resources and deal with direct threats. The indirect threats are:

- Possible failure of the OKACOM to agree on a joint water allocation and management process and formula for the future¹². If countries go it alone, the likelihood of a substantial decrease in the water inflow is considered to be high;
- Continued sectoral management approaches, particularly inadequate coordination and fine tuning of land use and water planning and conflicts between agriculture, wildlife utilisation and tourism. This is due to the lack of comprehensive policies (BDSAP is being finalised) and legal framework;
- Lack of cooperation between the stakeholders, in particular between the local population, commercial enterprises and regulators;
- Unfair distribution of the resource benefits and costs. If the local population does not reap growing benefits, their interest in wildlife and tourism development, and resource conservation will wane and they will call for agricultural expansion (arable and livestock);
- Inadequate understanding of and awareness about the BD processes and value in the delta;
- Open access to the delta's natural resources, particularly those in communal floodplains. Conflicts between arable farming, livestock farming and tourism may occur. The dangers of open access are enhanced by population growth.

Growing resource pressure is causing conflicts between different types of land and resource use. Most conflicts arise on the fringes of the delta (floodplains) between arable production, livestock, wildlife and gathering of veldproducts. Conflicts have also arisen between subsistence and recreational fishing (NRP, 2001) and between tourism and subsistence gathering.

7.2 Threats to the delta and livelihoods

Natural resources benefit livelihoods through direct household consumption, sale of resources, and improved future income generating perspectives.

¹² Angola has apparently not yet ratified the Shared Water Courses Protocol.

The link between the above threats and livelihoods is two ways.

Poverty eradication as a threat to the delta's resources

First, poverty and lack of livelihood security lead to heavy reliance on 'free' natural resources such as firewood, fisheries and veldproducts. This pressure could have been aggravated by the temporary demise of the livestock sector. However, an increase in government transfers and support has mitigated the adverse resource impacts. The use and livelihood sections suggest that livelihoods do not pose a large and universal threat to biodiversity. Instead, livelihood related resource threats are area- and species-specific.

The main threats of over-use related to livelihood are:

- Veld products related to the basket industry. Use exceeds the estimated sustainability level (of removing max. 50% of the new leaves of the *mokola* palm). Trees used for the natural bark are also in decline;
- Fuelwood around larger settlements;
- Expansion of cropland (has not yet occurred);

Livelihoods threats to fish resources and rangelands are currently not common, but could occur in future. Current fish resources are considered to be under-utilised; hence there is no threat of overall depletion. Overgrazing and land degradation continue to pose local problems, but given the decline in livestock numbers, there is no growing threat. There is, however, a need to monitor livelihood pressure to prevent resource threats in future.

At present, the commercial sector, particularly tourism, and the danger of large-scale water upstream abstractions are considered to be pose more significant threats than the pursuit of local livelihood improvements. The number of tourists and tourist facilities has rapidly increased, and tourism is found right inside the delta. Up-stream water abstractions and pollution associated with irrigation could threaten the delta.

Loss of biodiversity affects livelihoods?

Changes in the delta may affect local livelihood sources and security. There is no doubt that changes in water availability could alter the delta and seriously affect those who depend on the current resources that might be affected. Agricultural resources would greatly affect livelihoods level and security (as the cattle eradication did!). However, losses of non-agricultural natural resources would affect livelihood security, but the level of livelihoods would not change a lot given the small contribution of resources.

It should be noted, however, that certain population groups might be disproportionnally affected. Low-income groups tend to be mostly affected because they depend more on local natural resources and have fewer adaptation options. Ethnic groups that rely on the dwindling resource would also be more affected than other groups. It is therefore necessary to document livelihood strategies and activities in detail, to identify groups with different livelihood strategies and sources, and to review household resilience and adaptive strategies.

8 The proposed work plan for livelihoods, agriculture and BD

The work plan has to address the threats to the delta as well as the threats to rural livelihoods and growing livelihood insecurity (safe for government dependency).

