OKAVANGO DELTA MANAGEMENT PLAN PROJECT

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ACKNOWLEDGEMENT

The ODMP project has been an exciting yet challenging endeavor which trialed and tested, on the ground, key environmental management principles. These included the ecosystem approach, participatory planning, integrated management, database management, hydrological modeling, economic valuation, scenario planning, feedback mechanisms, piloting and joint planning, to mention a few. It was indeed a planning adventure which challenged the institutional set-up and the individual planners' mental disposition to operate and think beyond the box.

The Department of Environmental Affairs could not have achieved this milestone without the support and participation of a number of stakeholders and partners. Some of the notable ones being the departments of Water Affairs, Wildlife and National Parks, Tourism, Forestry and Range Resources, Animal Health and Production, Town and Regional Planning, and authorities in the district, namely, North West District Council, District Administration, Tribal Administration and Tawana Land Board. On the same note acknowledgements go to the NGOs and CBOs in the district as well as other national bodies for their tremendous support.

The University of Botswana Harry Oppenheimer Okavango Research Centre played a pivotal role throughout the ODMP process, first during the design of the project, through to the development of the plan where its staff was assigned to various components and activities to technically guide the process. The HOORC has committed itself to give technical guidance during the implementation of the plan.

MEWT would also want to extend their appreciation to the enthusiasm and level of participation by the tourism private sector in shaping the plan and making specific commitments to support the monitoring and research activities during the implementation of the ODMP. Dikgosi (Chiefs) of all settlements within the Ramsar site deserve special recognition for the high level of support in encouraging and ensuring that their *merafe* contribute in all ways possible during the preparation of the plan. There is no doubt that what is contained in the plan is a reflection of societal needs and aspirations.

To the upstream riparian states of Angola and Namibia, the Government of Botswana wishes to extend her sincere gratitude for the endorsement of the ODMP process through the Permanent Okavango River Basin Commission (OKACOM). This was a demonstration that within the region joint management of shared resources is possible and achievable. The Okavango Delta is enjoying international protection through the Convention on Wetlands of International Importance commonly known as the Ramsar Convention. It was the Ramsar Secretariat which provided seed funding for the design of the ODMP.

MEWT would like to acknowledge the financial and technical support it received from the Governments of the Kingdom of Denmark through the Danish Development Agency (DANIDA), Germany through the German Development Service (DED), the Kingdom of Sweden through the Swedish International Development Agency (SIDA) and The World Conservation Union (IUCN). Without their support the project would not have been as successful as it was.

Lastly the Ministry of Environment, Wildlife and Tourism would like to thank all those who contributed, but may have been inadvertently not mentioned.

Thank you

Ministry of Environment, Wildlife and Tourism
Government of the Republic of Botswana

FOREWORD

In a water deficient country like Botswana a wetland of any form and size and location attracts interest and is viewed as important to enhance the bio-physical and socio-economic wellbeing in that respective locality. While wetland management has come to be recognized as an embodiment of maintenance of the integrity of freshwater bodies it should be understood that for Botswana, management of such sources as well as surrounding resources has traditionally been standard practice. It may not have been known as wetland management in contemporary expressions, but it constituted an approach to sustainably use the resources.

Recognition of internationally renowned systems such as the Okavango puts into perspective the value that wetlands hold and the management attention it deserves. The Ministry of Environment, Wildlife and Tourism in collaboration with the rest of government, local authorities and organizations outside government joined efforts in formulating an initiative which evolved into a programme which culminated in the development of a Management Plan for the Okavango Delta. We recognize support from international partners during this endearing exercise.

The Okavango Delta is a magnificent piece of creation which is sometimes referred to as the "jewel of the Kalahari". It is indeed an oasis in the deep expanse of the Kalahari Desert. The river creates a unique feature which empties its water into the thirsty Kalahari sands forming a great inland fan of channels and swampland - the Okavango Delta. Geologically the system is referred to as "endorheic". The Okavango Delta forms the core of one of the largest declared Ramsar sites or Wetlands of International Importance. The site, which also includes the Kwando / Linyati river system, is located entirely within Ngamiland District of Botswana. Many people derive their livelihoods from the area and it is also economically valuable as it serves both as a source of revenue from tourism and source of water for the region.

Developing a management plan for such a system was both challenging and indeed a demanding task. The Government of Botswana is proud to have finalized the development of the Okavango Delta Management Plan (ODMP). The ODMP will provide a contextual framework within which all other sector plans should operate within the North West District. The ODMP strives for sustainable utilisation of the Okavango Delta's natural resources. It is an initiative which was provided for in the National Vision 2016. The 2006 national celebrations to mark the ten years into Vision 2016, saw the Ministry of Environment, Wildlife and Tourism through the Department of Environmental Affairs observing its accomplishment in the completion of the ODMP.

Through the ODMP the Ministry of Environment, Wildlife and Tourism demonstrated the possibility for integrated natural resource management and actual testing of the principles of ecosystem management of a key wetland system. The participatory planning and consultation principles embraced during the development of the ODMP have brought the broad environmental planning into some appreciable level and has enhanced cross-sectoral planning. The implementation of the ODMP should in this respect be a premise for more focused district development planning in future. We take pride in the Ministry of Environment, Wildlife and Tourism in a successful imitative which is also endorsed within the wider Okavango basin as a proactive gesture towards what could be considered as Botswana's contribution to an anticipated integrated management plan of the entire Okavango river system by Angola, Botswana and Namibia.

It stands to reason that the ODMP should and will be implemented as intended and that future review processes will indicate notable and positive impact on the bio-physical and socio-economic health of various aspects of the Okavango Delta Ramsar site, as well as improved institutional coordination and strengthening at all levels of operation. The level of expectation and commitment on the ODMP so far displayed gives some level of assurance for action. The Ministry of Environment, Wildlife and Tourism is bound to live up to these expectations.

I present to you the Okavango Delta Management Plan

Honourable Onkokame Kitso Mokaila
Minister of Environment, Wildlife and Tourism.

PREFACE

This document constitutes a Management Plan for the Okavango Delta. It is largely based on the Government of Botswana planning system and complemented by elements from the *New Guidelines for Management Planning for Ramsar Sites* and the Ecosystem Approach. The format is described below.

Chapter 1 - Introduction

This chapter sets out the goal of the Plan and the policy framework within which the Plan has been developed at local, regional and international levels. It also describes the need for the plan, why the site was selected and the planning approach.

Chapter 2 - Site Description

This chapter describes the ecological character and the institutional, and socio-economic characteristics of the Ramsar site. It is fundamentally a collation and synthesis of existing data and information about the site and identifies any shortfall of relevant data and information. The site description needs to be regularly reviewed and updated as new data and information becomes available. This section is further developed into a comprehensive and detailed inventory in a separate volume of the ODMP series of documents.

Chapter 3 – Evaluation of status and condition

The purpose of this chapter is to evaluate the status and condition of the features described in chapter 2 in order to determine the management interventions and objectives. The process of evaluation involves developing a set of evaluation criteria and applying this to each key feature. The evaluation focusses on the ecological character; the ecological components and processes as well as the ecosystem goods and services provided by the wetland to support livelihoods. The evaluation also draws from the stakeholder analysis and issues report.

Chapter 4 – Goals, Objectives and Action Plans

The purpose of this chapter is to set out management objectives determined from the type of management intervention identified during the evaluation process of the site characteristics and the necessary management interventions in the form of action plans. An objective defines what needs to be achieved through management of the site. Four levels of objectives have been used in this document, these are: the *Overall Goal* of the Okavango Delta Management Plan, the long term *Strategic Goals* of the three Okavango Delta Ecosystem thematic areas or subsystems, the *strategic objectives*, which have been developed in order to reach the three strategic goals, ,and the *operational objectives,* which are derived from the strategic objectives. A tabular presentation of the objectives and action plan is adopted which conforms to the standard Botswana Government planning format.

The action plan describes the implementation of management interventions in terms of operationalising the management objectives through various actions. It describes in detail activities, outputs and resources needed. At this level the integration elements are apparent with respect to the objectives and institutional responsibilities.

Chapter 5 Management Plan Implementation Strategy

This chapter describes the strategies as well as necessary instutional, and financial arrangements which would be required to implement the ODMP. The chapter also sets out the parameters or framework within which future management interventions should operate. It further presents the planning horizon as well as the procedures for reviewing the implementation of the plan.

Chapter 6 – Montoring and Evaluation Plan (M&E)

This chapter describes how the implementation of the plan will be monitored and evaluated against the operational objectives. M&E is the regular collection and analysis of information to track the implementation and measure the performance of any project against its expected results. It provides important information about how the project is performing, which helps decision makers and other stakeholders. It is therefore a powerful management tool that provides project managers with information to track implementation and achievements, so that they can identify whatever obstacles are impeding the project's success as early as possible. M&E is a source of information for justifying changes in management strategy, budgets, etc. through adaptive management responses.

Chapter 7 Conclusions

This chapter describes briefly the processes and principles used in the development plan and the expectations arising from its implementation.

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ALDEP	Arable Land Development Programme
BAIS	Botswana AIDS Impact Survey
BTDP	Botswana Tourism Development Programme
BWMA	Botswana Wildlife Management Association
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CBPP	Contagious Bovine Pluero Pneumonia
CC	Conservation Committee
CEDA	Citizen Entrepreneurial Development Agency
CHA	Controlled Hunting Area
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
CoR	Certificate of Rights
CSO	Central Statistics Office
CT	Community Trust
DAHP	Department of Animal Health and Production
DANIDA	Danish International Development Agency
DDC	District Development Committee
DDP	District Development Plan
DEA	Department of Environmental Affairs
Dept.	Department
DFRR	Department of Forestry and Range Resources
DLGSD	Department of Local Government Service and Development
DLUPU	District Land Use Planning Unit
DoT	Department of Tourism
DTRP	Department of Town and Regional Planning
DWA	Department of Water Affairs
DWNP	Department of Wildlife and National Parks
EA	Ecosystem Approach
EHD	Environmental Health Department
EIA	Environmental Impact Assessment
ERP	Every River has its People Project
FAO	Food and Agricultural Organisation
FAP	Financial Assistance Policy
FC	Farmers Committee
FMD	Foot and Mouth Disease
FMP	Final Management Plan
FPSG	Fixed Period State Grant

FRAMP	Framework Management Plan
GIS	Geographical Information System
GoB	Government of Botswana
HATAB	Hospitality and Tourism Association of Botswana
HEC	Human – Elephant Conflict
HIV	Human Immuno Virus
HOORC	Harry Oppenheimer Okavango Research Centre
IAS	Invasive Alien Species
ID	Identity Number
IMP	Integrated Management Plan
IUCN	The World Conservation Union
IWRM	Integrated Water Resources Management
KCS	Kalahari Conservation Society
LAC	Limits of Acceptable Change
M&E	Monitoring and Evaluation
MCM	Million Cubic Metres
MEA	Multilateral Environmental Agreements
MEWT	Ministry of Environment, Wildlife & Tourism
MFDP	Ministry of Finance and Development Planning
MGDP	Maun Groundwater Development Programme
MMEWR	Ministry of Minerals, Energy and Water Resources
MoA	Ministry of Agriculture
MOMS	Management Orientated Monitoring System
MWSSRUP	Maun Water Supply and Sanitation Rehabilitation and Upgrade Project
NACT	National Council on Tourism
NCSA	National Conservation Strategy (Co-ordinating) Agency
NDDP	Ngamiland District Development Plan
NDP	National Development Plan
NDSS	Ngamiland District Settlement Strategy
NGO	Non-Governmental Organisation
NMMAG	National Museum, Monuments and Art Gallery
NWDC	North West District Council
OCT	Okavango Community Trust
ODIS	Okavango Delta Information System
ODMP	Okavango Delta Management Plan
ODRS	Okavango Delta Ramsar Site
OFMC	Okavango Fishery Management Committee
OKACOM	Permanent Okavango River Basin Commission
ORB	Okavango River Basin
OWBC	Okavango Wetland Biodiiversity Conservation
OWMC	Okavango Wetland Management Committee
PA	Protected Area

PAN Trust	People and Nature Trust
PLA	Participatory Learning and Action
PMG	Project Management Group
PP	Participatory Planner
PPADB	Public Procurement and Asset Disposal Board
PPU	Physical Planning Unit
SADC	Southern African Development Community
SAP	Strategic Action Plan
SEA	Strategic Environmental Assessment
SIDA	Swedish International Development Agency
SLAAC	State Land Allocation Advisory Committee
SWOT	Strenghts, Weaknesses, Opportunities and Threats
TLB	Tawana Land Board
UB	University of Botswana
UNCCD	United Nations Convention on Combatting Desertification
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nationa Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VDC	Village Development Committee
VTC	Village Trust Committee
WANI	Water and Nature Initiative (IUCN)
WERRD	Water and Ecosystem in Regional Development
WHC	World Heritage Convention
WMA	Wildlife Management Area
WSB	Water Surveys Botswana
WTP	Willingness To Pay

EXECUTIVE SUMMARY

OKAVANGO DELTA VISION

The common and shared vision for the Okavango Delta is:

"A carefully managed, well functioning ecosystem that equitably and sustainably provides benefits for local, national and international stakeholders".

OVERALL GOAL OF THE OKAVANGO DELTA MANAGEMENT PLAN

The Overall Goal of the Okavango Delta Management Plan (ODMP) is:

"*to integrate resource management for the Okavango Delta that will ensure its long-term conservation and that will provide benefits for the present and future well-being of the people, through sustainable use of its natural resources*"

The Overall Goal further translates to three Strategic Goals, each with several Strategic Objectives, for the ODMP (see section 4 for an explanation of the development of these):

Strategic Goal 1. *To establish viable institutional arrangements to support integrated resource management in the Okavango Delta;*

> Strategic objective 1.1*: To establish viable management institutions for the sustainable management of the Okavango Delta;*
>
> Strategic objective 1.2*: To improve the planning and regulatory framework for sustainable management of the Okavango Delta;*
>
> Strategic objective 1.3: *To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.*

Strategic Goal 2. *To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services;*

> Strategic objective 2.1*: To conserve the ecological character (biotic and abiotic functions) of the Okavango Delta, and the interactions between them;*
>
> Strategic objective 2.2: *To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.*

Strategic Goal 3. *To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders;*

> Strategic objective 3.1: *To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders;*
>
> Strategic objective 3.2: *To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.*

POLICY FRAMEWORK

The context of the Okavango Delta Management Plan is defined within the framework of a national vision, legislation, policies, plans and strategies, regional protocols and

international conventions. The most noteworthy instruments with provisions for the development of the Okavango Delta Management Plan are the National Vision 2016 (with attendant environmental policies and plan), the Southern African Development Community (SADC) Protocol on Shared Water Courses, and the wetland management and planning guidance prepared by the Ramsar Convention.

NEED FOR THE PLAN

The existing diverse and complex nature of the Okavango Delta in terms of its natural resources, its wide range of users and uses, its multiple managers (both in and outside government and including communities), and an array of national laws, policies and guidelines, as well as regional and international conventions, agreements and protocols, are all factors that dictate the need and determine the context for an integrated management planning process for the Okavango Delta.

PLANNING APPROACH

The ODMP planning process borrowed from the Ramsar Planning Guidelines (Ramsar Secretariat 2006) and the Ecosystem Approach to wetlands management. The ODMP is anchored on the main principle of strengthening ownership through accountability and the active participation of all stakeholders both during development and implementation of the plan. The ownership of the ODMP process is premised on participatory mechanisms, association with international stakeholders, building partnerships at all levels and adopting an integrated and dynamic approach which recognises gender, HIV and AIDS and livelihoods elements.

SITUATIONAL ANALYSIS

The Okavango Delta has approximately 1300 plant, 701 fish, 30 amphibian, 65 reptile, 445 bird and 120 mammal identified species.

In the Delta, there are large variations in habitat patterns over small distances, although the Delta is very flat and is made up of homogeneous sand. Small differences in altitude of 1-2 m represent large differences in the frequency and duration of flooding, which creates gradients from permanent rivers and lagoons, to permanent swamps with reeds and papyrus, to seasonally flooded grasslands, occasionally flooded grasslands, riverine woodlands, and dry woodlands. Each of these ecosystems has a distinct species composition not only of plants, but also of reptiles, birds and mammals.

In a biodiversity comparison (Junk *et al.* 2006) of seven globally important wetlands, of which six are located in tropics and sub-tropics, the Okavango Delta had a low number of fish species, but the second highest number of plants and mammals, third highest number of amphibians, and highest number of reptiles and birds. In particular the number of large mammal species and their high abundance are outstanding in the Okavango Delta.

MANAGEMENT OBJECTIVES AND ACTION PLANS

The ecosystem approach provided guidance in categorising management interventions into three thematic areas or subsystems. This enables an integrated resource management planning approach in implementing management interventions.

The three subsystems are the institutional, bio-physical and socio-economic subsystems. The institutional subsystem entails the management infrastructure and associated tools; the bio-physical includes the biotic and abiotic components of the ecosystem; and the socioeconomic comprises different uses that humans make of the components of the bio-

physical subsystem. These are often referred to as the ecosystem services (*sensu* Millennium Ecosystem Assessment 2003). The overall goal of the plan, the strategic goals and the respective strategic objectives for the thematic areas are given Table 1-1. In addition the table presents the key issues from which the operational objectives are derived. The strategic objectives were subjected to a strength, weakness, opportunities and threats (SWOT) analysis to determine operational objectives which are specific, measurable, achievable, realistic and timebound (SMART). These were in turn translated into action plans which are given in Appendix I.

Table 1-1: Goals, Objectives and Key issues

Overall goal of the ODMP is to integrate resource management for the Okavango Delta that will ensure its long-term conservation and that will provide benefits for the present and future well being of the people, through sustainable use of its natural resources				
THEMATIC AREA: INSTITUTIONAL				
Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels	To establish viable management institutions for the sustainable management of the Okavango Delta	I.1.1	There is need to establish a regional DEA office in ODRS and strengthen its capacity to coordinate and monitor the implementation of the ODMP.	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP by March 2008
		I.1.2	There is need to build the capacity of communities for managing and ensuring the sustainable use of natural resources	NWDC to strengthen the capacity of the communities in management and sustainable use of the natural resources by
		I.1.3	Manpower capacity of the fisheries division needs to be addressed	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources by 2012
		I.1.4	The solid waste collection services within the ODRS need to be improved.	NWDC to improve solid waste collection within the ODRS by 2012
		I.1.5	The solid and liquid waste infrastructure in the ODRS needs to be improved.	NWDC to improve the solid and liquid waste infrastructures in the ODRS 2012
		I.1.6	The institutional capacity of the district waste management needs to be improved	NWDC to improve the institutional capacity of the district waste management.
	To improve the planning and regulatory framework for sustainable management of the Okavango Delta	I.2.1	There is need to harmonize legislation and policies applicable to the ODRS.	DEA to facilitate the process of harmonizing legislation and policies applicable to ODRS by 2012
		I.2.2	There is need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation
		I.2.3	There is need to facilitate the approval of the Draft National Wetlands Policy and Strategy by Parliament.	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy by 2012
		I.2.4	Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS.	HOORC to improve accessibility and updating of data and information for resources planning and management by 2012
		I.2.5	Research in the ODRS needs to be coordinated.	HOORC to implement the recommendations of the Research Strategy by 2012
		I.2.6	The long standing problem of fisheries conflicts need to be resolved.	DWNP to put in place fishery conflict resolution mechanisms

Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels		I.2.7	Haphazard and delays in land allocations as well as poor record keeping need to be reduced.	TLB to allocate land in an orderly and timely manner through the use of a land management database by 2012
	To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta	I.3.1	There is need to establish effective communication amongst ODMP stakeholders at all levels during plan implementation.	DEA to promote effective communication amongst stakeholders by implementing the communication strategy by 2012
		I.3.2	Uncertainties about stakeholders continuing to meaningfully participate in the implementation of the ODMP.	HOORC to provide participatory services to the ODMP implementing institutions through the provisions of the MoU between UB and MEWT by 2012 and long-term incorporation of these services into the HOORC functions
		I.3.3	Continued engagement of Namibia and Angola in the sustainable use of the Okavango River Basin.	DEA to facilitate engagement of Angola and Namibia through the targeted OKACOM activities.
		I.3.4	Limited awareness of the ecological impacts of tourism activities in the ODRS.	DWNP to organise an awareness raising campaign to reduce the negative ecological impacts of tourism activities in the ODRS by 2012.
THEMATIC AREA: BIO-PHYSICAL				
To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all organisms dependant on it	To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them	B.1.1	Water quality and sedimentation monitoring.	DWA to improve the water quality and sedimentation monitoring
		B.1.2	Understand habitat requirements of keystone species.	DWNP to carry out baseline surveys on keystone species
		B.1.3	Lake Ngami needs to be declared a bird sanctuary	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary
		B.1.4	The existing and potential breeding sites for slaty egret need to be protected.	DWNP to protect existing and potential breeding sites for the slaty egret
		B.1.5	Inadequacy of base line data on fish stocks in the ODRS.	DWNP to develop and implement fish stock monitoring programme
	To maintain or restore the wetland habitats and ecosystems of the Okavango Delta	B.2.1	Reduce the impact and frequency of uncontrolled veld fires.	DFRR to implement the guidelines on appropriate fire management practices as contained in the Fire Management Plan
		B.2.2	Limited knowledge on the impact of large herbivores on sensitive habitats	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats
		B.2.3	Overgrazing by livestock	DAHP to develop and implement range carrying capacity guidelines
		B.2.4	The risk of Tsetse re-infestation needs to be reduced.	DAHP to reduce the risk of Tsetse re-infestation by promoting dialogue with Angola, Namibia and Zambia to create a tsetse free zone.

THEMATIC AREA: SOCIO-ECONOMIC				
Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders	To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders	S.1.1	Establish the non-use economic values for the ODRS	DEA to undertake an estimation of non-use economic values for the ODRS
		S.1.2	6.1 Possible impacts of tourism activities on the ODRS ecosystem.	DoT to monitor and mitigate the impact of tourism in the ODRS
		S.1.3	8.4 Sustainable use of vegetation resources.	DFRR to develop regulations for sustainable use of vegetation resources
	To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.	S.2.1	2.2 Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation
		S.2.2	4.1 The need to manage channel blockages to sustain communities access to livelihood activities	DWA to manage small channel blocks primarily for communities access to livelihood activities.
		S.2.3	5.1 The human/wildlife conflicts.	DWNP to assess and mitigate the human/wildlife conflicts
		S.2.4	6.2 The level of citizen participation in the tourism sector.	DoT to develop and implement strategies to enhance citizen participation in the tourism sector
		S.2.5	6.3 The tourism products need to be diversified from being wildlife based to other areas.	DoT to develop and implement strategies for tourism product diversification
		S.2.6	10.2 Traditional access rights to natural resources in concession areas need to be upheld.	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected
		S.2.7	12.2 The livestock/wildlife interactions need to be reduced.	DAH to develop programmes for the reduction of livestock/wildlife conflicts.

IMPLEMENTATION STRATEGY

The implementation strategy is guided by the common and shared vision of the Okavango Delta Ramsar Site. The vision is designed to provide guidance to policy development and execution of the various programmes that support the sustainable management of the Okavango Delta Ramsar site, to help inform the Government and its partners of the stakeholder priorities for future action and to provide a common focus and direction for the diverse stakeholders utilising and managing the natural resources within the Ramsar site (ODMP – Okavango Delta Ramsar Site Common Vision for 2016, 2006).

Furthermore the implementation strategy sets out parameters which provide the context for future actions in the wise use and management of the Okavango Delta Ramsar site. These are largely premised on the values which support the common shared vision. The parameters are in the form of management strategies, zoning, prescriptions and action plan (projects).

The implementation of the ODMP will be coordinated by the Department of Environmental Affairs (DEA) through an integrated approach in order to optimize the use and management of resources. The ODMP recognizes the current sectoral mandates and while it seeks to

maintain them it accords prominence to the seemingly subdued elements of integration which are fundamental to the overall objective of the ODMP. It is proposed that University of Botswana HOORC provides DEA with the required technical support.

In order to strengthen its capacity to effectively coordinate the implementation of the ODMP and further service the Ngamiland District in terms of its broad management functions, DEA will have a presence in Maun. This will further be strengthened by HOORC through technical support to DEA.

With respect to the sectoral responsibilities outlined in the action plans, the current institutional arrangements still hold. The ODMP recognizes the institutional inadequacies which may hinder implementation and appropriate objectives are formulated to address these.

It is proposed that implementation of the plan be guided by the Okavango Wetland Management Committee (OWMC) which is a district multi-sectoral structure set up during the development of the plan. The establishment of the OWMC is provided for in the Draft National Wetlands Policy of 2000. This committee like any other committee in the district should be accountable to the District Development Committee (DDC).

The ODMP recognizes the existing financial arrangements and processes in government and this sets the premise for the financial and budgetary requirements for its implementation.

In order to secure financial resources for implementation, government departments and institutions should follow the normal budgeting procedures. This entails that activities to be undertaken during the implementation of the plan be mainstreamed into other existing or on-going programmes as planned under the current District Development Plan 6 (DDP6) and National Development Plan 9 (NDP9) as well as the subsequent plans.

The ODMP is aligned with national and district planning processes and in this respect, its planning horizon will coincide with those of the DDPs and NDPs which span a period of six years. The ODMP action plan has been incorporated into the District Strategic Plan which ends in March 2009.

Institutions will make budget provisions through the normal funding mechanisms. The ODMP action plan will overlap with the other planned sectoral projects funded through the same government funding systems within the context of DDPs and NDPs. The reviews and audits of the ODMP should be aligned to a normal planning process.

MONITORING AND EVALUATION PLAN

A Monitoring and Evaluation (M&E) plan has been developed to track the implementation of the ODMP. The monitoring will be carried out at two levels. The first entails monitoring of implementation of outputs during the ODMP planning, and the second monitors changes at operational objective level during implementation of the plan. Within the context of government planning structure the M&E will be equivalent to the performance measurement tool which usually accompanies strategic plans.

CONCLUSIONS

The Okavango Delta Management Plan (ODMP) project reached its official completion target. Four milestones (inception, framework management plan, draft management plan and final management plan) were programmed for the delivery of the project through

collaborative efforts of twelve sectoral components anchored within ten organizations both at central and local government as well as the University of Botswana.

The ODMP process was largely issue-driven. Stakeholder consultations were held at community, departmental, private sector, NGO/CBO and policy making level. Their diverse interests and expectations on the ODMP were recorded, analysed and to the extent possible incorporated into management options and action plans contained in the draft management plan.

The approach of the ODMP was also premised on the Ramsar Planning Guidelines as well as to a large extent informed by the policy framework in Government. A learning-by-doing course of action was pursued in order to adapt methods which support the overall objective and principles of the ODMP as well as the sectoral functions of participating organizations. It was therefore not plausible for the process to follow to the letter the methodology outlined in the Ramsar Planning tool. Some of its elements, can only be implied.

The focus of the ODMP was on integrated resource management. There is evidence of success attained through improved cross-sectoral planning even outside the ODMP programme itself. Sectors apply themselves in a more focused way and can readily identify the synergies and complementary support which they can source from other sectors in a more coorperative manner and without necessarily shifting burdens or pointing fingers. Integration is a process. ODMP has demonstrated that it is possible to integrate; its maturity will be realised through change of mind-set as well as indicators for success in achieving the plan objectives over time.

Technical objectives often take supremacy in planning and it is becoming evident that management issues that have recurred over time cannot only be solved by applying science and academic methods. The ODMP participatory methods, which take account of societal needs, create room for improved understanding and ownership of the decisions which are ultimately made. A deliberate effort was made to engage all stakeholders through the services of a full-scale communications team and a participatory planner. Such arrangements will continue during implementation to keep the level of interest high and strengthen opportunities for stakeholder involvement in decision making.

The sustainability of the ODMP process in the long-term continues to be raised during all deliberations and ODMP platforms. The coordinating role which the DEA possesses is now visible within the district. The DEA's permanent location in Maun will enhance opportunities for more focused environmental planning. Through incorporation into the District Strategic Plan the ODMP has found its place in the District and National Development Planning frameworks. At a more technical level, the existence of the Harry Oppenheimer Okavango Research Centre in Maun creates an opportunity for direct links with the ODMP implementation in order to guide the sectoral activities within the agreed research strategy.

Data gathering, updating, storage and processing for more informed decisions is key to the implementation of the ODMP. As new information is acquired through focused research which should benefit communities in the ODRS, action plans should be adjusted accordingly. The ODMP should remain adaptable and flexible for it to be acceptable and effective. Annual sectoral reviews should be institutionalized to keep the plan relevant.

Capacity building at institutional and community levels is crucial to enhance understanding, dispel misconceptions, and to create opportunities for sustainable use and management of the Okavango Delta resources. The ODMP project had allocated funds for

this, but sectors should continue to budget annually for training and capacity building programmes which are relevant for the advancement of their ODMP implementation programme.

Regional or basin-wide collaboration is inevitable. Persuasion and constructive negotiations should be pursued through existing mechanisms such as the OKACOM. Botswana stands to strengthen its negotiation power if its positions are based on information that is emperical. Mechanisms for continued updating at the regional platforms such as the ODMP Communication Strategy are encouraged. Partnership building with and participation in regional programmes and projects should be encouraged to push the basin-wide interests of the ODMP forward and therefore solicit buy-in from basin-states.

Recommendations from key ODMP studies should be tabled for consideration at appropriate levels and implemented. Through the ODMP monitoring and evaluation tool the impact of the implemented results should be noted and negative ones avoided while positive ones should be adopted and replicated in other parts of the Delta.

Implementation of pilot projects, identification of best practices, infusion of traditional knowledge and enhancement of livelihood are key elements that can enrich the impact of the plan. These elements will constitute a substantial part of the workplan under the communication component. Lessons derived from these processes will inform management options and practices and can be shared locally, regionally (within the basin) and internationally.

Resource allocation commitments for integrated wetland management planning should consider the dynamism of the processes adopted to service the needs which may be adequately articulated in project documents but assume a highly varied form when actually implemented. The finances, institutional arrangements, ecosystem dynamics, and socio-political contexts within an integrated planning framework present a complex situation where adjustments should happen as implementation evolves.

1 INTRODUCTION

1.1 OKAVANGO DELTA VISION

The common and shared vision for the Okavango Delta is:

"A carefully managed, well functioning ecosystem that equitably and sustainably provides benefits for local, national and international stakeholders".

1.2 OVERALL GOAL OF THE OKAVANGO DELTA MANAGEMENT PLAN

The Overall Goal of the delta management plan (ODMP) is:

"*to integrate resource management for the Okavango Delta that will ensure its long-term conservation and that will provide benefits for the present and future well-being of the people, through sustainable use of its natural resources*"

The Overall Goal further translates to three Strategic Goals, each with several Strategic Objectives, for the ODMP (see section 4 for an explanation of the development of these):

Strategic Goal 1. *To establish viable institutional arrangements to support integrated resource management in the Okavango Delta;*

> Strategic objective 1.1*: To establish viable management institutions for the sustainable management of the Okavango Delta;*
>
> Strategic objective 1.2*: To improve the planning and regulatory framework for sustainable management of the Okavango Delta;*
>
> Strategic objective 1.3: *To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.*

Strategic Goal 2. *To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services;*

> *Strategic objective 2.1: To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them;*
>
> *Strategic objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.*

Strategic Goal 3. *To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders;*

> *Strategic objective 3.1*: to sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders;
>
> *Strategic objective 3.2*: to develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.

1.3 THE NEED FOR A MANAGEMENT PLAN

The existing diverse and complex nature of the Okavango Delta in terms of its natural resources, its wide range of users and uses, its multiple managers (both in and outside government and including communities) and an array of national laws, policies and guidelines as well as regional and international conventions, agreements and protocols are all factors that dictate the need for an integrated management planning process for the Okavango Delta.

While the ultimate goal of the plan is sustainable use of the Delta natural resources, it should at the same time be aligned with the expectations of the national development goals articulated through the District Development Plans and National Development Plans as well as Vision 2016. The plan, once adopted, should thus align sector policies, legislation strategies, etc., in such a way that the long-term ecological functioning of the Delta is ensured.

1.4 LEGISLATIVE, POLICY AND PLANNING FRAMEWORK

The context of the Okavango Delta Management Plan is defined within the framework of national vision, legislations, policies, plans and strategies; regional protocols and international conventions. The most noteworthy instruments which have provisions for the development of the Okavango Delta Management Plan are described in Table 1-1 to Table 1-3.

1.4.1 NATIONAL FRAMEWORK

Table 1-1: National legislative and regulatory framework within which the ODMP is being developed

Instrument	Year	Objective	Relevance
"National Vision 2016: Towards Prosperity for All".	1997	This document sets out the Government of Botswana's long-term vision of the achievement of *kagisano*, or social harmony.	The national vision has recognised the urgent need for the Okavango Delta Environmental Master Plan, realising the complex and fragile nature of the Okavango Delta ecosystem.
Legislative instruments			
Environmental Impact Assessment Act	2005	The Act provides for environmentally sound policies, programmes and projects	The Okavango Delta is a complex and sensitive ecosystem hence environmental impacts of any policy, plan, programme or development project should be assessed to ensure that there minimal disturbance to the system
Wildlife Conservation and National Parks Act	1992	The Act provides for the conservation and management of the wildlife of Botswana	Several sites (in the Moremi Game Reserve and a number of Wildlife Management Areas in the Okavango Delta Ramsar Site) are protected under this act.
Forest Act	1976	The Act provides for the regulation and protection of forests and forest products in Botswana	The ODRS is blessed with high abundance of vegetation resources in this case the forest resources.
Fish Protection Act	1975	This Act provides for the effective regulation, control, protection and improvement of fish and fishing in Botswana	Fisheries is a very important sector within the ODRS. Fish resources are key in the subsistence, sport or angling fishery and commercial sectors. The sector is riddled with resource use conflicts.
Tourism Act	1992	The Act makes provision for regulating of the tourism industry with regard to promoting its development and well being	The Okavango Delta is a major tourism destination in Botswana with the majority of leisure tourists coming to Botswana to see and experience the Delta. Tourism is a major economic activity within the ODRS
Water Act	1968	The Act regulates the management and use of water resources within Botswana	The major driver of the Okavango Delta ecosystem is water. The use and management of water has great influence on the maintenance and sustenance of the Okavango Delta.

Instrument	Year	Objective	Relevance
Herbage Preservation Act	1977	It is the legal framework administering the management of fire in Botswana	Fire is a critical factor in the functioning of the Okavango Delta ecosystem. The Act provides a well structured set of rules for a potential integrated fire management system in Botswana including the ODRS.
Agricultural Resources Conservation Act	1976	The general aim of this Act is to control and conserve agricultural resources in Botswana.	Agricultural resources are broadly defined to include animals, birds, plants, water, soils, vegetation and vegetation products, fish and insects. Management of these resources are key in the ODRS
National Policies and plans			
Draft National Wetlands Policy and Strategy,	2000	The Draft Policy provides the contextual and institutional framework for appropriate and effective management, conservation and sustainable use of Botswana's wetlands resources	The provisions of this policy facilitated for the development of the Okavango Delta Management Plan with the goal to integrate resource managemt of the Delta for the long-term conservation and sustainable use of Delta resources
National Policy on Natural Resources Conservation and Development,	1990	This Policy focuses on key environmental issues and solution packages such as the National Conservation Strategy Action Plan and the establishment of the National Conservation Strategy Coordinating Agency.	The policy fully captures the importance of the conservation and development vis-à-vis the natural resources of the country. The Okavango Delta is a key national asset and the provisions of this policy contribute immensely to the conservation of the Delta through strategic and coordinated actions.
National Biodiversity Strategy and Action Plan	2004	The goal of the strategy and action plan is long-term health of Botswana's ecosystems and related species, and to encourage sustainable and wise use of resources through the provision of a framework of specific activities designed to improve the way biodiversity is perceived, utilised and conserved	The Okavango Delta is a major biodiversity hotspot nationally. The mosaic and variety of habitats found within the ODRS is home to a large number of fauna and flora. The relevance of the strategy to the Delta cannot be over-emphasised.
Tourism Policy	1990	The policy provides guidelines for planning, developing and managing tourism in Botswana. It is designed to ensure that tourism activities are carried out on an ecologically sustainable basis	The policy provides local communities with direct and indirect benefits from tourism activities as well as encouraging communities to appreciate the value of wildlife and its conservation. It avails opportunities for the rural areas to participate in wildlife-based activities including tourism. This policy is highly relevant to the Okavango Delta given that it is the country's tourism hub
Wildlife Conservation Policy	1986	The Policy provides strategies for development of a viable and commercial wildlife sector through practice of sustainable resource utilization and conservation in Wildlife Management Areas (WMA) and in the process addresses issues of community livelihoods through citizen participation in the wildlife industry	The Okavango Delta is well endowed with wildlife resources the management of which is critical. The Okavango Delta as a tourism product is dependent on the conservation and proper management of wildlife resources.
National Water Conservation Policy and Strategy Framework	2002	The Water Policy has amongst its objectives, the protection, conservation, and efficient use, management of water resources, and protection and restoration of the environment. The Policy seeks to use water conservation to promote environmental sustainability, economic efficiency and social equity.	Botswana has a huge water deficit and the Okavango Delta is viewed by some stakeholders as an alternative source of water. The relevance of this policy is critical in that through promotion of water conservation measures it helps to divert attention from the Delta as alternative water source.
National Settlement Policy	1998	The Settlement Policy provides for the creation of settlements and the re-settlement of people as part of a developmental process.	Several settlements are dotted all over the ODRS most of which are ungazzeted and demand to be recognised by government. Some of these settlements are located in very sensitive areas with no services provided which presents a challenge to the conservation of the Okavango Delta.