While livelihoods levels may not have gone down, livelihoods have become less secure and dependency on government has grown. If government cannot sustain its current levels of transfers, insecurity will further increase. The conclusion that livelihoods have become less secure is based on the following arguments. Firstly, the important livestock sector has not yet recovered from its demise in 1995. Its role for rural livelihoods, even though livestock ownership was skewed, is therefore smaller than before. This is regrettable for a sector with a reasonable to good potential in the district. Secondly, arable production is depressed and has low returns and high risks, and yet it continues to play an important in rural livelihoods, as evidenced by the Rural Development Survey and adaptive strategies to the CBPP disaster. Obviously, the importance of arable production reflects the lack of alternatives for households. Thirdly, the tourism sector has grown considerably, but the livelihoods benefits are unclear. Available evidence suggests that the direct livelihood benefits from CBNRM project are small. In contrast, DDP6 states that half of the district employment is related to tourism. This would be a substantial contribution to livelihoods. The different perspectives need further analysis. Finally, households have become increasingly dependent on government employment and transfers. This contributes to short-term security, but could lead to long-term insecurity.

The work plan focuses on year 1, as per request.

Proposed work plan for year 1:

Proposed main activities:

I. Data collection and analysis component.

It is recommended that data collection and analysis focuses on three key areas:

- a. No comprehensive, quantitative insight exists in the role of natural resources (direct and indirect) in local livelihoods. Data are haphazard, difficult to compare and sometimes conflicting. There is need to carry out livelihood and biodiversity surveys and assessments at the pilot sites. These surveys would build upon existing findings (e.g. BIDPA, 2000; HIES, 2003/04, ARD 2001, and Kgathi *et al*, 2004).
- b. Insight in the economic potential of natural resources is inadequate and fragmented. This area needs to be researched, starting from the market side (e.g. what market does Maun offer? Which new opportunities exist for baskets through the air link of Maun with Cape Town and Johannesburg?
- c. Insight in the resource availability and use is inadequate and needs to be improved. The potential of fisheries and various veldproducts is considered under-used, but to what extent? Concern is growing that the rapid growth in tourists may exceed the carrying capacity. What is the level of sustainable use? Where are the hotspots likely to be (e.g. floodplains, breeding grounds)?

II. Stimulating integrated resource management with participation of all users and regulators.

In many cases livelihoods do not pose the biggest threat to BD and resources at present. Commercial activities and upstream developments are probably more important risks. In future, rebuilding of the livestock sector could add to those pressures. It would therefore be critically important to bring together the local population, companies and regulators to discuss resource and BD threats, develop integrated monitoring systems and to ensure that the monitoring results are interpreted and understood by users and regulators alike and will lead to management actions.

It is recommended to initiate this process for wildlife resources (focussing on monitoring by users and sub sequent joint quota setting) and for BD and livelihood critical veldproducts (e.g. mokola palm) and fish resources.

III. Strengthening livelihood security.

We concluded in the preceding sections that livelihood security has deteriorated in the 1990s due to the CBPP outbreak, changing water distribution within the delta and growing dependency on arable farming and government. Global climate change is likely to amplify the changes, and hence increase insecurity.

This activity would aim to document livelihood security and explore options to improve security by effective seasonal, coping and adaptive strategies. The questions to be addressed are:

- How effective have existing coping and adaptive strategies been in maintaining livelihoods?
- Which adaptive strategies have been used for situations where the delta is drying up? How effective have they been and which alternative strategies would be more effective?
- Which coping strategies have been used to deal with the CBPP effects? How effective have they been (e.g. why was most cash not saved or re-invested?)?
- How sustainable is government dependency and what can be done to ensure security?