Instrument	Year	Objective	Relevance
The Revised National Policy on Rural Development	1997	The Revised National Policy on Rural Development is a framework policy to link and facilitate coordination of the various sectoral policies, and to engender a common vision and unity in pursuit of rural development	The ODRS is predominantly rural with huge challenges for development. There is a need to balance development with environmental conservation
Development Plans and Strategies			
National Development Plan 9 (NDP 9)	2003 - 2009	NDP 9 calls for appropriate use of natural resources and consideration of environmental costs in planning for development	Within the Government's development goals and objectives, sustainability is seen as a strategic concept that links population, the economy and natural resources together in the context of socio-economic development. The integrated management plan for the Okavango Delta takes these issues into consideration
Ngamiland District Development Plan 6 (NDDP 6)	2003 - 2009	One of the NDDP 6 key planning issues is Environmental Conservation. The associated development goal is "to retain the ecological and environmental integrity of the district through improved conservation measures	The objectives are to integrate environmental planning issues into all district development sector plans throughout the planning period, develop a district environmental strategy and promote sustainable natural resource use across all commercial activities in the district, hence ODMP
Botswana Tourism Master Plan	2000	The master plan serves as a basic guideline for development of tourism, enabling the decision makers to agree on the principles for the direction of tourism development for the next decade	The Tourism and Community Based Natural Resources Management (CBNRM) Master Plans developed under the ODMP are a further elaboration of the National Tourism Master Plan.
National Water Master Plan	1991	The NWMP provides development and management strategies for water resources in the country	Water is an economic, social and environmental resource that provides the inter-sectoral linkages. The Government is therefore adopting an integrated approach to water resource development. The Government of Botswana is currently reviewing the National Water Master Plan (NWMP) that was completed in 1991
Ngamiland District Settlement Strategy	2003 - 2027	The overall intention of the strategy is to ensure orderly development and growth of settlements within the Ngamiland District	One of the goals of the strategy is to protect and preserve the environment generally in the district, and sustainably utilise its natural resources

1.4.2 REGIONAL FRAMEWORK

Table 1-2: Regional agreements and protocols which have a direct bearing on the development and implementation of the ODMP

Regional Protocols			
Permanent Okavango River Basin Agreement	1994	The Permanent Okavango River Basin Commission (OKACOM) is a political agreement which commits the river basin states to work toward joint management of the Okavango River System.	Under the OKACOM Agreement, the riparian countries of Angola, Botswana and Namibia are working toward the implementation of an Integrated Management Plan (IMP) for the basin on the basis of an Environmental Assessment (EA). OKACOM is important in that the Okavango Delta is part of a shared river basin, the Okavango River Basin. The ODMP is expected to contribute to the river basin management plan.
Southern African Community (SADC) Shared Watercourse Systems Protocol	Signed in 1995 and came into effect in 2001	The protocol calls for equitable utilization of shared water courses and monitoring of the implementation of integrated water resources plans in shared water courses by Member States	The Okavango River Basin, which the Okavango Delta is part of, is a transboundary river basin and it is important that its management be a joint effort amongst the three riparian states which are all SADC member states
SADC Protocol on Fisheries	Singed in 2001 and effected in 2003	This Protocol applies, amongst others, to living aquatic resources and aquatic ecosystems within the SADC states; living aquatic resources of SADC states that extend outside the areas of their jurisdiction; and fishing by nationals of SADC states and activities directly related to fishing	The Okavango Delta is a wetland system which supports about 71 identified fish species. The fish resources found in the delta provides livelihoods to the local communities within the ODRS. The fishery industry has to comply with the framework of the protocol at regional level (SADC).

Regional Protocols			
SADC Protocol on Development of Tourism	Signed in 1998 and effected in 2002	The objectives of the protocol are to use tourism as a vehicle to achieve sustainable social and economic development, and to ensure equitable, balanced and complementary development of the tourism industry region-wide	The Okavango Delta is one of the iconic tourism products within the SADC region. Within Botswana the Delta is a major tourism destination which supports the economy of the ODRS. The Okavango Delta also forms part of the Kavango-Zambezi Transfrontier Conservation Area. The intention is to offer the area as a regional tourism product, hence the relevance of the provisions of the protocol
SADC Protocol on Wildlife Conservation and Law Enforcement	2003	Its principal objective is to establish common approaches to the conservation and sustainable use of wildlife resources and to assist with the effective enforcement of laws governing those resources	Some of its aims are to assist in building national and regional capacity for wildlife management, conservation and enforcement of wildlife laws; to promote the conservation of shared wildlife resources through the establishment of trans-frontier conservation areas; to facilitate community-based natural resources management practices for management of wildlife resources. The Okavango Delta is rich in wildlife resources and hosts a significant number of community based organisations who benefit from wildlife resources

1.4.3 INTERNATIONAL FRAMEWORK

Table 1-3: International agreements and conventions with direct relevance to the ODMP

International Conventions			
The Convention on Wetlands of International Importance (Ramsar Convention)	Botswana ratified the convention in 1997	The convention advocates for the wise use of wetlands and their sustainable utilisation for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem	The Government of Botswana ratified the Ramsar Convention and became a contracting party as of the 4th April 1997 and listed the Okavango Delta as a Ramsar Site. The obligations under this convention coupled with national interest necessitated the preparation of this management plan.
United Nations Convention on Biological Diversity	Botswana ratified the convention in 1997	The objectives of the Convention are to conserve biological diversity, promote the sustainable use of biodiversity components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources	The Okavango Delta is rich in biodiversity and genetic resources, the use and conservation of which is within the framework of this convention.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Botswana ratified the Convention in 1978	The aim of the convention is to prevent extinction of endangered species by controlling international trade in the endangered species and their by-products	CITES deals with the trade in a number of wetland flora and fauna species, including elephants, and therefore is relevant to the management of the Okavango Delta
United Nations Convention on Combating Desertification (UNCCD)	Botswana ratified the convention in 1996	The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa. It flags effective action at all levels; international cooperation and partnership.	The Okavango Delta is located within the Kalahari Desert which is susceptible to droughts and degradation. The utilisation of the vegetation resources if not controlled properly may contribute to desertification. The convention provides a framework to facilitate action to combat desertification.
United Nations Framework for Convention on Climate Change (UNFCCC)	Botswana ratified the convention in 1993	The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.	The Okavango Delta is an ecosystem which is highly susceptible to the impacts of climatic change. The Okavango Delta is critical in that it acts as carbon sink through carbon sequestration
United Nations Convention on the Law of Non-navigational use of International Watercourses		It obliges riparian states to take into account the effects of the use or uses of the watercourses between riparian states and encourages harmonisation of use	It provides the legal foundation for regulating the shared Okavango River Basin of which the Okavango Delta is a key ecosystem

Relavant conventions which Botswana is not party to			
Convention on migratory species	1979	The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale	The Okavango provides habitat for a number of migratory species especially avi-fauna. The maintance of the Delta is crucial for the conservation of these species. Some of the species have the potential to transmit diseases hence this convention is critical.

1.5 SITE SELECTION

The Okavango Delta was selected as a wetland of international importance in accordance with the Ramsar Convention which identifies a wetland of international importance in terms of ecology, botany, zoology and limnology or hydrology.

The Okavango Delta is an inland drainage system which is important for approximately 1300 plant species, 71 fish species, 33 amphibians, 64 reptiles, 444 birds and 122 mammals.

The Delta also contains high densities of large mammal species particularly elephant. It is the habitat of one of the largest remaining populations of the African wild dog (*Lycaon pictus*) and is a stronghold for the Sitatunga antelope (*Tragelaphus spekii*) and the Nile crocodile (*Crocodilus niloticus*). One endemic reptile species, the Tsodilo Gecko *(Pachydactylus tsodiloensis*), has been identified. Two resident bird species, the Wattled Crane (*Burgeranus carunculatus*) and the Slaty Egret (*Egretta vinaceiqula*), are globally threatened.

The currently known flora of the Okavango Delta comprises about 1300 taxa on the species and lower levels, of which 1260 taxa are on the species level. They belong to 530 genera and 134 families. One near endemic has been identified, the ground orchid (*Habenaria pasmithii*).

1.6 PLANNING COORDINATION, APPROACH AND PROCESS

1.6.1 PLANNING COORDINATION

The custodian of the ODMP is the Ministry of Environment, Wildlife and Tourism (MEWT). The development of the ODMP was guided by the Department of Environmental Affairs (DEA) through a Project Secretariat in Maun.

The ODMP spans the functions relating to policy direction, communication, research, data management, participatory planning, water resources, wildlife management, vegetation resources, sustainable tourism, community based natural resources management (CBNRM), fisheries management, settlement planning, land management, waste management and livestock management. The ODMP planning was primarily driven by the desire to address the identified management issues. These issues, which were identified through stakeholder consultation, provided the basis for the key ODMP components which are tabulated in Table 1-4.

Table 1-4: Project Components

Component	Responsible Institution
Policy, planning and strategy – including project management, co-ordination, integration and technical assistance.	DEA and IUCN
Communication	DEA
Research, data management and participatory planning:	Harry Oppenheimer Okavango Research Centre (HOORC).
Hydrology and water resources:	Department of Water Affairs (DWA).
Sustainable wildlife management:	Department of Wildlife and National Parks (DWNP).
Sustainable tourism and CBNRM:	Department of Tourism (DoT) and North West District Council (NWDC).
Sustainable fisheries management	DWNP, Division of Fisheries
Sustainable vegetation resources management	Department of Forestry and Range Resources.
Physical planning	NWDC, Physical Planning Unit (PPU).
Land use planning and land management	Tawana Land Board (TLB) in association with DLUPU
Waste management	NWDC, Environmental Health Department (EHD).
Sustainable livestock management	Department of Animal Health and Production (DAHP).

1.6.2 PLANNING APPROACH

The approach adopted under the ODMP is largely based on the Government of Botswana planning system and complemented by elements from the *New Guidelines for Management Planning for Ramsar Sites* and the Ecosystem Approach. In its demonstration of the key ecosystem management principles contained in these planning tools, the ODMP was guided by the need to address key management issues experienced over the years by diverse stakeholders. This therefore was one of the key drivers of the process.

Though issue driven, the ODMP assumes a strategic framework position in the Ngamiland District planning context. In this respect, specific and detailed management proposals and interventions still remain the responsibility of the sectors. ODMP in this regard outlines the key strategic interventions to address the management issues. To this effect all the 12 components have sectoral management plans and strategies, which are products of specialised studies commissioned during the ODMP planning phase and some of these are District Tourism and CBNRM Master Plan, Fire Management Plan, Research Strategy, etc.

The ODMP is anchored on the main principle of strengthening ownership through accountability and the active participation of all stakeholders both during development and implementation of the plan. Ownership in this context is premised on participatory mechanisms, partnership building at all levels and adopting an integrated and dynamic principle which recognises gender, HIV and AIDS, and livelihoods elements.

1.6.3 PLANNING PROCESS

The ODMP planning was highly participatory. The participatory approach in this respect entailed engagement of various stakeholder groups during the five phases of the project which were concluded with critical milestones. These were the project design, inception, framework, draft management and final management phases. These phases were sequential building blocks, that is, each phase led to the subsequent one.

1.6.3.1 Project Design Phase

Following Botswana's accession to the Ramsar Convention in 1997, the Department of Environmental Affairs (DEA) (formerly National Conservation Strategy Coordinating Agency, (NCSA) through the support of the Ramsar Bureau commissioned a design mission, which detailed a proposal for the development of a management plan for the Okavango Delta in 2001 (HOORC, et al, 2001). A parallel exercise to formulate the National Wetlands Policy and Strategy was also initiated.

The proposal identified the key management issues, formulated objectives, outlined project activities and funding requirements. This was followed by a situational analysis which entailed information gathering, review of existing literature and stakeholder consultations. 200 issues were identified, clustered into thematic areas and developed into major project components (HOORC, et. al, 2001). This process was followed by an appraisal mission in 2001 to determine the adequacy of the proposal, confirm management issues and recommended a "hot spots approach" to deal with priority issues to be addressed under the ODMP planning (Appraisal Mission Debriefing Notes, 2001).

1.6.3.2 Inception Phase

Stakeholder buy-in was key at the initial planning stages of the ODMP. The process made a deliberate effort to consult and allow for feedback to confirm and prioritise issues identified during the design phase.(ODMP – Inception Report, 2005).

The various stakeholders were engaged as individual groups through the different fora which, culminated in a multi-stakeholder workshop which was held in November, 2004 and a report on the proceedings was produced (ODMP – Inception Report Workshop Proceedings, 2004). Drawing from the stakeholder analysis that was carried out during the ODMP planning, the stakeholder consultation took an approach which engaged different stakeholder groupings as outlined below.

Community engagement
The community stakeholders were engaged through a series of kgotla meetings and workshops. In November and December 2003 and February and March 2004, 33 kgotla meetings were held in most of the major villages in and around the Delta. Detailed reports on the issues and their prioritization as well as analysis of the consultative processes were produced to guide the planning process in determining the areas which need management interventions (ODMP – Community Consultation and Feedback Report, 2004, ODMP – Analysis of the Participatory Process of the Okavango Delta Management Plan, 2004).

Private sector engagement
In January 2004, a special meeting dedicated to representatives of the private tourism sector was organised and held in Maun. From the 120 invitations sent out, approximately 60 different companies comprised of 81 representatives attended reflecting the high level of interest from the tourism sector in the project. The meeting was structured in a similar way to the kgotla meetings although in this instance members of the Project Secretariat made presentations not only on the project as a whole but also on each individual component. There was again an extensive question and answer session and representatives were given an opportunity to raise issues and concerns and make suggestions. These were captured in a report (ODMP – Private Sector Workshop Proceedings, 2004).

Institutional engagement
Direct consultations were undertaken by the Project Secretariat with local NGOs, government offices and many other institutions in the district, including both those directly

involved in implementing ODMP components and those not so. Regular briefings have also been provided to various district authorities and officers including the District Commissioner, the Council Secretary, Tribal Administration, District Development Committee, the District CBNRM Forum, the Full District Council and the Tawana Land Board.

1.6.3.3 Framework Plan Phase

The phase covered the period from December 2004 to November 2005. It entailed further prioritization of issues raised during the inception phase and development of broader management intervention objectives. This was achieved through three major focussed workshops targeting different tiers and community consultations.

Community engagement
A workshop for the community leaders (Chiefs/headmen, VDC, CBOs, ODMP Contact Persons) was held in Shakawe in February 2005 and its proceedings were documented. The workshop led to an agreement on priority issues which require management intervention (ODMP – Shakawe Community Leaders Workshop, 2005). A series of kgotla meetings were thereafter held in 43 villages. Community Contact Persons Officers workshops were held in October 2005 (ODMP – Community Contact Persons Workshop Proceedings, 2005).

Technical engagement
Another technical planning workshop was held in August 2005 with the ODMP project components institutions during which issues from the various stakeholders were discussed, prioritized and the approach in dealing with them was agreed upon (ODMP – Technical Backstopping Mission Report, 2005). This workshop resulted in the development of prioritisation criteria, strategic goals; and operational objectives for issues which were prioritised as requiring management interventions.

District authorities
Subsequent to the technical workshop, several workshops were held to discuss and get feedback on the priority areas as well as the broad management objectives. Two workshops were held for the North West District Councillors and Tawana Land Board in November and December 2005. The outcomes of the councillors' workshop are contained in ODMP – North West District Councillors Workshop Proceedings (2005). The Framework Plan was presented to the Members of Parliament whose constituencies fall within the Ramsar Site in November 2005.

The Framework Plan phase culminated with a multi-stakeholder workshop in December 2005 where the plan was presented and discussed (ODMP – Framework Plan Workshop Proceedings, 2005).

1.6.3.4 Draft Management Plan Phase

The phase covered the period from December 2005 to July 2006. It focussed on the development of operational objectives, the action plan as well as the monitoring and evaluation tool. The participatory process leading to the preparation of the Draft Management Plan was largely anchored on one-on-one meetings with all the ODMP component institutions. The results of these meetings are reflected in what is contained in the action plan (Okavango Delta Draft Management Plan, 2006). This also culminated with a multi-stakeholder workshop in September, 2006 (ODMP – Draft Management Plan Workshop Proceedings, 2006).

1.6.3.5 Final Management Plan Phase

Subsequent to the production of the Draft Management Plan document, a series of kgotla meetings covering the whole of the Ramsar site were held as well as stakeholder-targeted workshops and one-on-one meetings with the component institutions to present and get feedback on the contents of the Draft Management Plan.

A total of 43 kgotla meetings were held in the Ramsar site between September and October 2006, Community Leaders and Private Sector Workshops were conducted in August 2006, the Tawana Land Board Workshop in September 2006, Presentation of the Draft Management Plan to the Parliament Select Committee on Agriculture and Environment and a special meeting of the North West District Council in October 2006.

The Final Management Plan was subjected to a Strategic Environmental Assessment (SEA) in accordance with the provisions of the Environmental Impact Assessment Act of 2005.

2 SITE DESCRIPTION

2.1 GENERAL

2.1.1 REGIONAL SETTING

The Okavango is an endorheic basin (that is, an internal drainage basin) in central southern Africa. The basin includes parts of three countries: Angola, Botswana and Namibia (Figure 2-2).

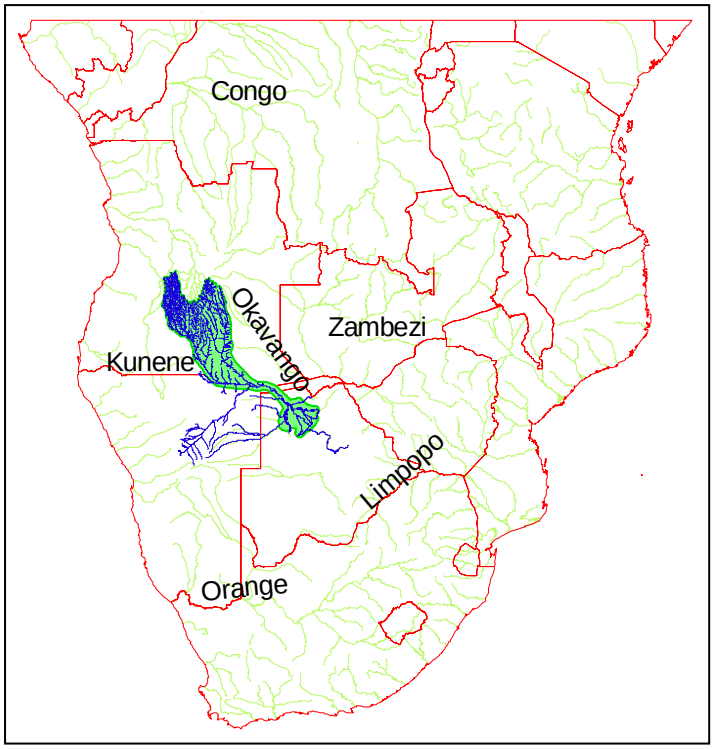

Figure 2-1: Location of Okavango and neighbouring river basins

The main source of runoff is the highlands of Angola where the Cubango and Cuito rivers rise at an altitude of around 1,600m. The climate is tropical with summer rainfall (mostly from November to March). It varies from relatively humid in the north of the basin, to semi-arid in the south. Annual rainfall averages in the range 1,100 to 1,200mm in the Angolan highlands, gradually declining southwards to 480 mm over the Delta.