IV. Strengthening of agricultural livelihood sources

Livestock and arable farming are 'normally' the backbone of rural livelihoods in Botswana. Livestock farming has (temporarily?) lost that role, and is only slowly regaining some of its importance. Arable farming is currently too dominant in livelihoods given its limited potential. The challenges are therefore:

- a. Rebuilding of the livestock sector in an efficient, equitable and sustainable manner. This requires the following activities:
 - i. Comparison of the empirical household and economic benefits of the three livestock farming models (i.e. cattlepost farming, livestock ranches and keeping livestock around the villages. The study would inform future livestock development.
 - ii. Tracking cattle distribution in time;

- iii. Comparison of the economic, social and environmental benefits of goats and cattle; and
 - iv. Studies of the market potential of cattle and goats of Ngamiland.
- b. Strengthening of arable farming. Given the GEF's focus on the delta, it is proposed to concentrate on better exploitation of molapo farming and on the potential of cultivation of non-conventional crops for sale (e.g. mokola palm). Given efforts of the past, it is recommended that in year 1, a review study be carried out into the constraints and potential of molapo farming and into the reasons for the failure of the cultivation of the mokola palm. The review study would lead to the formulation of relevant activities for years 2-5.
- c. Fisheries development. The sector is considered to be under-developed, and should therefore be able to strengthen livelihoods directly or indirectly. Questions that need to be answered:
- i. What is the sustainable harvest level?
 - ii. What is the local and external market/demand?
 - iii. Which fisheries models can best exploit the identified potential (e.g. CBO-led, commercial/ private and/or government controlled)?
- Presumably, fisheries development would be concentrated in the panhandle area.

V. Strengthening of non-agricultural livelihood sources.

Non-agricultural natural resources only make a small contribution to livelihoods. Employment is much more important, and yet a serious constraint in the area. The employment data are fragmented and lack detail. Therefore, it is recommended that the GEF-project analyses the employment situation in the delta area, in particular to:

- Ascertain the role of tourism and government;
- Identify opportunities to enhance employment creation in the tourism sector (the non-government growth engine of the district). This would include the development of a People and Parks Strategy for Moremi Game Reserve to maximise local employment and income opportunities, and reviewing the experiences with CBO/ private sector joint ventures;
- Identify other employment and income opportunities;
- Identification of economically viable natural resources, including market potential and required propagation/ cultivation and management techniques.

VI. Improve the understanding of the BD threats related to livelihoods and identification of management options.

We concluded above that communal grazing resources and veldproducts are not adequately managed. The impacts may not be clearly visible because of the contraction of the livestock sector and dominance of government support. It is necessarily to address communal resource management and BD conservation now to prevent problems in future. Current monitoring is inadequate and fragmented. Community monitoring (e.g. wildlife resources) does not have a visible impact on resource quota and management. Questions that need to be answered include:

- What is the (potential) role of resource users (individuals, communities and companies) in resource monitoring?
- What indigenous knowledge does resource users possess that can identify BD threats and benefit resource management and conservation?
- How can monitoring of users be integrated (see activity II)?
- Can community based natural resource management effectively be expanded to e.g. water supplies (cf. Namibia), control of invasive species (cf. Zambia) etc.?

In addition to the above, the 'enabling' environment for development, BD conservation and resource use needs to be analysed, particularly to what extent resource management is decentralised and effective (Council and community levels). This task may already have been carried out by the ODMP, requiring close cooperation.

It is too early to identify the number of and location of project pilot sites. Spatial distribution of sites is the most important criterion. Sites need to be established in distinct parts of the delta such as:

- the panhandle (with perennial water and mostly aquatic activities);
- the eastern side of the delta that is receiving more water, and hence has increased development opportunities;
- the western side, which is drying up, and where people have to switch towards less water dependent activities; and finally
- the southern part, where the population is growing fastest, and the impact of Maun as a market and employment centre is great.

In addition, it is important that the pilot sites cover the crosscutting factors of ethnic diversity in the delta (with its associated different livelihood sources), gender concerns, income differences and HIV-AIDS incidence.