Approximately 95% of the basin's runoff is generated by the headwaters from catchments in Angola. The river flows along the border between Angola and Namibia, and then crosses the Caprivi Strip into Botswana where it fans out to form the Okavango Delta. The two main contributing rivers in Angola, the Cubango in the west and the Cuito to the east, have different hydrological responses to rainfall. The Cubango reacts rapidly to rainfall, with an earlier and higher peak, and also has a low base flow. Flow in the Cuito is attenuated in extensive floodplains and swamps; the peak arrives later at the confluence and is lower, but the river sustains a higher base flow. Downstream of the confluence, the main Okavango River tends to produce two major peaks, in February and in April, reflecting the different contributions of these two tributaries; the lowest flow tends to occur in mid-endOctober.

Part of the catchment in Namibia contains streams flowing north west to join the lower reaches of the Cubango and directly into the Delta. These streams are highly ephemeral with any surface water being exploited locally, and no runoff reaches the mainstream.

The distribution of soils reflects the major differences in geology between the upper western and eastern sides of the basin. The eastern and lower parts of the basin are dominated by Kalahari sands, while the upper western region is dominated by sandstones and mudstones.

2.1.2 LOCATION OF THE OKAVANGO DELTA RAMSAR SITE

2.1.2.1 Location

The Okavango Delta Ramsar Site (ODRS) is situated in the north western part of Botswana in the Ngamiland District (Figure 2-2). It encompasses the Okavango Delta, Tsodilo Hills, the Kwando-Linyanti River system and Lake Ngami.

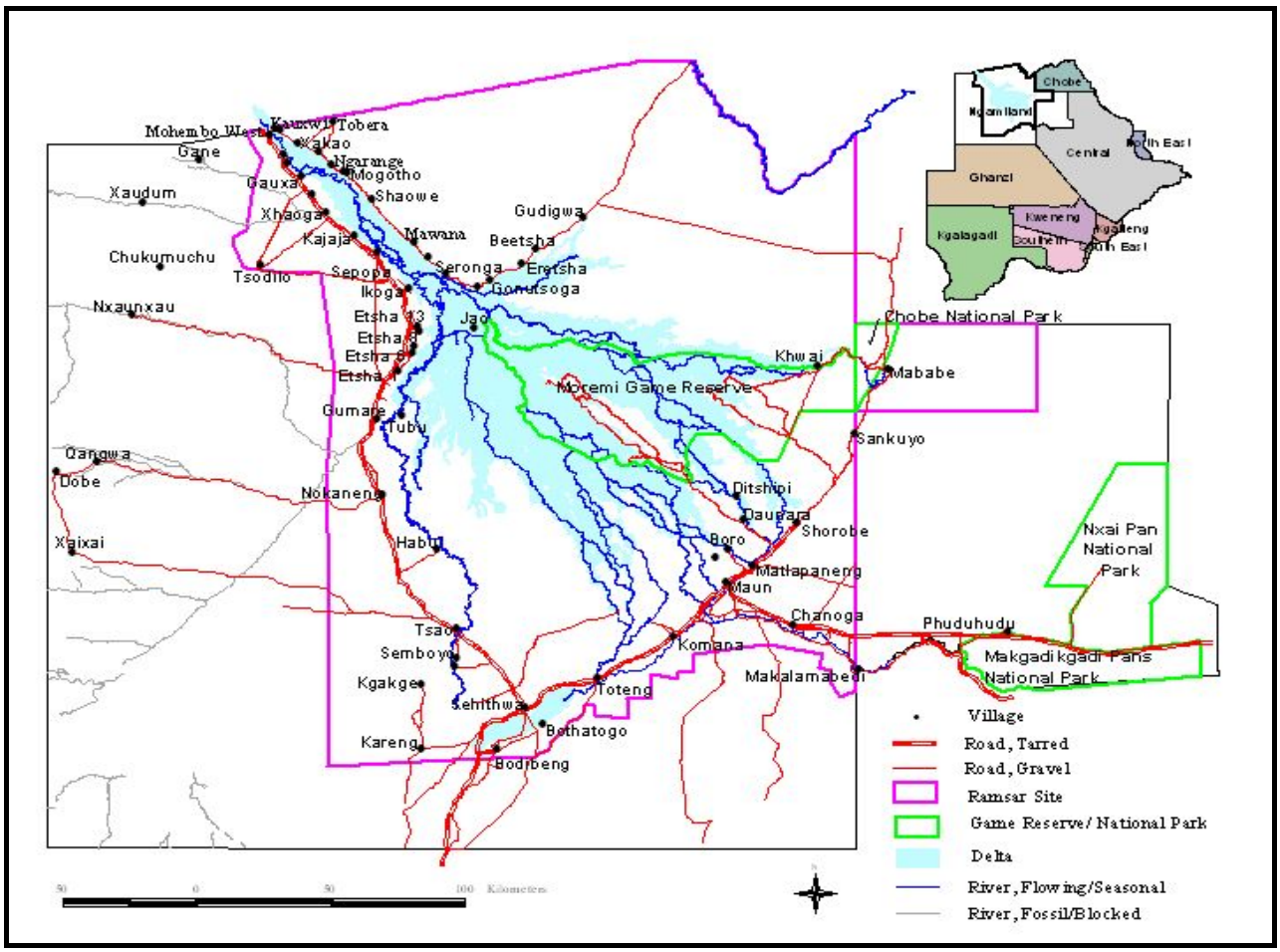

Figure 2-2: Map of the Okavango Ramsar Site

The district is bordered to the north and west by Namibia, to the south by Ghanzi district and to the east by the Chobe sub-district and Central District. The main population centres in the site are Maun, Gumare and Shakawe.

2.1.2.2 Size and boundary

The boundary of the ODRS (Figure 2-2)were rationalised in 2004 based on ecological, hydrological and land use features (ODMP – Okavango Delta Ramsar Site Revision Report, 2004). The size of the ODRS is 55 374km^2 which places it amongst the larger Ramsar sites globally. The area of permanent swamp covers approximately 6000 km^2, while the seasonal swamp varies between about 4000 and 10,000 km^2 in size, depending on the size of the flood each year (ODMP – Integrated Hydrological Modelling Report, 2006).

2.1.3 LEGAL STATUS AND RIGHTS

2.1.3.1 Ownership

Ownership of the land within which the ODRS falls is defined by the land tenure systems in Botswana (Figure 2-3). There are three land tenure systems, namely, Tribal (Communal) Land; State Land (includes most of the Protected Areas (PAs) and Forest Reserves) and Freehold Land. It is important to note that the only state land in the ODRS is NG 41 within which Mababe settlement is located (Figure 2-3). 95.4% of the land falls under the Tribal Land Tenure system, while the remaining 4.6% constitutes State Land (NDSS, 2003). There is no Freehold Land in the ODRS.

2.1.3.2 Legal Rights

Tribal land which is communally owned is held in trust for communities by the Tawana Land Board (TLB), which performs land management functions in accordance with the provisions of the Tribal Land Act of 1968.

Usage rights to land under the Tribal Land Tenure systems are either granted communally or to individuals. Land under tribal ownership is never sold and as such land transactions are only for the sake of improvements or development on land. Allocations of tribal land in the project area are made by TLB on customary law grant or common law grant basis. Under customary law grant, land allocations are made only to citizens of Botswana for residential, arable and borehole purposes. Though allotees cannot assume perpetual rights to such land, most often, they assume such rights, and pass on their titles to their children. Residential plots are issued a lease period of 99 years. Common law grants on the other hand, can be made to citizens and non-citizens alike, for commercial, tourism and industrial developments on a 50 year lease basis.

With regards to State Land, the Department of Lands holds and administers the land on behalf of the Government. State land allocation is on Fixed Period State Grant (FPSG) and Certificate of Rights (CoR) basis. FPSG is granted on a lease basis with the period of grant varying according to the land use, with industrial and commercial land being leased for a period of 50 years, while residential land use is leased for 99 years.

2.1.3.3 Site Status

Following Botswana's accession to the Ramsar Convention, the Okavango was listed and designated as a Ramsar Site in 1997. Within the ODRS are the Tsodilo Hills which are a World Heritage Site.

The site comprises the Moremi Game Reserve and Wildlife Management Areas (WMA) and Communal Areas. The communal areas are further subdivided into smaller and more specific categories that include settlements, arable lands and grazing areas.

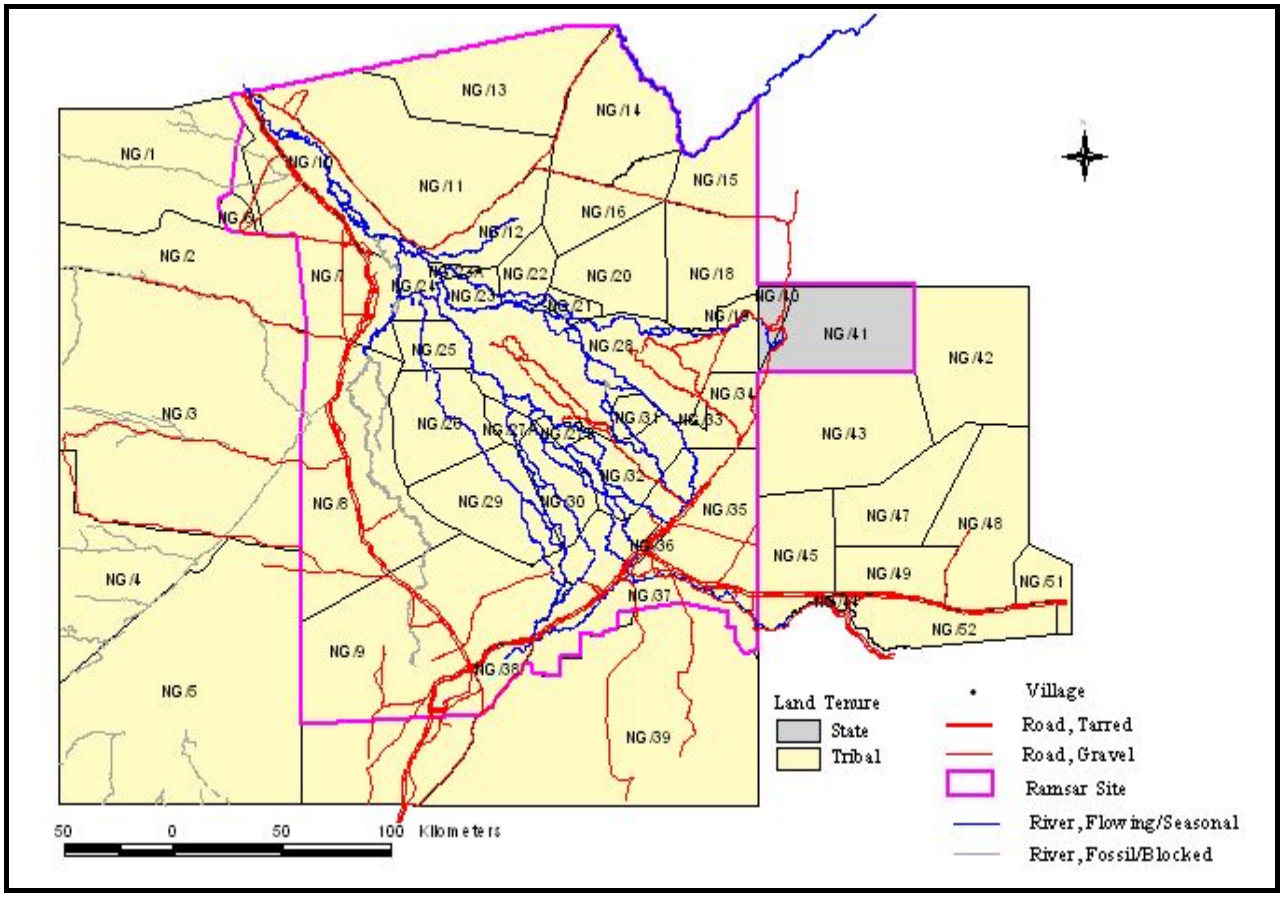

Figure 2-3: The Okavango Delta Ramsar Site Land Tenure

2.1.4 DEMOGRAPHY

The population of Ngamiland District has grown significantly over the last decades. Between 1981 and 1991 the population grew from 68 063 to 94 534 while between 1991 and 2001 it increased from 94 534 to 124 712, reflecting an increase of 39% and 32% respectively. The Ngamiland District population constitutes about 8% of the National population. This shows that the population is increasing at a declining rate. This is attributed to declining fertility rate and consequently a decrease in birth rate (Ngamiland District Settlement Strategy, 2004). These figures show an annual population growth of about 2.8%. Table 2-1 shows the characteristics of the Ngamiland District population.

Table 2-1: Summary of Ngamiland District Population Profile – 2001

Total population	124 712
Proportion of National Population	8 per cent
Population Density (per km^2)	1.1
Annual Population Growth Rate (1991-2001)	2.8 per cent
Male Population	59 661 (47,8 per cent)
Female Population	65 051 (52,2 percent)
Number of Households	26 313
Average Household Size	4,7 persons
Number of Female Headed Households	13 710 (52,1 percent)
Number of Male Headed Households	12 603 (47,9 percent)
Percentage of Employed Population	36 percent
Percentage of Unemployed Population	64 percent
Illiteracy Rate	36 percent

Source: CSO, 2001 Census of Poppulation and Housing

Using the 1936 and 1946 population census figures about 12 different ethnic groups in Ngamiland were identified (Tlou, 1983). Cultural and ethnic diversity is evident in the numerous languages spoken in Ngamiland District. The following people are often cited as inhabitants of Ngamiland: San groups (Basarwa), Bayei, Bambukushu, Baherero, Batawana, Bakgalagadi and Basubiya.

2.1.5 STAKEHOLDER ANALYSIS

The ODMP stakeholders incorporate a very broad range and a very large number of people. Stakeholders can thus be divided into primary, secondary and tertiary, with primary stakeholders more closely and intimately involved with the Delta and its resources than secondary and tertiary stakeholders.

2.1.5.1 Primary Stakeholders

These are groups or individuals directly dependent on, and who derive immediate benefit from the natural or other (e.g. cultural) resources of the Delta, whether at a subsistence or small-scale commercial level. These people could be severely or permanently affected should such resources be damaged or destroyed; they would usually be without obvious or immediate alternatives in such an event.

Primary stakeholders of the Okavango Delta are thus the more than 120,000 residents of the Okavango Delta and their various groupings include Community Based Organisations (CBOs), Village Development Committees (VDCs), Conservation Committees (CCs), Farmers Committees (FCs), Community Trusts (CTs) and Village Trust Committees (VTCs).

2.1.5.2 Secondary stakeholders

These are groups or individuals indirectly dependent on, and who derive benefit from, the natural or other (e.g. cultural) resources of the Delta at an, often large-scale, commercial level. This category also includes individuals and institutions with some degree of influence on management and decision-making in the Delta. Secondary stakeholders would have their well-being undoubtedly affected, sometimes severely, should resources be damaged or destroyed, though they would often have recourse of action or the resources to develop alternative strategies in such an event.

The major group of secondary stakeholders for the Okavango Delta is contained within the Government of Botswana as an economic entity, government institutions directly involved in the manangement of the Delta, the private sector tour operators (both fixed and mobile) operating in the Delta and local research institutions. Secondary stakeholders also include organisations that work to represent primary stakeholders, e.g. NGOs such as Tocadi, People and Nature (PAN) Trust, Conservation International (CI) and Kalahari Conservation Society (KCS), particularly through the Every River Has Its People project (ERP) as well as the organisations that represent secondary stakeholders themselves, e.g. Hospitality and Tourism Association of Botswana (HATAB) and the Botswana Wildlife Management Association (BWMA).

In a shared river basin like the Okavango, upstream communities who are not directly dependent on the resources of the Delta but are part of the wider ecosystem and whose actions can affect such resources would also be classified as secondary stakeholders, as would river basin organisations such as OKACOM and other projects (and their associated organisations) running either in the Delta or in the Okavango River Basin.

2.1.5.3 Tertiary stakeholders

These are groups and individuals with an interest in or influence over the Okavango Delta but not directly or indirectly dependent on it for their well-being and with other interests and responsibilities not related to the Delta itself.

Tertiary stakeholders for the Okavango Delta thus include other Government of Botswana institutions not directly involved in the ODMP, international and national donor agencies, government departments in Namibia and Angola (other than those directly involved in OKACOM), certain other NGOs, international interests (such as the Ramsar Secretariat and the United Nations (UN)) and interested individuals, such as tourists.

2.1.6 MANAGEMENT FRAMEWORK

The management of the ODRS and its resources is multi-sectoral and involves central government departments, district authorities and private sector. For the implementation of the ODMP, direct responsibilities lie within six ministries with specific functions within the following departments.

2.1.6.1 Ministry of Environment, Wildlife and Tourism

Department of Environmental Affairs (DEA)

The DEA is responsible for overall coordination of environmental activities in Botswana. It also coordinates environmental research, undertakes environmental education and ensures implementation of environmental impact assessments, amongst other duties.

DEA is the government institution responsible for the implementation of the Ramsar Convention in Botswana and thus is the authority to coordinate wetlands management processes in the ODRS (in collaboration with District Authorities).

Department of Wildlife and National Parks (DWNP),

The DWNP is primarily responsible for wildlife (including fisheries) conservation and utilisation. Given the diverse wildlife resources within the ODRS, the role of DWNP in the management of the Okavango Delta is inevitable.

Department of Forestry and Range Resources (DFRR)

The DFRR has direct management authority over the utilisation of vegetation resources. The department is responsible for fire management activities. It also carries out extension on forestry management and range resources.

The Department of Tourism (DoT)

The department is established with a mandate to regulate tourism enterprises, set out procedures with respect of applications, undertake inspections and conduct appeals. It also serves as secretariat to the National Council on Tourism (NACT) and Tourism Licensing Board. The Department also work in close collaboration with the recently (in 2005) established Botswana Tourism Board which is charged with the responsibility to market the tourism plan of Botswana.