Literature

ADRC, 2001. A report of the socioecological survey of the Okavango basin. Every river has its people. KCS.

Arntzen, J.W., D.K.Molokomme, E.M.Terry, N.Moleele, O.Tshosa and D.Mazambani, 2003. Main Findings of the Review of Community-Based Natural Resource Management in Botswana. *CBNRM Support Network Occasional Papers No. 14*, Gaborone. www.cbnrm.bw.

Arntzen, J.W., 2003. An Economic View on Wildlife Management Areas in Botswana. *CBNRM Support Network Occasional Papers No.10*. Gaborone. www.cbnrm.bw.

Barnes,J.I., 1998. Wildlife conservation and utilisation as complements to agriculture in southern African development. DEA Research Discussion Paper 27

Barnes,J.I., 2001. Economic returns and allocation of resources in the wildlife sector of Botswana. *South African Journal of Wildlife research*, 31, 141-153.

Bernard,T., K.Mosepele, L.Ramsberg, 2003. Environmental monitoring of tropical and subtropical wetlands. Conference Proceedings. HOORC Report Series No. 1.

Bernard, T. N. Moetapele, not dated. The death of the Gomoti river: biophysical process and indigenous resource management in northern Botswana.

BIDPA, 2001. Review of the Rural Development Policy. Consultancy report for the Rural Development Division, Ministry of Finance and Development planning.

Botswana Society, 1976. Proceedings of Symposium on the Okavango Delta and its future utilisation.

Breen, C.M., N.W.Quinn and J.J.Mander, 1997. Wetland Conservation and management in southern Africa: challenges and opportunities. IUCN wetlands programme.

BRIMP, not dated. Draft report on the impacts of range related policy on different socio-economic groups, with pilot studies in Tubu and Makwate. DIFID and Ministry of Agriculture.

Carney,D, 2003. Sustainable livelihood approaches; progress and possibilities for change. DFID.

Chenje, M and P. Johnson, 1996. Water in southern Africa. IUCN-SARDC-SADC. Harare.

DFID, 1999. Sustainable livelihoods guidance sheets. UK.

Ellis,F., 2000. Livelihood security and diversity in developing countries. Oxford University Press, UK.

Ellis,F., 2001. Diverse livelihoods and natural resources. A research context. Sustainable livelihoods in Southern Africa: Institutions, governance and policy processes. SLSA Working Paper 7.

Emerton,L., 1998. Economic tools for valuing wetlands in eastern Africa. IUCN Eastern Africa Programme. Economics and Biodiversity, Nairobi.

Emerton.,L., L.Iyango, P. Luwum and A.malinga, 1999. The present economic value of Nakivubo urban wetland, Uganda. IUCN Eastern Africa Programme. Economics and Biodiversity, Nairobi.

Fizani,B, W.S.Mlenga and M.M.Shatera, 1999. Socio-economic effects of CBPP in Ngamiland. Ministry of Agriculture.

Fruhling, P., 1995. A liquid more valuable than gold; on the water crisis in southern Africa, future risks and solutions. SIDA, Sweden.

Goldblatt, M., J.Ndamba, B. van der Merwe, F.Gomes, B.Haasbroek and J. Arntzen, 2000. Water demand management; towards developing effective strategies for southern Africa. IUCN Wetlands and Water resources Programme. Harare.

Kgathi,D.L. D.Kniveton, S.Ringrose, T.Turton, C van der Post, J.Lundqvist, H.Savenije, H. Seely, S. el Obeid and J.J.Mendelson, (forthcoming). Rural Livelihoods, indigenous knowledge systems, and political economy of acces to natural resources in the Okavango delta, Botswana. HOORC, Linkoping University.

Kgathi, D.L., D.Kniveton, S.Ringrose, T.Turton, C. van der Post, J.Lundqvist, H. Savenije, H. Seely, S. El Obeid and J.Mendelson, (forthcoming). The Okavango: a river supporting its people, environment and economic development.

Kgathi, D.L., G.Mmopelwa and K.Mosepele, forthcoming. Natural resources assessment in the Okavango delta, Botswana: case studies of some key resources. Submitted to Natural Resources Forum.

Masundire,H., K.N.Eyeson and S.F.Mpuchane, 1995. Proceedings of the conference on wetlands management. ,

Masundire, H.M., S.Ringrose, F.T.K.Sefe and C. van der Post, 1998. Inventory of wetlands of Botswana. Botswana Wetland policy and strategy. NCSA-MLGL.

Mbaiwa,J., 2002/ The socioeconomic and environmental impacts of tourism development in the Okavango delta. HOORC.

Mendelsohn,J. and S. el Obeid, 2004. Okavango river: the flow of a lifeline.

Merron,.S, 1995. The ecology and use of the fishes of the wetlands in northern Botswana, with particular reference to the Okavango Delta.

Ministry of Agriculture, 1998. North and South regional forum reports. National Action Programme to Combat Desertification.

National CBNRM Forum, 2004. Proceedings of the Third National CBNRM Conference “ Back to the Future” and CBNRM Status report.

National Conservation Strategy Coordinating Agency, 2002. State of the environment report. Ministry of Environment, Wildlife and Tourism.

Ndozi, C.T., H.B. Nthibe, T.J. Bandeke, 1999. Evaluation study of socioeconomic impacts of the CBPP eradication and government relief programmes on communities of Ngamiland district and Okavango sub-district. Ministry of Local Government, Lands and Housing.

North west District Council, 1998. Ngamiland District Development Plan 5: 1998-2003. Ministry of Local Government.

North west District Council, 2004. Ngamiland District Development Plan 6: 2003-2009. Ministry of Local Government.

Pallet, J. (ed.), 1997. Sharing water in southern Africa. Desert research Foundation of Namibia.

Ramsar, 1971. Final act of the international conference on the conservation of wetlands and waterfowls. (and www.wetlands.org/reports).

RAMSAR convention bureau, 2002 Ramsar sites, Directory and overview: a guide to the Ramsar Convention's wetlands of international importance

Ringrose, S, C vander Post, R. Kwerepe and M. Mulalu, 1997. Assessment of potential rangelands degradation in period 1984-1994 using satellite imagery. Ministry of Agriculture and University of Botswana.

Scott Wilson and EDG, 2000. Environmental impact assessment of the veterinary fences in Ngamiland: summary report. Report prepared for DAHP, Ministry of Agriculture.

Scudder, T. *et al*, 1993. The IUCN Review of the southern Okavango integrated water development project. IUCN-wetlands programme.

Shackleton, S., C. Shackleton and B. Cousins, 2000. Revaluing the communal lands of southern Africa, ODI Natural resource perspective No. 62. DFID.

Sinkala, T., M. Mwala and E. T. Mwasa, 2000. Control of aquatic weeds in the lower Kafue River, Zambia. Paper presented at the WARFSA-Waternet workshop on Sustainable use of water. Maputo, Mozambique.

Spinage, C., 1991. History and evolution of the Fauna Conservation Laws in Botswana. Botswana Society.

Townsend, R.F. and H.K. Sigwele, 1998. Socioeconomic cost-benefit analysis of action and alternatives for the control of CBPP in Ngamiland, Botswana.

Terry, E.M., 1986. The basket industry of Gomare and Tubu. Botswana Craft and Ministry of Commerce and Industry.

Townsend, R.F., S. McDonald and H.K. Sigwele, 1998. The macroeconomic effect of exogenous shocks to agriculture in sub-Saharan Africa; a case study of livestock disease in Botswana.