2.1.6.2 Ministry of Lands and Housing

Tawana Land Board

The Tawana Land Board administers the entire Okavango Ramsar site in the Batawana Tribal Territory. The Land Board which receives policy guidance through the Department of

Lands, is statutorily charged with the responsibility of administering, coordinating, allocating and managing tribal land (residential, commercial, industrial, agricultural and tourism) and furthermore with the responsibility of determining and defining land use zones within its jurisdiction.

The District Land Use Planning Unit (DLUPU) serves as an advisory organ to the Land Board in matters relating to land use planning and land management. DLUPU is a Sub Committee of the District Development Committee (DDC) and is made up of different officers from Ministries and Departments with a stake in land use and related matters.

2.1.6.3 Ministry of Agriculture

Department of Animal Health and Production (DAHP)

The department is responsible for veterinary services which support its animal health and production mandate. This includes erection and maintenance of veterinary fences, disease control, artificial insemination and tsetse fly control.

Department of Crop Production

The Department is responsible for arable agriculture and for increased crop production in the district through technical expertise, extension, support services and specific programmes.

2.1.6.4 Ministry of Minerals, Energy and Water Resources

Department of Water Affairs

The DWA is responsible for the water resources in the whole country. The DWA has the responsibility for supervision and control over ground and surface water utilisation, flow monitoring and control of aquatic weeds in the Delta.

2.1.6.5 Ministry of Labour and Home Affairs

National Museum, Monuments and Art Gallery (NMMAG)

NMMAG is the legal authority in planning and regulating the utilisation of national monuments such as the Tsodilo Hills which is a World Heritage Site and part of the ORDS.

2.1.6.6 Ministry of Local Government

District Administration

The District Administration coordinates the activities of central government departments in the district and oversees the implementation of government policies.

North West District Council

North West District Council provides a wide variety of services to communities in the District within the ODRS. Additionally, the Council provides a political forum for district development issues affecting communities through their representative Councillors.

Tribal Administration

The Tribal Administration is responsible for tribal matters in the district. This includes administration of tribal justice through the traditional courts (Kgotla) system as well as providing advice on tribal issues. All traditional chiefs are under the Tribal Administration.

2.1.6.7. Harry Oppenheimer Okavango Research Centre (HOORC-UB)

The Harry Oppenheimer Okavango Research Centre of the University of Botswana was set up in 1994 in Maun to work on the conservation of the natural systems in Northern Botswana particularly the Okavango Delta. Research at HOORC is aimed at enhancing the understanding of the natural system of the Okavango Delta (and indeed the Basin) and its relationship between human activities as well as its functioning. The centre specialises in hydrology and water resources management, ecology, social aspects of natural resource management, and tourism. HOORC was instrumental during the development of the ODMP through the provision of available information about the Okavango Delta and its resources. The centre also has a variety of expertise which was tapped to support various components of the plan, mainly for quality assurance and technical input.

2.1.6.8 Private Sector

Hospitality and Tourism Association of Botswana (HATAB)

HATAB is an association representing the interests of a number of companies in the hotel, tourism and related services sector (like air transport companies). HATAB takes active part in the CBNRM District Forum and sends representatives to almost all workshops and reference groups that deal with the management of the natural resources of the Okavango Delta.

Botswana Wildlife Management Association

The Botswana Wildlife Management Association is an organisation whose members are drawn largely from companies or safari operators involved in consumptive use of wildlife resources.

2.1.6.9 Non-Governmental Organisations (NGOs)

Kalahari Conservation Society (KCS)

KCS is a Botswana-based NGO whose objectives are to promote the knowledge of Botswana's rich wildlife resources and its environment through education and publicity; to encourage and in some cases finance research into issues affecting these resources and their conservation; and to promote and support policies of conservation towards wildlife and its habitat.

KCS is currently coordinating a trans-boundary natural resource management project, known as Every River Has Its People, between Botswana, Angola and Namibia.

Trust for the Okavango Cultural and Development Initiatives (TOCaDI)

TOCADI is the Ngamiland branch of Kuru Development Trust which is based in Shakawe. It supports remote area communities in land use planning, strengthening of CBOs and identifying and setting up income generating projects (thatching grass harvesting and marketing, fishing, community tourist enterprises) and in starting a communal savings- and reinvestment system.

2.1.6.10 Community Based Organisations (CBOs)

There are 21 CBOs in the Ramsar site managing the different resources. The CBOs in the Ngamiland District have an established structure, CBNRM Forum, where they engage with their Joint Venture Partners, the private sector and government on matters related to management of resources in their conscession areas. The CBOs have a 15 year lease agreement with the Tawana Land Board for the use of resources.

2.1.7 FACILITIES AND SERVICES

2.1.7.1. Settlement Hierarchy

There are 65 gazetted settlements in Ngamiland District and many other un-gazetted settlements comprising cattle posts and arable lands areas. Settlements are classified in terms of size and functional relationships. These are (number of centres in brackets) Primary (1), Secondary (1) and Tertiary Centres with the latter being divided into Tertiary I (1), II (10), III (17) and IV (45). Figure 2-4 shows the settlement patterns for the district.

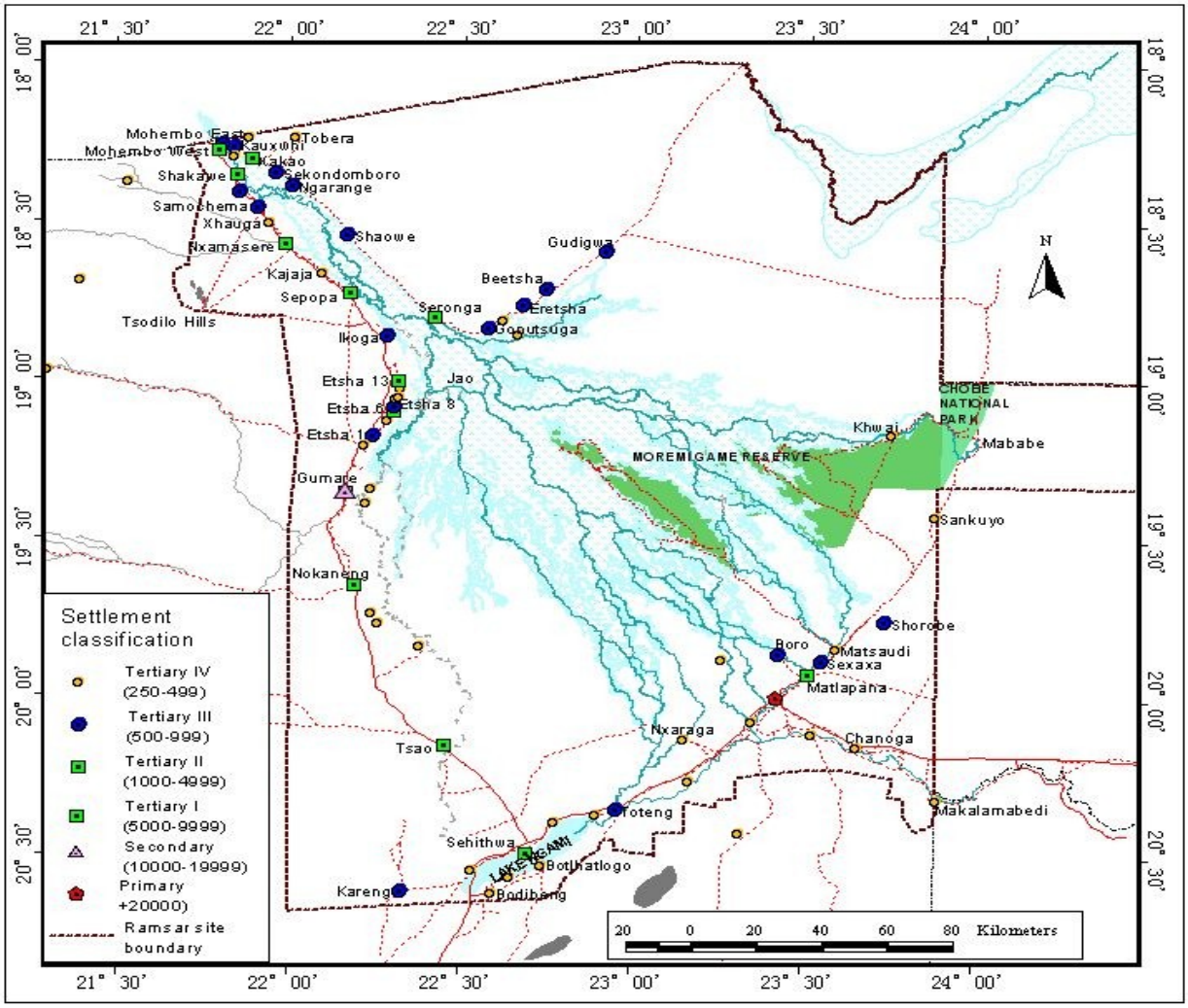

Figure 2-4: Settlements and road network in the Ramsar Site

2.1.7.2 Road Network in the District

The roads department of the central government and the North West District Council are responsible for the roads in the Ramsar site. National roads includes the following:

A3 Ghanzi – Maun – Nata road - tarred
A35 Sehitwa – Mohembo road- tarred
B334 - Maun – Shorobe road- tarred
Mohembo-Gudigwa (recently transferred from council)-

The District Council is responsible for all other roads (paved, gravel or sand) in the Ramsar site. .

2.1.7.3 Public Transport

Public transport is provided by private operators. There are three main modes of transport-buses, aeroplanes and boats. The boats and aeroplanes are generally used by tourists whilst buses run along the bitumen standard roads. Buses run between the district centre Maun and Shakawe/Mohembo. On the eastern side of the river there is no public transport due to the poor state of the roads.

Maun has an international airport. There are also some smaller airfields in some of the villages and camp sites. Airfields in the campsites are owned by the operators and those in the villages are operated by the Department of Civil Aviation. The most common mode of transport for short journeys is horse riding, donkey carts and canoe.

2.1.7.4 Postal Services

Postal services are provided through a network of post offices and postal agencies. Currently, there are six (6) post offices and nine (9) postal agencies in the Ramsar site (NDSS, 2004). Post offices are located in Maun, which has two, Sehithwa, Gumare, Etsha 6 and Shakawe. Postal agencies are located in Maun, Shorobe, Komana, Toteng, Nokaneng, Sepopa, Nxamasere, Ngarange and Seronga. Maun Post Office is the headquarters for postal services in North West and Ghanzi Districts.

2.1.7.5 Energy Supply

Some villages in the district are supplied by power from the Namibian Grid, while the rest are connected to the Botswana Grid. Villages supplied from the Namibian Grid are Nokaneng and those further west.

The following villages have power reticulation: Maun, Shorobe, Toteng, Sehithwa, Tsau, Nokaneng, Gumare, Sepopa, Shakawe and Mhembo West. Most of these villages benefited from the recent Government programme of extending electricity to rural villages.

Most settlements are not connected with electricity power supply, so the main alternative sources of energy are firewood, gas, paraffin and candles. The area has good trees for firewood; over-harvesting is being discouraged in order to reduce the impact on the trees. Alternative sources of energy and affordability need to be explored in order to ensure the sustainable use of wood resources. The supply of electricity to more villages should be considered as one of the priority areas of concern.

2.1.7.6 Telecommunications

Most of the main centres and villages have telephone facilities while cellular phones are increasingly used. Telecomuunciation services are provided by both Mascom and Orange. Internet facilities are available in Maun, but limited elsewhere.

2.1.7.7 Education

There are 55 primary schools in the Ngamiland District with 30 in the Ngami Sub-District and 25 in the Okavango Sub-District. There are ten (10) Community Junior Secondary

Schools (CJSSs) and one Senior Secondary School. The illiteracy level in Ngamiland is one of the highest in Botswana ranging from 30% to 50% in some areas (NDSS 2004).

Tertiary education facilities include the Maun Technical College and three Brigades Development Trusts. In addition, rehabilitative training programmes for specific groups of people are available in Maun at the Thuso Rehabilitation Centre and Tshidilong Stimulation Centre. The University of Botswana has a centre in Maun, the Harry Oppenheimer Okavango Research Centre, which engages mainly in research.

Library services are provided and managed by the Botswana National Library Services through the establishment of public library branches, village reading rooms, and mobile visits. However, due to shortage of resources, a library branch has been provided only in Maun. In other settlements such as Sehithwa, Gumare and Shakawe, the communities utilise village reading rooms. The library also provides a 'book box service' to primary schools in the district since, unlike secondary schools, primary schools do not have their own libraries. Notably HOORC has a functional library facility which is linked to the main University of Botswana library. Other library facilities are located in secondary schools and are only available to students. Government printers have been established where government publications can be accessed.

2.1.7.8 Health Facilities in the District

The health services provided in the Ramsar site include mobile health stops, health posts, and clinics with or without maternity wings, one primary hospital and a district hospital.

HIV and AIDS is the biggest health threat in the district. Although Botswana had achieved some success in providing health services this has been eroded by the advent and spread of HIV and AIDS. Having realized that HIV and AIDS, unlike other diseases, is more than a health problem, a multi-sectoral approach to solving the problems of AIDS has been established. It had been established that factors that lead to the spread of HIV and AIDS in Ngamiland are socio-economic in nature. Poverty and unemployment, gender inequalities, communication barriers between youth and elders on issues relating to sexuality as well as drug and alcohol abuse are the basic determinants. This therefore poses a challenge for the entire population in the district.

However, the response strategies have not adequately addressed these factors; instead they comprised an education campaign about HIV and AIDS, community mobilization, awareness raising, and various counselling efforts and medical treatment (Ngamiland District HIV and AIDS Comprehensive Plan, 1999) The specific programmes implemented included:-

- Information, Education and Campaign through workshops, seminars, commemorations, kgotla meeting, and condom distribution, counselling etc.
- Home based and orphan care programmes
- Mother to Child Transmission treatment, Anti Retroviral treatment etc.

As a starting point the Ngamiland District Multisectoral Aids Committee (DMSAC), has developed a proposal for capacity building during DDP6, which focuses on empowering the local communities and extension agents in different capacity building activities. This goes a long way in addressing the basic factors that foster the spread of HIV and AIDS.

In implementing the ODMP, DEA works with the existing structures such as DMSAC, Every River Has Its People project (ERP) and other relevant stakeholders in mainstreaming HIV and AIDS in the planning process.

The district is also affected by a number of other diseases. These include malaria, anaemia, tuberculosis, diarrhoea and sexually transmitted diseases.

2.1.7.9 Safety

The Botswana Police has stations in Maun, Gumare, Seronga, Sehithwa and Shakawe. Maun hosts the district police headquarters. There is also a Botswana Defence Force camp in Maun. The Botswana Local Police under Tribal Administration has a wider presence in the ODRS. The Department of Prisons and Rehabilitation is also present in Maun. In addition to government safety institutions, there are several privately owned security companies.

2.1.7.10 Places of Worship

There are many churches in all settlements in the Ramsar site. Some of the well established churches include the Roman Catholic, Seventh Day Adventist, United Congregational Church of Southern Africa (UCCSA), Assemblies of God, Lutheran, Spiritual Healing, New Apostolic Church and Zion Christian Church.

2.2 PHYSICAL FEATURES

2.2.1 CLIMATE AND CLIMATE CHANGE

The climate within the ODRS is semi-arid with rainfall (in Maun) ranging from 195 to 940 mm per annum. Rainfall occurs in the summer months (November to March), with a mean annual amount of 455 in Maun and 480 mm over the Delta. Characteristic of a semi-arid environment, the rainfall is highly variable, with a coefficient of variation of annual rainfall of 35%. The monthly mean temperature ranges from 16 to 26°C in June and October respectively. The winds are generally light easterlies. Annual potential evapotranspiration, (class A pan with appropriate, seasonally varying pan coefficient), is high at nearly 1850 mm.

2.2.2 GEOMORPHOLOGY

The Okavango alluvial fan is situated among dune sediments within the down faulted MOZ (Makgadikgadi-Okavango-Zambezi) basin of north-west Botswana. The Okavango fan has developed on flat terrain within a south-western extension of the East African rift (EAR) which was re-activated approximately 2.4-5.0 million years ago along a NE-SW direction (Kampunzu et al., 1998; Tercillin and Lezzar, 2002). The surface of the down-faulted area comprises washed longitudinal dunes, with current and relict alluvial fan deposits and salt pans which overlie up to 300 m of predominantly sandy sediment. Catchment headstreams include the Okavango River which flows through Namibia to the Panhandle. The Okavango Delta is in reality the wetter part of an alluvial fan that is slightly conical and which disburses south of the Panhandle after flowing over 1000 km through Angola, Namibia and Botswana.

In terms of gross fluvial sub-environments, the quasi-level Okavango alluvial fan comprises a mosaic of meandering watercourses, floodplains and islands, and is subject to low velocity flooding (ca. 2-3 cm/s) with significant lateral groundwater discharge under the islands and shoreline. The present Delta consists of seven active (slowly diffusing) and intermittently active distributary floodplain systems with a total east-west extent of c. 140 km. The distribution of flow through the 1-500 m wide floodplains varies with decadal or biannual frequency (Wolski and Savenjie, 2006).

Recent geomorphologic work has shown that the Delta (possibly as slowly diffusing multiple streams) was much more widespread 200 000 years ago and flowed extensively southwards to around Deception Valley in the northern Kalahari (Ringrose et al., 2005). Re-activation of the faults to the north (around Gumare) and south (the Thamalakane and Kunyere) led to the confinement of the present fan, likely around 40 000 years ago. More movement along the faults may be anticipated in this earthquake-prone rift zone.

2.2.3 SOILS

The soils of the Delta have been investigated by Staring (1978). They are mainly sand-based (arenosols) as a result of the sediment infill into the east African Rift basin (see geomorphology section). However, the local geomorphology and the effects of weathering, change the nature of the surface condition of the sands such that the original arenosols are modified. A major characteristic of the sands is the lack of diagnostic horizons other than a surface layer rich in organic material, which may extend from 30-100 cm.

Typically the arenosols have very low water-holding capacities because the sand in the soil is not graded so that sands of varying coarseness are constantly mixed throughout the soil. As most sands are highly siliceous and are also extremely low in essential nutrients, especially phosphorus, most are acidic and therefore difficult to farm. In addition the low and erratic rainfall experienced within the ODRS tends to lower productivity of the soil. Dryland farming takes place on haplic arenosols while the more productive flood-recession agriculture takes place on gleyic arenosols. In areas where intermittent clay has been deposited as a result of former water ponding or vegetation induced surface processes (e.g. under tall mopane) some clay-like structures are found in the soil leading to the development of luvic arenosols. Some ferralic arenosols occur in the dune areas, peripheral to the Delta.

2.2.4 GEOLOGY AND STRUCTURES

The Okavango Delta overlies solid basement bedrock, which occurs under 20-300m of Kalahari sediments. The older basement rocks are referred to as:

1. Palaeoproterozoic (approx 2.05 thousand million years old) comprising gneiss, granites and amphibolites exposed in the Qangwa area and granulites exposed in the Gweta area

2. Mesoproterozoic (approx 1.2-1.1 thousand million years old) gabbros, granites and meta-rhyolites and meta-basalts which are exposed in the Kgwebe and Ngwanalekau Hills.

3. Karoo supergroup comprises (approx 180 million years old) silica rich sedimentary rocks with mafic lava and dolerites which are less exposed close to Tsodilo Hills and around areas east of Ngamiland.

These are covered by the Kalahari Group sediments comprising silica rich sands and carbonates such as calcretes and occasionally silcretes.

The geological map of the ODRS is given in Figure 2-5. As the older rocks may be emplaced by mineral rich ores (such as kimberlite pipes) the possibility of mining occurring in the Ramsar site over the longer term should not be discounted. The older rocks are aligned on two trends, an older NW-SE trend and a younger NE-SW trend. Re-newed movement along this latter trend has caused the Okavango Delta to form in a down faulted depression

which is itself an extension of the East African Rift system. The significance of the rift lies in the fact that this fault system is presently active and may well lead to renewed earthquake activity in the foreseeable future. The most noteworthy faults are Gumare, Kunyere and Thamalakane.

The overlying Kalahari Group sediments contain some calcretes and silicretes which occur as a result of strong evaporation following past or present hydrological processes. Calcretes and silcretes (duricrusts) are used along with crushed bedrock throughout the Ramsar site for road construction and maintenance.

2.2.5 HYDROGEOLOGY

Three major aquifer formations exist in the ODRS. These are the Basement rocks, Karoo and Kalahari Group sediments. Karoo and Basement rocks, where they occur at shallow depth, also form locally important aquifers. The Kalahari Group sediments comprise the most important known aquifers. These aquifers are at shallow depth, typically less than 100 m. Although at places several distinct aquifers can be distinguished within the Kalahari Group profile, they are usually hydraulically connected. The groundwater table is present at 5-30 m below ground in non-floodable areas, and is shallower (typically 0-10 m) within contemporary and recently flooded floodplains.

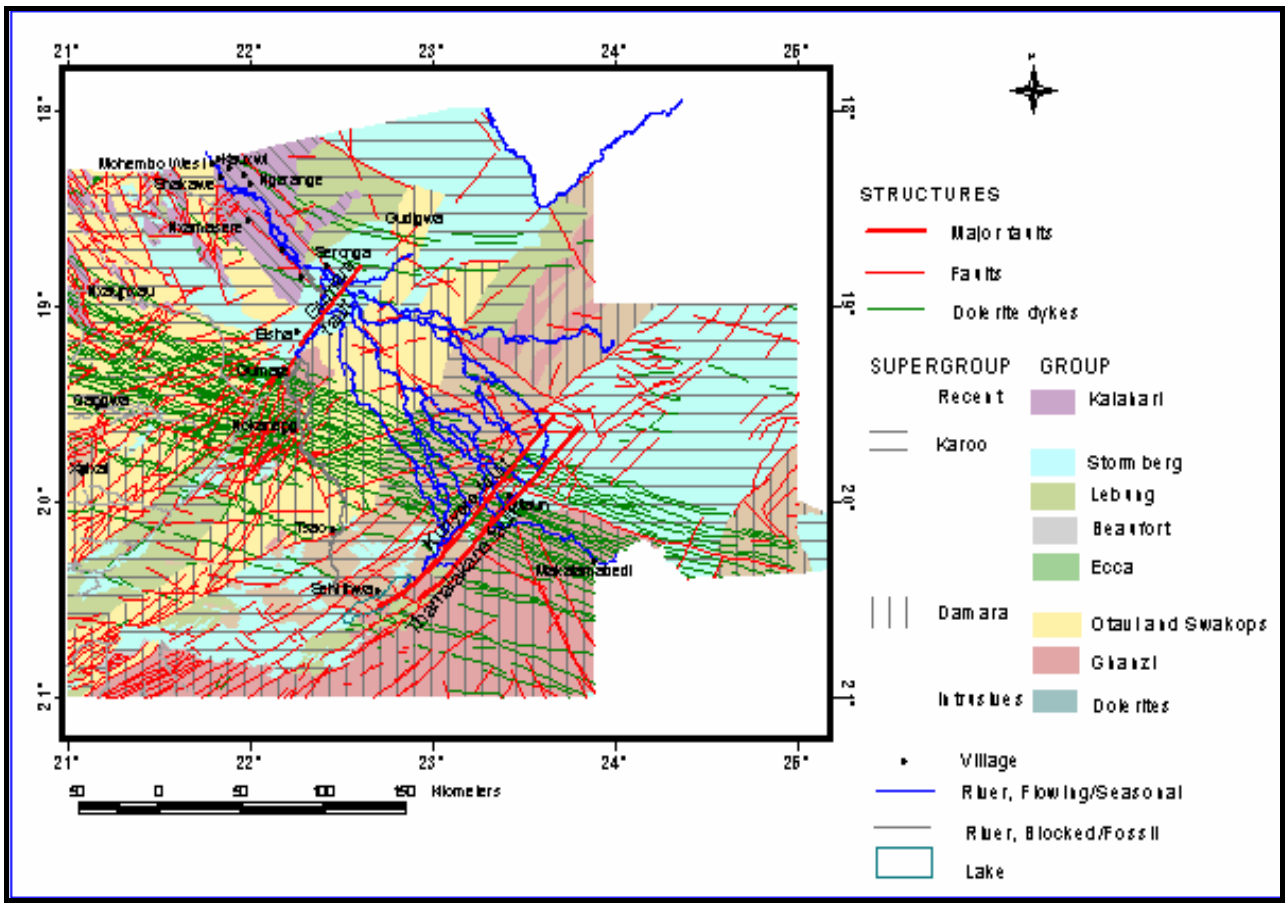

Figure 2-5: Geological map of the ODRS

2.2.6 HYDROLOGY

The flood wave which results from upstream rainfall lasts from January to July, with its peak in late April or the beginning of May. A five year record from 1997 to 2002 is shown in . The seasonal flow range is from to 80 to 700m^3/s, and the average annual flow at Mohembo during this period was 7,500MCM yr^{-1} while the long term mean annual flow is 9 500MCM yr^{-1}.

2.2.6.1 Panhandle

Popa Falls on the river in Namibia marks the upstream boundary of the Panhandle. The river is laterally confined by geological faults and sand ridges to a flood plain up to 15km wide. The river channel meanders across the flood plain, varying in width from around 50 to 100m wide, and 5 to 6m deep. The length of the Panhandle valley is around 100 km, while the length of the meandering river is around 200km. The gradient of the valley is from around 1,000m (above mean sea level) to 980m.

At the downstream limit of the Panhandle, which is not clearly defined, between the villages of Sepopa on the western and Seronga on the eastern margins of the Delta, the Okavango River starts to break out into its primary distributaries, marking the start of the Delta.

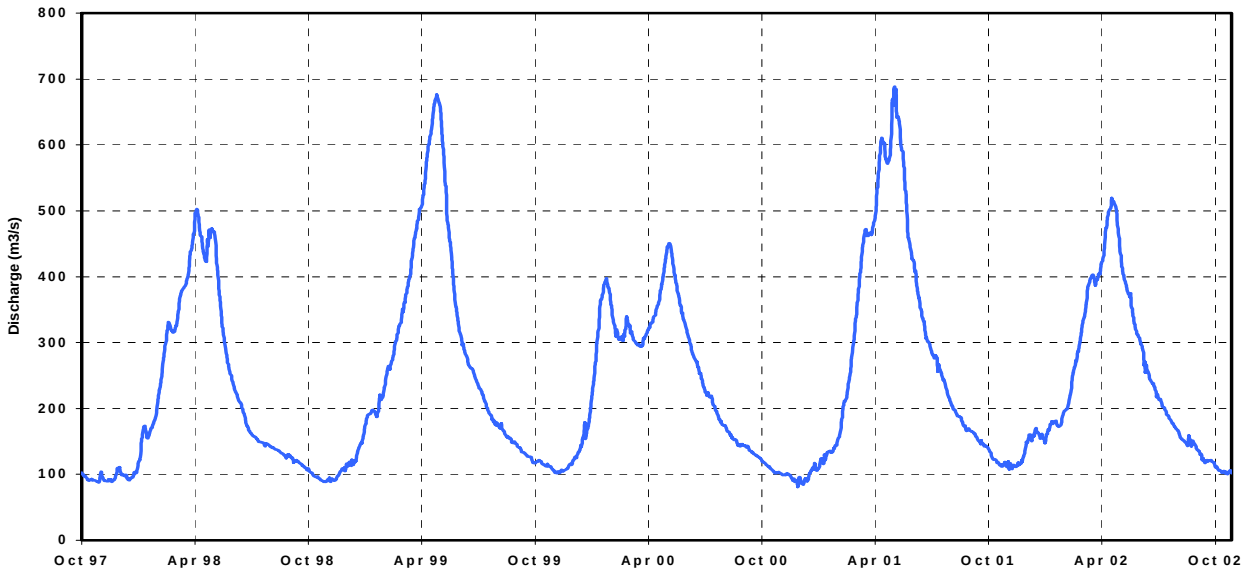

Figure 2-6: Inflow at Mohembo (1997–2002)

2.2.6.2 River systems

The Delta is conventionally divided into four water and land categories: the Panhandle, upstream permanent swamps, downstream seasonal flood plains, and large islands and sandveld tongues. The upstream Delta is characterised by the main Okavango River flowing through extensive papyrus swamps, bifurcating into distributary channels which convey the flow on to extensive perennial flood plains.

The primary distributaries are shown in Figure 2-7. The boundaries between the distributaries are not well defined, apart from the Chief's Island clearly separating the

eastern from the central and western part of the system. The most western distributiary is the Thaoge. The central distributary, the Jao/Boro is often the only path for surface water outflow from the Delta. The Kunyere/Xudum/Matsibe system is essentially a branch of the Jao, ultimately leading water to Lake Ngami. To the east of the Delta there is the Maunachira distributary splitting into the Khwai and Mboroga, which further splits into Gomoti and Santantadibe.

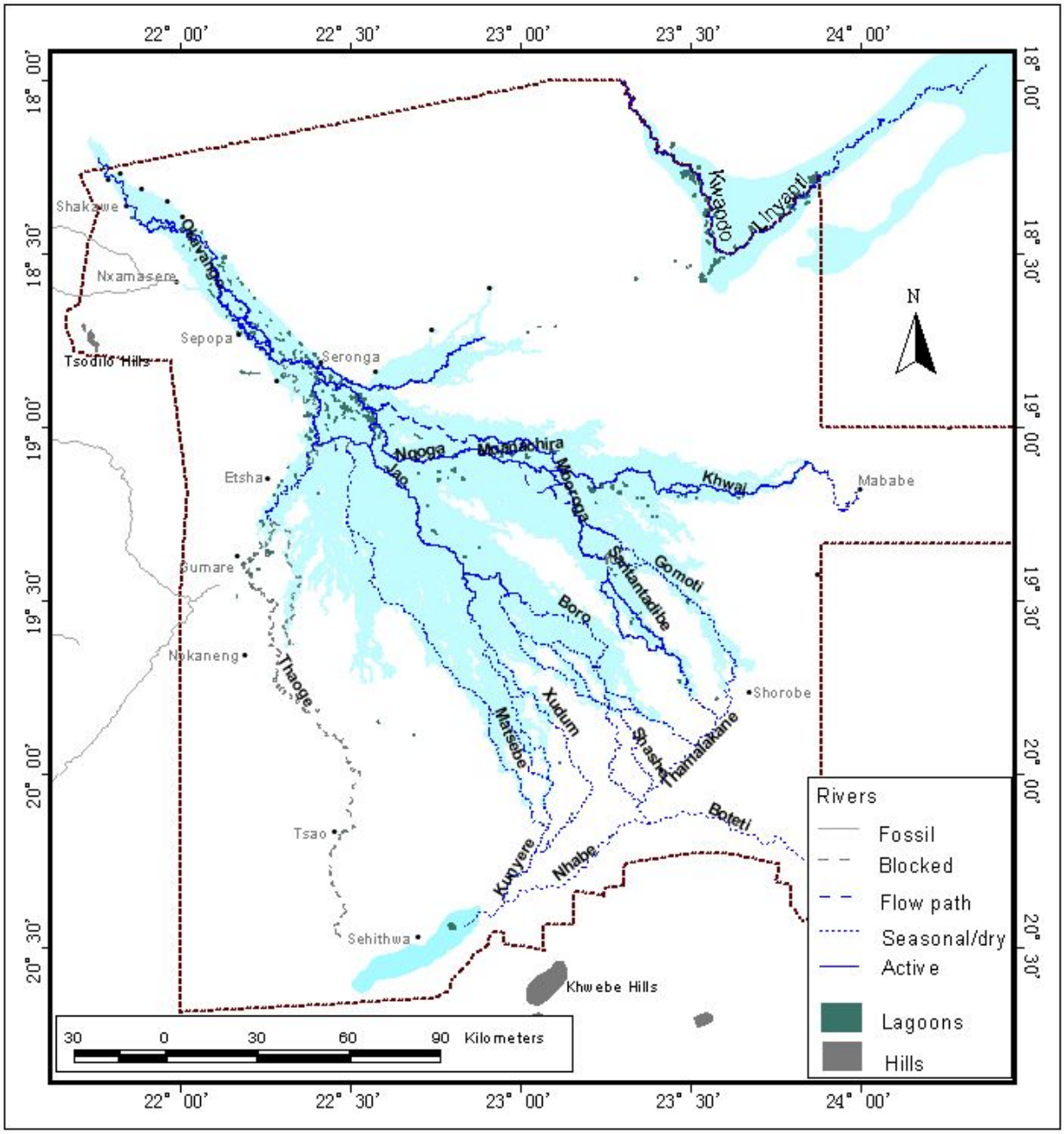

Figure 2-7: Okavango Delta river channels

There are some changes observed in distribution of water between the distributaries. Santantadibe and Gomoti are perceived to be drier than in the past, while the Khwai appears to be gaining in importance. To the west, the Thaoge is known to have been reduced considerably in the early 20th century. Recently, further reductions have been observed, with water redirected to the Kunyere/Xudum/Matsibe, and consequently causing considerable flooding of Lake Ngami in 2004; the last flood having occurred in 1989.

Of the three main distributaries, the Thaoge River in the west terminates in a series of lagoons and permanently inundated plains near its upstream end, choked by sedimentation and vegetation. The Jao/Boro comprises pemanent swamp in its upstream end. The middle part (essentially the Boro and Kunyere/Xudum/Matsibe) is a system of seasonally inundated floodplains. In the downstream end it is flowing in confined channels, discharging to the Thamalakane and to Lake Ngami. The Maunachira and Khwai, as well as the Santantadibe in the east, have permanently inundated plains along the entire length, with only narrow bands of seasonal floodplains. The Gomoti floods only in higher rainfall years. The Khwai, Santantadibe and Gomoti end in single channels. The two latter ones used to connect to the Thamalakane, which, however, has not been observed since 1989. The Khwai usually dries out within its channel, but in the past it was probably a major provider of water to the Mababe depression; travellers around 1850 described the depression as a lake.

2.2.6.3 Outflow

The course of the Thamalakane River follows the Thamalakane Fault line which runs perpendicular to the main axis of the Delta and demarcates its downstream limit. The river flows south west, and functions as a collection drain for the distributaries from upstream. In low flood years, however, flow in the distributaries succumbs to evaporation and infiltration before reaching the Thamalakane River.

In high flood years, flow in the lower Boro discharges to the Thamalakane, and upstream bifurcates into the Kunyere/Xudum/Matsibe to discharge into Lake Ngami, from which there is no outflow. Flow in the eastern Maunachira bifurcates into the Mboroga River and may also reach the Thamalakane River. In contrast to the inflow to the Delta of 7,500Mm^3/annum, the average outflow in recent years has been 20Mm^3/annum (Figure 2-8Figure 2-8: Outflow at Boro Junction (1997–2002)). About 98% of the entire inflow is lost to evapotranspiration and infiltration to ground water.

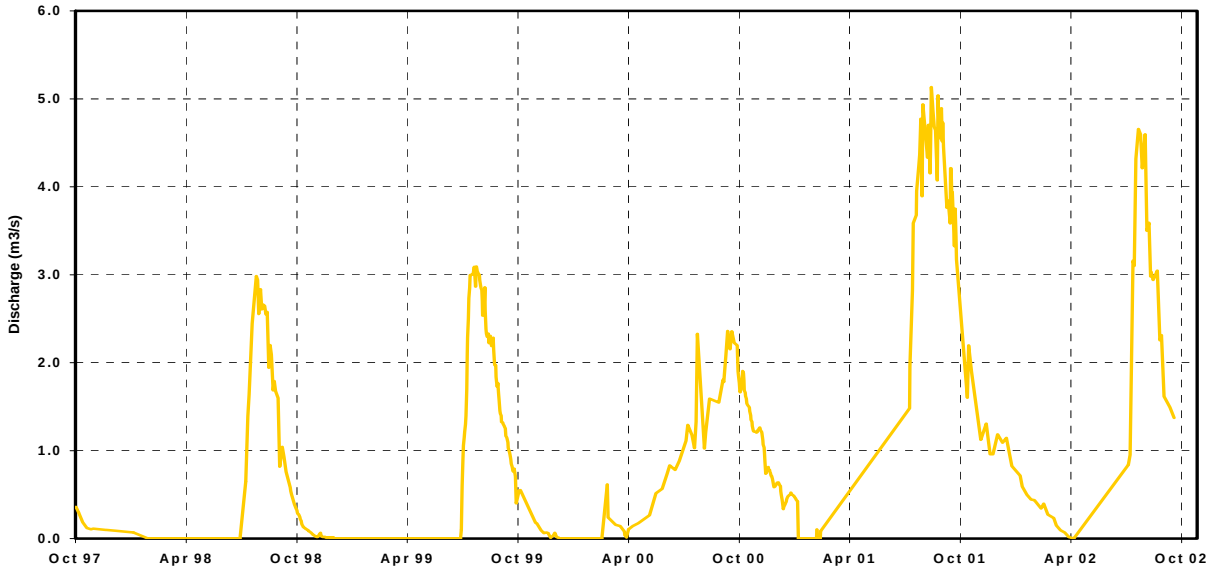

Figure 2-8: Outflow at Boro Junction (1997–2002)

Subsequently, flow from the Thamalakane passes through a break in the fault downstream of Maun into the Boteti River. There is a potential drainage route downstream to the Makgadikgadi Pans, and into the Nhabe River and downstream to Lake Ngami, though this has not been observed since 1989. Since 2000, the Boteti has at best reached Chanoga, which is approximately 60 km downstream. The Boteti River downstream and its eventual outfall to the Makgadikgadi Pans are excluded from the area of the river basin, and from the Ramsar wetland area.