UNESCO, 1994. Convention on wetlands of international importance especially as waterfowl habitat. (www.ramsar.org). Including amendment

Verlinden, 1995. The importance of the wetland resources for wildlife management in Botswana. In: Masundire *et al* (eds.), *ibid*, pp. 65-79.

World Bank, 2003. A user guide to poverty and social impact analysis. Washington DC.

Annex A: Past development proposals for the delta

Date and source	Proposed activities
1859 (Chapman)	Irrigation north of lake Ngami
1897 (Schulz and Hammar)	European settlements at Makgadikgadi, Lake Ngami and Okavango
1919 (Swartz)	Diversion of Okavango and Zambezi to join Orange and create Etosha and Makgadikgadi Lakes.
1926 (du Toit)	Irrigation Makgadikgadi, Mabaabe, Boteti and eastern end of Lake Ngami.
1934 (Naus)	Irrigation Boteti/Rakops
1935 (Agric. Adviser)	Irrigation at Rakops/ Mopipi/ animal watering
1946 (Conroy)	Irrigation
1946 (Bowker)	Delta irrigation
1946 (Stratford)	Resettlement of 'Union's rural natives
1946 (Cilliers)	Water transfers to Makgadikgadi and Limpopo.
1953 (Brind)	Irrigation Mabaabe Calanisation of Thaoge; Boteti Lake river reservoir
1953 (Debenham)	Cotton irrigation
1955 (Wellington)	12 000 km ² west of Chief's island Transkalahari railway via delta Hydro-electric power generation at Popa Falls
1960 (Morse Commission)	Irrigation at Gumare, Tubu and Boteti. Water transfers to as far as Mahalapye
1960 (Hawes)	Sepopa-Toteng canal.
1963 (Lund)	Canal linking Zambezi-Okavango system Clearing and improving Thaoge and Thamalakane channels
1963 (Langdale-Brown and Spooner)	Irrigation in delta Water transfer through Okavango-Cunene canal; Hydro-electric power generation at Popa Falls
1969 (Hydro consultants)	Hydro-electric power generation at Popa Falls
Midgeley	Water transfer to Pretoria via eastern Botswana Gaborone-Shakawe canal
1980s	Rice irrigation project Maun
1991 (SMEC)	Irrigation Dredging of channels Reservoir at Samedupi

Source: up-dated from Botswana Society, 1976, pp. 333-334.

Annex B: Land use options and economic activities in Ngamiland District

The natural resource economist deals with this issues in depth. This appendix summarises some findings of Barnes *et al* (2001) and ULG (2001).

Barnes *et al* (2001) have studied the economic returns of the major economic activities and livelihood options in Ngamiland district; they did not examine fisheries.

They argued that from an *economic* perspective (mostly return/ha), crop production and gathering and subsistence hunting are *secondary* land use. Intensive forms of wildlife ranching and farming have low returns per ha due to the high investment levels.

Barnes *et al*, (2001) concluded that:

- wildlife-based tourism in high quality areas (in terms of scenery and wildlife resources) of the delta is very efficient and should be prioritised;
- Community wildlife use should be promoted in areas where wildlife and people co-exist and where the return are higher than from livestock;
- Small scale livestock production can become efficient if effective grazing management schemes are established;
- Cattle post commercial livestock production is most efficient in sandveld areas further away from the delta with groundwater and low wildlife densities;
- Capital-intensive commercial livestock production is not economic efficient and should not be promoted.

In brief, small and larger scale traditional livestock production and wildlife-based tourism need to be expanded at the right places in Ngamiland district. Key factors for the choice of the production system are the wildlife resources, scenery, population and market access/ transport costs.

The results of the economic analysis are summarised in Table B.1.

Table B.1: Economic returns of livestock and wildlife systems in Ngamiland.