2.2.6.4 Flooding pattern

Sediment deposition, and swamp vegetation with associated peat aggradation raise the channels above the flood plains. The transfer of flow between the river and flood plains is highly dynamic depending on the period of the flood from upstream, antecedent ground water conditions and the rainfall over the Delta.

This causes extreme spatial and temporal variations in the flooding pattern, which change over at least four time scales. The longest is over geological periods of 10 000 to 1 000 000 years and at times the Delta has probably been a completely dry desert with sand dunes, while at other times it has been completely flooded. Since around 1850 the flooding pattern has moved from a very westerly to a central and now a very easterly distribution (McCarthy and Ellery, 1998), with some recent evidence of a return to a westerly trend. There are dry and wet periods as well with about 8 and 18 years interval (Tyson et al., 2002), which causes the seasonally flooded areas to withdraw and expand. Finally the flooding pattern can change from year to year caused by local factors such as vegetation blockages in the streams causing damming and overflow of riverbanks. This large variation in flooding pattern is one of the important and unique features of the Okavango Delta.

2.2.6.5 Infiltration

The calculation of the water balance within the Delta reveals that the infiltration to groundwater is very large. In one floodplain system it amounted to 90% of the total inflow. Groundwater levels that were 3–5 meters below ground rose with arrival of the water within a few days up to the surface. As far away as 600 meters from the floodplain groundwater levels rose 1.5 month after arrival of the flood. This was caused by lateral groundwater flow, which became the dominant infiltration process after the first days and transferred at least 80% of the total infiltration to the surroundings. The impact area was calculated to be 3–6 times larger than the floodplain itself. This surrounding area of riverine woodland is a dominant element of the vegetation throughout the Delta. It is probably strongly dependent on this mechanism of flooding – infiltration – lateral flow. The lateral flow itself is in all likelihood driven by transpiration from the riverine woodland. Early hydrological models (Gieske, 1997, Dincer et al., 1987) neglected the groundwater-surface water interaction. The new generation of models (Bauer et al., 2006, ODMP Mike SHE model) take this process into account. It is a dominant hydrological process, which has large implications for the understanding of the Delta ecology. For instance the proposed water development projects like clearing of channels in the Delta of vegetation, upstream water diversions and building of dams, are all actions that will reduce the duration of the seasonal flooding and its spatial extent. The impacts will not be restricted to the floodplains but affect large areas of woodland as well.

2.2.6.6 Island growth and salinity

In the Okavango Delta about 94% of inflowing solutes are retained within the Delta (Table 2-1). This could lead to an entirely saline environment, but that is not the case: the surface waters have very low salinity with a freshwater biota. It has been deduced that the

numerous islands in the Delta have been formed through evapotransporative concentration in groundwater of infiltrating solutes followed by precipitation and volume increase. Evidence of this is the large amount of calcrete in island soils. These islands of 3-10 m thickness with clayey soils are under-laid by fine Kalahari sand to a depth of 200-300 m, which also indicates that they are formed through surface processes.

The infiltration rate of surface water from floodplains and streams into islands is very high and predominantly a lateral process that is unidirectional. This flow is driven by evapotranspiration in the riparian woodland zone and causes the ground-waters in the central area of islands to have very high salinities as evidenced by halophyte species. By use of chloride as a conservative element, the concentration factor between the channel and the central island groundwater/surface water is calculated to be 500 – 1000. This groundwater is completely depleted of calcium and magnesium supporting the early deductions that they have precipitated as calcrete. There is however an even larger depletion of silicate which probably has precipitated as well forming the clayey soils typical of the islands. The central island groundwater is dominated by sodium, bicarbonate and dissolved organic matter. The gradual increase of salinity in this central island groundwater is causing it to become much heavier than the under-laying deep groundwater with lower salinity and periodically some of this high-saline water is let off through a fingering process to the deeper layers. Island growth through precipitation of solutes and salinity-density fingering to deep groundwater are the two major sink processes of inflowing solutes and explains how the Okavango Delta can be a freshwater system.

Table 2-1: The mass balance of dissolved elements entering the Okavango Delta through the inlet (McCarthy et al., 1986).

	Tonnes per year
Total solute load in inlet	381 000
Loss through outlet	21 000
Remains in Delta	360 000
Precipitation in islands 60%	216 000
Sink to deep groundwater 40%	144 000

The biogeochemical growth of islands is a unique process first described for the Okavango Delta by McCarthy et al., 1991b, 1993; McCarthy and Ellery 1994. It has recently been discovered that the islands in another wetland of global importance, the Everglades in Florida, USA, are formed through the same process. In contrast, the density-driven salt transport process into deep groundwater (fingering) that is functioning as a permanent sink of solutes has probably not been described for any other wetland system.

2.2.6.7 Retention of nitrogen, phosphorus and carbon

About 90% oO the total nitrogen, phosporus and dissolved carbon coming into the Delta through the inlet has disappeared before the water reaches the outlet. For nitrogen it is probably due to de-nitrification in the infiltration zone formed by the floodplains/islands where the groundwater has high numbers of bacteria and also a considerable methane emission. About half of the phosphorus is probably precipitated as complexes in island soils but a similar amount of dissolved phosphorus is deposited in deep groundwater caused by the density fingering process. By this process about 20% of dissolved organic carbon is also permanently deposited, while the rest probably is processed by bacteria and returned to the atmosphere as carbon dioxide and methane. The importance of these elimination and retention processes the establishment of low concetrations of nutrients in the surface waters that in turn may contribute to the crystal clear waters in the Delta. The

capacity of these processes to eliminate nutrients from the inflow may be a decisive factor in determining how much additional nutrient loading (eutrophication) the Delta can sustain.

2.3 ECOLOGICAL AND BIOLOGICAL FEATURES

The ODRS is a habitat for about 1300 idenitifed plant species, 71 fish, 33 amphibians, 64 reptiles, 444 birds and 122 mammals.

In the Delta there are large variations in habitat patterns over small distances, although the Delta is very flat and is made up of homogeneous sand. Small differences in altitude of 1-2 m result in large differences in the frequency and duration of flooding, which creates habitat gradients from permanent rivers and lagoons, to permanent swamps with reeds and papyrus, seasonally flooded grasslands, occasionally flooded grasslands, and riverine woodlands and dry woodlands. Each of these habitats has a distinct species composition not only of plants but also of reptiles, birds and mammals (Table 2-2).

Table 2-2: Number of species in taxonomic groups of originally terrestrial origin observed in each major habitat in the Okavango Delta (Modified from Ramberg et.al. 2006).

Taxonomic group	Total Number of species	Percent habitat overlap	Aquatic/ Perennial swamp	Wetland/ Seasonal swamp	Dryland/ Terrestrial	Sum of species observed in each habitat
Plants	1061	35%	205	519	704	1428
Reptiles	64	0%	7	5	52	64
Birds	444	0%	112	57	275	444
Mammals	122	10%	3	21	110	134

In a worldwide biodiversity comparison (Junk et al. 2006) of seven globally important wetlands, of which six are located in tropics and sub-tropics, the Okavango Delta had a low number of fish species, but the second highest number of plants and mammals, third highest number of amphibians, and highest number of reptiles and birds. In particular the number of large mammal species and their high abundance are outstanding in the Okavango Delta.

2.3.1 HABITAT DIVERSITY

On a finer scale, Delta habitats have been classified based on a combination of plant life-form characteristics and dominant species. In total 46 habitats were identified. In the Delta study area, the specific habitat size is fairly small, 0.05 km^2. The number of different habitat types in 9 km^2 areas varies between 1 and a maximum of 31. These areas with exceptionally high vegetation variability are mostly located along the perimeter of the wet Delta, along the Panhandle, and along the major flow channels to the east and west. The highest habitat diversity is found in the fringe areas of the Delta and it is highly likely that the total species diversity is highest here. The implications for the management of biodiversity in the Delta are immense since conservation efforts should not concentrate on preserving a core area but the entire habitat pattern, including the fringes. This is complicated even more by the fact that these fringe areas with high biodiversity are under pressure from human exploitation.

2.3.2 FLORA

The Okavango Delta is located in the Zambesian Phytochoria which is one of 16 such areas in Africa defined as having more than 50% endemic plant species and more than 1000 such species in total. This area predominantly includes the Okavango and Zambezi river basins.

2.3.2.1 Plant species number and composition

The currently known flora of the Okavango Delta comprises about 1300 taxa at the species and lower levels, of which 1260 taxa are on the species level. They belong to 530 genera and 134 families. The most diverse families are the Poaceae (grasses), Cyperaceae (sedges), followed by the Asteraceae and Fabaceae, each of which have more than 20 genera and 50 taxa of species and lower ranks. Most genera (73%) are represented by one or two species only, whereas a small number of genera (7%) are represented by 10 or more taxa of species and lower ranks.

Ellery and Tacheba (2003) list 1259 species for the Okavango Delta for an area of 25 000 km^2, while the more commonly reffered to figure is 1061 species for the 16 000 km^2 area of the active Delta. Calculations of species density following Rosenzweig (1995) shows that the Okavango Delta has a species density of 210 species per km^2, similar to the dryer and colder southern and western biomes in Southern Africa, while the species densities are more than twice as high for the better watered and warmer grasslands and savannas in the eastern and northern parts of the sub-continent (Ramberg et al., 2006).

Of the total number of taxa present in the Okavango Delta, a significant proportion of about 60% occur in dryland settings on islands or sandveld tongues. However, despite their terrestrial character many of these taxa are absent in the surrounding savanna habitats as they require a different air humidity or soil moisture regime or higher ground water table. Thus they are intimately associated with the wetland environments of the Okavango Delta (Ellery and Tacheba 2003).

A large number of species occur in the permanent swamps (about 220 taxa), and many are connected to the flooded grasslands (about 90 taxa) or to the combination of flooded grasslands and dryland settings (80 taxa). A small number of species are parasitic (18) or insectivorous (12).

Of the 147 plants classified as aquatic and semi-aquatic only 10 are woody of which only three are trees. The palm *Phoenix reclinata* and *Syzygium guineense* are fully grown trees that occur in patches fringing islands or termitaria, while the shrubby *Ficus verruculosa* lines the lower reaches of river channels in the perennial swamp (op. cit.).

There are no known endemic plant species in the Okavango Delta and the species composition has similarities with the large wetlands in the middle and upper Zambezi river basin such as Kafue and Barotse (Liuwa). Due to very small topographic gradients in this whole area it is likely that these wetlands during wet periods have been united into one huge complex of several 100 000 km^2 (Ramberg et al. 2006).

2.3.2.2 Vegetation communities

A classification of plant communities based on quantitative data covering a considerable part of the Delta habitats was done by Sliva et. al. (2004). This clearly shows that on each level of division the hydrological conditions are decisive.

Nine meaningful ecological vegetation groups were identified: (1) Vegetation of open water; (2) *Cyperus*-dominated channel fringe and backswamp communities; (3) *Phragmites*-

dominated channel fringe and backswamp communities; (4) *Miscanthus-Ficus* permanently flooded backswamp communities; (5) *Schoenoplectus corymbosus-Cyperus articulatus* communities of shallow backswamps and frequently inundated floodplains; (6) communities of seasonal floodplains; (7) island fringe communities; (8) island interior grassland communities; (9a) pan communities – upper level; and (9b) pan communities – bottom level.

These nine major communities arrange neatly along hydrological gradients, the first being the depth and duration of flooding; the second being their location upstream – down stream with low annual water level variations in the upper parts of the Delta (0.5 m) and much higher variations in the lower parts (2 m); and the third the difference between stagnant and flowing waters.

Recognising the different seasons, scale and focus of all the vegetation studies done in the Delta about 26 meaningful ecological plant communities can be classified within the vegetation of permanent swamps, floodplains and islands (Ramberg et.al, 2006). The drylands remain unconsidered, which are the never flooded vegetation of large sandveld tongues and large islands representing the Acacia and Mopane woodlands and shrubland, as well as the non-inundated grassland types.

Communities associated with permanent water (No. 1-14) are relatively species poor, harbouring about 50 to 70 species per community group. *Cyperus papyrus* as well as *Phragmites* species tend to develop large and dense monospecific stands, supported by the relatively higher nutrient loadings in the upper reaches of the Delta, making the establishment of other less competitive species difficult. The species diversity increases on the open boundaries, for instance along the channel and lake fringes. In open water areas (ledibas, oxbow lakes) the diversity raises with the shallowness of the water. The species composition and abundance in these communities remains similar through the whole year independent of the flood pulse.

Compared with permanent aquatic communities, the number of plant species rises up to twofold on seasonal floodplains (No. 15-20). On regularly inundated floodplains the water fluctuation causes periodical changes between terrestrial and aquatic phases of the sites. The aquatic-terrestrial-transition-zone, "ATTZ" (Junk, 2003) is a dynamic system of steadily changing water and nutrient status, of establishment and dying off of species. This dynamic littoral zone provides good living conditions for both terrestrial and semi-terrestrial short-lived plant species during the low water period as well as for aquatic species during the inundation, as long as these species are able to survive the unfavourable period or to colonise and occupy the new habitats rapidly enough. The availability of various temporary habitats which are densely packed within relatively small areas is responsible for the high species diversity. If one compares the low and high water season, the alteration of species and their abundances within the floodplain communities is also expressed by the significantly lower similarity indices.

However, the highest species diversity is exhibited in the riparian woodlands along the island margins (No. 21-22). During the field campaign in February 2003 between 20 and 83 species were recorded per 70 m^2 plot, and altogether more than 150 species (e.g. more than one eighth of the whole Okavango flora) were identified within only five plots (Sliva et al. 2004). Island margins provide optimal habitat for a large number of woody species (shrubs and trees), which increase the species diversity considerably. Apart from the woody species, vegetation composition here have distinctive seasonal variations.

The origin and the unique ecological functions of islands and associated woodlands has been subject of several in-depth studies (McCarthy et al., 1991; McCarthy et al., 1993; Ellery at al., 1993; Ellery and Tacheba, 2003, Ramberg and Wolski, 2007). In this environment the classification of the riparian plants as dry land species is ambiguous as the riparian zones are fed by shallow horizontal groundwater infiltration from adjacent rivers and floodplains (Ramberg et al., 2006). The majority of woody species (trees, shrubs and lianas) which occur within these riparian bands in the island fringes of the Okavango Delta are probably able to tap this groundwater resource (Ringrose, 2003). Even though these are not strictly wetland habitats, they are central for the present structure and functioning of the whole Delta ecosystem (Ellery and Ellery, 1996; Ellery and Tacheba, 2003; Ramberg and Wolski, 2007), and the fact that we find the highest species diversity in these island fringe communities underpins their high ecological value.

Next to the hydrological factor complex, the salinity of the island soils influences the diversity of species within small areas. There is a gradient of increasing solute concentration in the ground water from the edge of the islands towards the centre (McCarthy at al., 1991; Ellery at al.; 1993) which is reflected by a typical zonation of vegetation and the establishment of characteristic communities (No. 23-24). On sites with high solute concentrations species diversity declines considerably since only few species are adapted to those harsh living conditions. Although the communities of saline soils seem to be the species poorest among all other communities in the Okavango Delta (with only about 20 species), they contribute to the overall species diversity because of the occurrence of the specialized halophytes.

Small ephemeral water bodies (pans) occur during the rainy season in drier habitats and carry the next specific plant communities (No. 25-26) with a distinct zonation according to the water depth and duration.

It is obvious that the main reason for the high plant species diversity of the Okavango Delta as well as for the exceptionality of this ecosystem from a nature conservation point of view, lies in the interaction of periodical natural phenomena – the annual flood in the dry season and the distinct rainy season in time of low water level – with the shifts in flooding pattern over short and long periods. Succession processes at different phases of development are therefore ongoing in all plant communities in the Delta. These processes are the main driving forces for the species and habitat diversities in the Okavango Delta and must be conserved in order to maintain the uniqueness of this system.

2.3.2.3 Vegetation spatial coverage

According to a preliminary vegetation classification map produced by the Harry Oppenheimer Okavango Research Centre, ten different vegetation units can be distinguished within the Okavango Delta Ramsar Site. The map is given in Figure 2-9. Table 2-3 below shows the spatial coverage for each of the ten classes throughout Ngamiland District with a total land coverage of 107,906 km^2 including the Linyanti floodplain.

It can be seen that a large proportion of the District is covered by tracts of *Colophospermum mopane* and tree shrubland dominated by Acacia species especially *Acacia erioloba* and *Acacia mellifera*. The latter class is found mainly in areas used for livestock farming along the southern and western edges of the Delta. This might suggest signs of bush encroachment due to overgrazing and over exploitation of resources as these areas are heavily populated. The third largest vegetation grouping consists of open shrubbed

grasslands which overlaps with the tree shrubland described above. This class also occurs on areas that appear to have been overgrazed and showing significant levels of erosion.