	Small-scale traditional livestock production	Large-scale cattle post livestock production	CBNRM in low wildlife quality areas	CBNRM in high wildlife quality areas	Commercial tourism
I. Financial analysis					
Rate of return (%)	11.5	6.8	8.0	8.1	9.6
NPV (Pula)	381	- 52 846	3 466	20 302	229 517
NPV/ha (P/ha)	52	- 8	0.00	0.25	15.94
II. Economic analysis					
Rate of return (%)	10.1	2.0	24.8	54.1	64.0
NPV (Pula)	4 679	-235 621	1.8 million	2.9 million	6.6 million
NPV (P/ha)	26	- 37	3.00	36	457

Source: Barnes *et al.*, 2001.

The economic importance of sector also lies in their linkages with the rest of the (rural) economy. Both livestock and tourism have high multiplier effects in the economy. A one million increase in livestock output leads to an increase of gross income in the economy of P 8 million. A similar increase for the wildlife-based tourism sector leads to increase of P 6 million (Barnes *et al*, 2001). ULG (2000) carried out a review study of Botswana's commercial hunting sector using empirical data, interviews and literature. Models were developed for individual concessions and for the country at large. Details of the models are not provided in the report. The study's findings indicate

that the commercial hunting sector generates substantial local economic benefits and is highly dependent on species species. Almost half of the expenditures of the commercial hunters benefit the local economy (49.5%). The balance is spent elsewhere in the country (25.7%) or abroad (24.8%). This finding contradicts the widely held view that most benefits do not reach the country. Elephants account for over half of the license and trophy income (56.2%). Other important species include buffalo (6.5%), leopards (6.6%) and lion (4.7%). The moratorium on lion hunting and restrictions on elephant hunting in some areas cost the sector US\$ 1.3 and 1.6 mln. respectively, or 22.8% of gross income; the introduction of tendering for tourism concessions has successfully raised the revenues of government and communities (15.7% of total expenditures each).

The economic analysis of Barnes *et al* (2001) identified key development constraints for agriculture (see table B.2).

Table B.2: Development constraints of economic activities in Ngamiland

Activity	Development constraints
Crop production	Poor soils Low and unreliable rainfall Large distance/ high transport costs to major markets
Livestock production	Outside EU export zone Large distance/ high transport costs to major markets No significant local slaughtering capacity Livestock kept mostly for multiple purposes, not just beef production Cattle lung disease impacts
Tourism	Volatility of tourism market Hunting quotas Wildlife densities and variety Exchange rate

Source: expanded from Barnes *et al*, 2001.

Annex C: Livelihood sources in northern Botswana

Table C1: Ranking of livelihood activities by contribution to household Income/ Consumption, by Region

Livelihood Activity	Full Sample	Large Village	Rural East	West	North
Employment	(1) 29%	(1) 28%	(1) 31%	(1) 41%	(4) 15%
Transfers	(2) 26%	(2) 25%	(4) 22%	(3) 22%	(1) 55%
Arable Agriculture	(3) 26%	(4) 21%	(2) 30%	(5) 17%	(2) 29%
Livestock	(4) 23%	(3) 22%	(3) 23%	(2) 28%	(3) 24%
Remittances	(5) 18%	(5) 21%	(5) 19%	(6) 14%	(6) 5%
Informal Sector	(6) 14%	(6) 15%	(6) 12%	(4) 20%	(5) 12%
Natural Resources	(7) 1%	(7) 0%	(7) 1%	(7) 1%	(7) 5%

Note: Activities are ranked according to the percentage of households reporting that the activity makes a significant contribution (25%+) to total household income and consumption. The three most important livelihood systems in each region are marked in bold type.

Source: BIDPA, 2001, vol. 2, p.16.

Annex D: Livelihood assessment of natural resources

The importance of natural resources for livelihoods is determined by the frequency of use and the amount used or income generated. Two thirds of the households in and around the delta use a variety of natural resources (ARD, 2001). Most of the use is for own household consumption but some resources are sold (e.g. basket material, grass, reeds).

Table D1: Major livelihood activities in and around the delta

Natural resources based activities	Non-natural resources based activities
<u>Crop production</u> Three quarters has arable land and 70% ploughed in 2000 (ARD, 2001) 1. Molapo (16-27% of area in 1997-98): mostly maize, higher yields (av. of 520kg/ha) than dryland farming. 2. Dryland farming away from the delta and in desiccated parts of the delta. Mostly sorghum and millet; low yields.	<u>Formal employment</u> On-farm: herding and arable work. Non-farm, e.g. tourism, government. Employment in tourism is estimated at 1650 by Mbaiwa, 2001. 1503 are permanent jobs held by citizens. According to ARD (2001) 192 out of the 638 heads of interviewed households were formally employed.
<u>Livestock production:</u> Cattle ownership has declined to around 20%. The ARD found a livestock ownership of 55%, mostly of herds smaller than 40 head.	<u>Government transfers</u> Productive subsidies Welfare transfers
<u>Fisheries</u> , particularly in the northern part (Shakawe, Etsha and Xhahaba in the anhandle), where 65% of the population benefits from fishing (Mosepele, 2001). He estimates the number of fishers at 3289 fishers, of which 44% are females.	<u>Remittances</u> from absent household members
<u>Gathering</u> Wood Plants Productive inputs	<u>Informal, often temporary jobs</u>
<u>Wildlife utilisation</u> Hunting Tourism	<u>Beer brewing</u>
<u>NR-processing activities</u> Craft production Building, roofing and fencing	

Natural resources do not merely represent a direct use value. The ARD (2001) survey also found that almost the entire population (96%) attaches religious and cultural values to (some of the) delta's natural resources.

Annex E: CBNRM activities in Ngamiland District

Ngamiland has a total of 21 CBOs. The CBNRM Status Reports (2000-2003) show that roughly one in six people of Ngamiland (excl. Maun) reside in CBNRM villages (2001); that revenues amounted to over P 8 million (Ngamiland and Chobe) and have rapidly grown in time (P 1.3 million in 1997) (Ngamiland and Chobe) and employment ranged from 250 to 429 persons¹³; this is around 2% of the paid employment in the district (cf. 2001 Population Census). The activities of the CBOs are summarised in Table E.1.

¹³ Employment figures are unreliable as they do not differentiate between jobs of the Trusts and the joint venture partners, full time and part time and temporary and permanent jobs.

Proposed livelihood component: GEF project on building local capacity for the conservation and utilisation of biodiversity in the Okavango delta

Table E.1: Activities and sources of income of Ngamiland CBOs

	name	CHA	Villages	area	Sell quota	Subs. Hunt	Photosaf.	Cult. Tour.	Craft marketing	Campsite	veldprod.	fish	Others
1	CTT	4 and 5	Xai/Xai	2460	1	1		1	1				1
2	KDT	18	Khwai	1918	1	1			1	1			
3	OCT	22 and 23	Seronga, Beetsha, Eretsha, Gudigwa and Gonutsuga	1			1						
4	OJCT	24	Etsha, Jao flats	589			1			1			
5	OKMCT	32	Ditshiping, Quxau, Daonara, Boro	1223	1		1			1	1	1	1
6	BCCT	NG12 part	Gudigwa				1	1					
7	STMT	NG34	Sankuyo	860	1	1				1	1		1
8	MZCT	NG41	Mababe	2181	1	1							
9	OPT	in NG 12	Seronga				1		1	1			1
10	TT	in NG11	Kaputura, Ngarange, Ncoagom, Sekondomboro					1			1		
11	TDT	applied NG 13	Kaputura, Tobere, Gudigwa and Kyeica										
12	TCDT	NG6	Tsodlio					1					1
Total (out of 12)					6	4	5	4	3	5	3	1	5

Source: CBNRM Status Report 2003.

Proposed livelihood component: GEF project on building local capacity for the conservation and utilisation of biodiversity in the Okavango delta