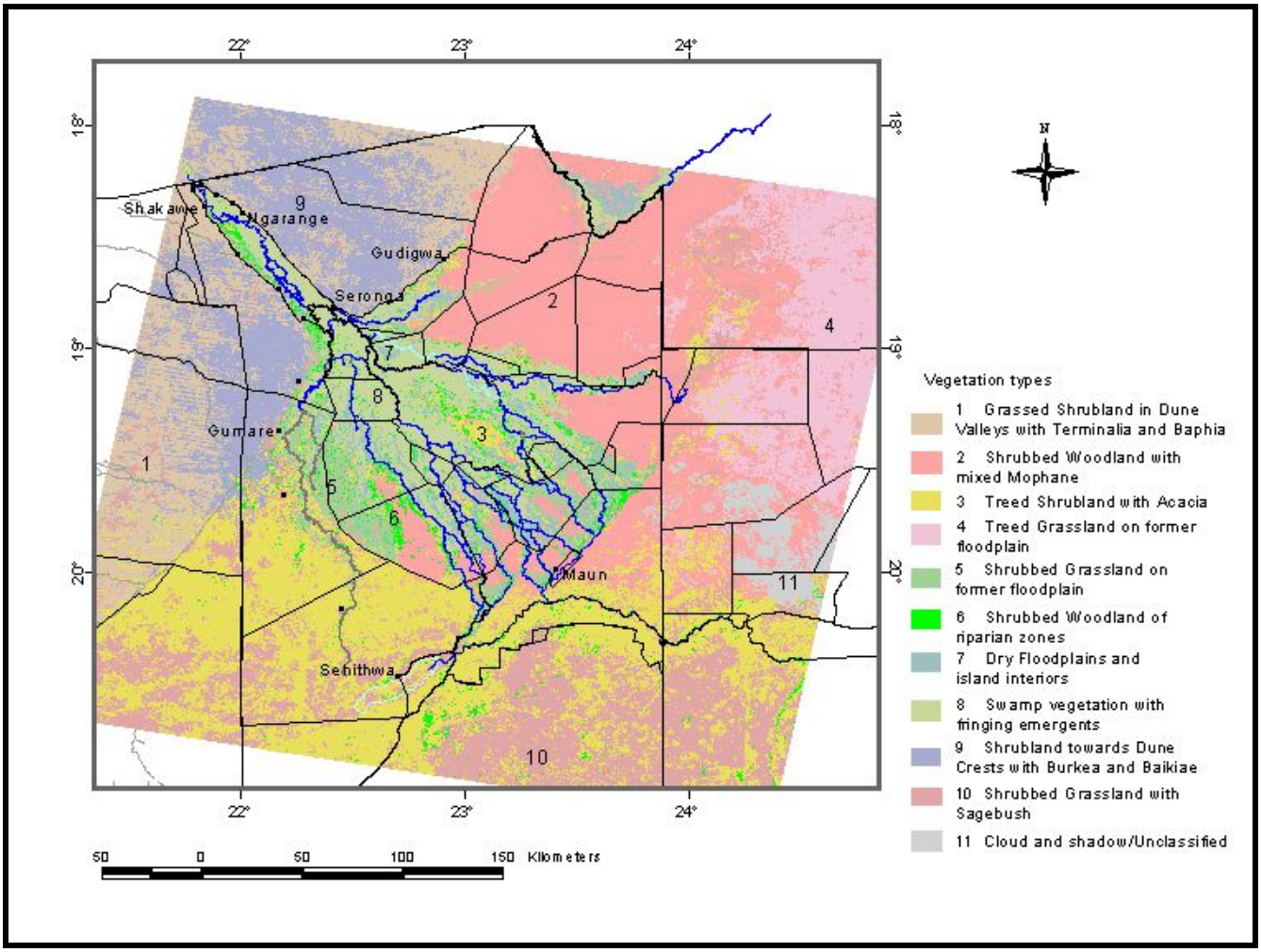

Figure 2-9:Vegetation classification map of the ODRS

Table 2-3: Spatial coverage (km²) of each vegetation grouping for the entire Ngamiland District

Zone	Description	Area(km2)
1	Grassed Shrubland in Dune Valleys with Terminalia & Baphia	10419
2	Shrubbed Woodland with mixed Mophane	20063
3	Treed Shrubland with Acacia	22959
4	Treed Grassland on former Floodplain	8460
5	Shrubbed Grassland on former Floodplain	3258
6	Shrubbed Woodland of Riparian zones	1816
7	Dry Floodplains and Island Interiors	2857
8	Swamp vegetation with fringing emergents	8531
9	Shrubbed towards Dune Crests with *Burkea avourab* and *Baikiae plurijuga*	10519
10	Shrubbed Grassland with Sagebrush	17186
11	Cloud and Shadow/Unclassified	1838

	Total: Ngamiland (Includes Linyanti)	107906

Source: HOORC Vegetation Map – 2004.

2.3.2.4 Alien and Invasive Plant Species

The most common alien invasive species in the ODRS is the free floating water fern *Salvania molesta* (Mochimbamo). It occurs mainly in the eastern parts of the Delta and is kept under control by the introduced weevil *Cyrtobagus salvianae*. The control is not completely successful probably due to the cold winters that tend to kill most of the weevil population, originally coming from tropical Brazil. As long as the waters are low in nutrients the density of Salvinia will remain low but with eutrophication it could very well turn into a serious pest.

At the moment there is limited information on the distribution of other alien plant species that can be potentially invasive in the project area, though there have been complaints by various stakeholders on the introduction of such species in the Okavango Delta especially for ornamental purposes and through various tree planting activities. However attempts are being made to computerize the species lists distributed as part of National Tree Planting Activities since 1999 to date in order to input this data in the planning process.

In relation to the Ramsar Site, there have been reports of occurrence of the alien grass *Cenchrus biflorus* already common in parts of the Kalahari, which is harmful due to its spiny seeds that tend to attach to the mouth and eye region of grazing livestock. These occur mainly in Okavango Sub-District but the extent of their distribution has never been mapped.

2.3.2.5 Rare and Endangered Plant Species

A total of 20 plant species occurring within the ODRS have been selected for Red Data List status using recognized IUCN Red Data List criteria (ODMP – Assessment of occurrence and distribution of threatened and endangered plant species in the Okavango Delta, 2006). Their distribution is given in Figure 2-10. Of these 20 species, 7 are listed as THREATENED, i.e. at very to extremely high risk of going extinct in the wild (at local level).

- *Zeuxine africana* is considered CRITICALLY ENDANGERED.
- Eulophia angolensis and Habenaria pasmithii are thought to be ENDANGERED
- *Acacia hebeclada subsp. Chobiensis, Aldrovanda vesiculosa, Eragrostis subglandulosa* and *Erlangea remifolia* qualify for VULNERABLE status,
- *Ansellia Africana, Eulophia latilabris* and *Harpagophytum zeyheri* subsp. S*ublobatum* are thought to be NEAR THREATENED.
- *Aristida stipitata subsp. Spicata, Boscia matabelensis, Harpagophytum procumbens subsp. Procumbens, Harpagophytum ze*yheri subsp. *Sublobatum, Orbea knobelii, Oryzidium barnardii* and *Panicum gilvum* are thought to be of LEAST CONCERN.
- The grass *Eragrostis leptotricha* is still DATA DEFICIENT, but potentially and ENDANGERED species.

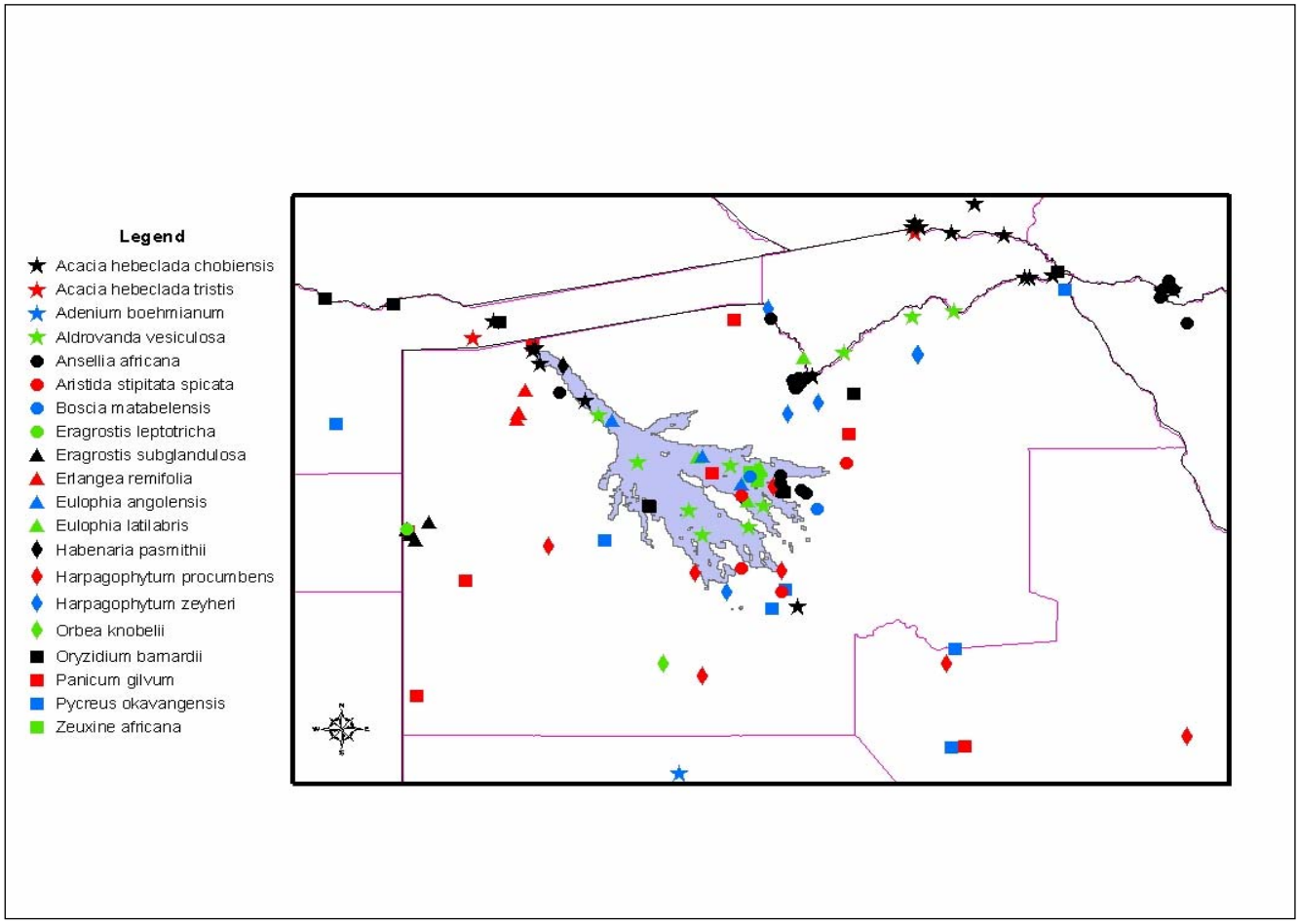

Figure 2-10: Distribution map of rare and endangered plant species in the ODRS

2.3.3 FAUNA

2.3.3.1 Invertebrates

The data on invertebrate species in the Okavango Delta is far from comprehensive and many taxonomic groups are too difficult to collect, or nobody has tried to sample them, while some are taxonomically not well known, or there are no taxonomists able to identify them. The picture will, therefore, be patchy and will probably remain so for a long time.

Dragonflies (Odonata)

Comparatively good information exists for Odonata. Pinhey, (1967; 1976) collected samples in the Okavango area during a number of expeditions until 1976 and Kipping, (2003) repeated these studies. A total of 94 species were found, 33 Damselflies (Zygoptera) and 61 Dragonflies (Anisoptera). Many of these have a Central African distribution and reach their southern most distribution in the Delta.

Kipping found one new species for the area and one new for science. He could however only find 70 out of the 92 species found by Pinhey. The reason for the absence of species could be the gradual decline in flooding of the Delta since the mid-seventies which could have resulted in a loss of suitable aquatic habitats for the larvae or in a loss of suitable flying prey for hunting adults. Another factor is the aerial spraying against tsetse flies in the Delta which took place during the eighties and then again 2001-02. During the first period fairly

potent insecticides such as dieldrin were used, but over smaller areas in each year. In the recent spraying, however, the entire Delta south of the Panhandle was sprayed, the northern part in 2001 and the southern part in 2002. Deltamethrin was used which has some good properties such as short half-life in nature and its specificity for invertebrates. Adult Odonata experienced high mortality during the spraying of Deltamethrine and the same results were recorded for larvae of the families living on the sediment surface or on vegetation (Perkins and Ramberg, 2004).

Butterflies (Lepidoptera)

A preliminary checklist of butterflies of Botswana, including the Okavango Delta, was published by Pinhey (1968; 1971; 1974; 1976). 115 species were recorded from this area.. Very little other information has been published since 1976.

The Nymphalidae and Lycaenidae are the most diverse families in the Okavango Delta (Table 7), despite the abundance and conspicuousness of the Pierids (Pinhey, op.cit.). The vast majority of butterflies encountered in the Delta belong to this first family, and are restricted mainly to two very abundant migratory species – *Belenois aurota* (Brown-veined White) and *Catopsilia florella* (African Migrant). Large numbers of these two butterfly species migrate in a north-easterly direction throughout the region, including the Okavango, in mid-summer. The Lycaenids by contrast are small, inconspicuous species, which nevertheless contribute to over 30% of the observed diversity.

Analysis of Pinhey's Checklist of Butterflies of Botswana shows that the Okavango Delta is a focus of butterfly diversity in Botswana. This is not unexpected since this is a wetland area surrounded by arid Kalahari semi-desert – a wide variety of habitats exist with a wide range of larval food plants, and angiosperms which provide nectar for the adult butterflies. Some species such as *Danaus chrysippus* and *Vanessa cardui* are cosmopolitan, while others are characteristic of wetlands such as: *Hyalites rahira*, *Precis ceryne*, *Myrina silenus*, *Borbo micans*, *Parnara monasi* and *Gegenes hottentota*.

There are no documented ENDANGERED or VULNERABLE butterfly species in the Okavango (Henning and Henning, 1989). The following species are RARE: *Anthene minima*, *Colotis doubledayi angolanus*, *Pseudonympha swanepoeli* and *Tuxentius malaena*.

Mollusca

The occurrence of aquatic snails has been fairly well documented in several studies compiled by Murray, (1997). Most of the aquatic snails found in the Okavango Delta are widespread in the Afrotropical region. The most southerly localities known in Africa for populations of *Pila* and *Gabbiella* (op.cit.) are found here and only one species out of 16 may have some affinity with temperate climates. There are no endemic snail species and many of them occupy seasonal waters scattered over huge areas of the African savanna.

Zooplankton

In total 37 microcrustaceans have been recorded in the Delta by Lindholm (2006). There are 16 species of copepods within six genera, with *Microcyclops* and *Tropodiaptomus* being dominant and 45 cladoceran species. Most are minute, reflecting the strong predation pressure from visually feeding fish fry.

Three different zooplankton habitats may be distinguished in the Delta: permanent lakes, seasonal floodplains and isolated temporary rain pools. Among these, seasonal floodplains offer the most diverse zooplankton fauna. During high water periods, the production of ostracods, copepods and cladocerans can be extremely high temporarily. Nearly 90 g DW l^{-1}

zooplankton biomass has been recorded, making zooplankton on seasonal floodplains a crucial link in the aquatic food web (Høberg et. al., 2002).

Effects of aerial spraying against tsetse flies

The aerial spraying of the entire Delta (except the Panhandle) against tsetse flies 2001 and 2002 using Deltamethrin (0.26-0.30 g/ha) was repeated five times during the cold season May – August and environmental monitoring was done by HOORC (Perkins and Ramberg, 2004).

No effects of the spraying could be documented for fish and birds and Deltamethrine in the low doses used is known for its small effects on vertebrates. Similarly no negative effects on humans or on the tourism industry were reported. After spraying, aquatic invertebrate families showed a 25-46% reduced total abundance Out of a total 65 taxa 23 were common, and of these, six taxa with several species in each, declined drastically during the spraying campaign and had disappeared by the fifth spraying cycle. It is likely that at least the same proportion of the less common taxa was eliminated as well.

Terrestrial invertebrate abundance declined by up to 68%. The most affected group was beetles. The composition of species changed through the cycles. Around 30% of the species were only collected before the spraying or in the first spraying cycle, whilst a lower proportion appeared in later cycles for the first time.

During year 2003 many of the affected families returned to pre-spraying abundances and the composition of aquatic invertebrates in the sampled habitats returned approximately to their pre-spraying patterns.

2.3.3.2 Fish

The Okavango system has been connected to the Upper Zambezi drainage basin and its fish fauna can be considered as being part of the Zambezi system, which has some 134 species of fish (Skelton 2001; Ramberg et al. 2006). Of these 86 are found in the Okavango basin and 71 within the Okavango River and Delta below the Popa Rapids of the East Caprivi Strip in Namibia. The Zambezi fauna includes 23 (17%) endemic species, most of which are restricted to the upper Zambezi (Skelton, 2001). There are, however, no endemic species restricted to the Okavango River and Delta below the Popa Rapids. So far no alien introductions or translocated fish have been found in the Okavango River and Delta. This is an almost unique situation in Southern Africa where a large number of alien species occur in most river basins

Fish stock assessment

Locally, the seasonal floodplains have a much larger density of fish than the permanent swamp and streams (Hogberg et al., 2002). Occasionally very high densities occur before and during spawning, as well as in drying-up pools that have been isolated from the streams. Here fish eating birds aggregate in large numbers.

Compared with a large number of African lakes and rivers the number of fishermen per square km is extremely low in the Okavango Delta (Mosepele, 2000). Locally household fishing may be important, but large areas of the swamp are not accessible by boat due to vegetation blockages and the risk of Hippopotamus attacks. The total yield of the fishery is low, and the catch per unit effort (CPUE) very low (0.4 kg/Lundgren gillnet set) compared with ten other aquatic systems in Africa which had a range of 1.4 – 4.2 kg/set (op.cit.). This does indicate an overall low fish biomass in the Delta and reflects its low nutrient status.

2.3.3.3 Reptiles and Amphibians

In total 33 amphibians and 64 reptiles have been recorded in the Okavango Delta (Murray, 1997). All amphibians are dependent on water at least for reproduction and/or deposition and hatching of the eggs. Most of the 33 amphibian species occur close to water and only 3-5 species are more terrestrial. On the other hand only two amphibian species (*Xenopus laevis* and *X. muelleri*) are fully aquatic. Most other species select habitats close to water and some have adopted strategies of hibernation or aestivation to survive temporal and seasonal desiccation of habitats.

Out of the 33 species in Botswana twelve (36%) have a distribution restricted to the Okavango and the Chobe and eight (24%) are confined to the Okavango Delta only. These species are tropical and the Okavango Delta is commonly the southern end of their distribution.

Out of 64 reptile species recorded from the Delta the four terrapins (Pelomedusidae), *Varanus niloticus*, the Nile Crocodile and one snake (*Crotaphopeltis barotseensis*) are confined to water, while the python and four snake species in Colubridae mainly occur in swamp habitats. Most reptiles, 52 in all, are thus terrestrial. Most of these have a wide distribution in southern and central Africa. There are on the other hand 10 species whose distribution in Botswana is restricted to the Okavango and the Chobe. Seven of them are aquatic or swamp species and have a northern – tropical distribution. Two species are terrapins and the other five are snakes.

2.3.3.4 Birds

The number and variety of birds in the Okavango Delta is well documented, due largely to the efforts of amateur birdwatchers who contributed substantial data to the Bird Atlas of Botswana between 1980 and 1990. This database, where birds have been recorded in a standardized way for the whole country, has subsequently been kept updated by the Records Sub-committee of BirdLife Botswana.

Number of species

There are 444 confirmed bird species occurring in the Okavango Delta. This makes the Delta together with the Chobe River, the most species-rich area in Botswana. Most are widely distributed species belonging to 74 families of which the most important in terms of number of species are the following:

Accipitridae (eagles, hawks, buzzards, kites): 38 species.
This family includes the African Fish Eagle *Haliaeetus vocifer* and African Marsh Harrier *Circus ranivorus* as two typical wetland species.

Sylviidae (warblers, apalises, cisticolas etc.) : 31 species.
One of the warblers (Greater Swamp-Warbler *A. rufescens*) and three cisticolas (Red-faced Cisticola *C. erythrops*, Luapula Cisticola *C. galactotes*, Chirping Cisticola *C. pipiens*) are wetland species with their ranges in Botswana largely confined to the Okavango Delta.

Ploceidae (sparrows, weavers, bishops, widows, queleas): 25 species.
Eight members of this family are wetland species, with substantial populations in the Okavango Delta, as follows: Thick-billed Weaver *Amblyospiza albifrons*, Spectacled Weaver *Ploceus ocularis*, Village Weaver *P. cucullatus*, Golden Weaver *P. xanthops*, Southern Brown-throated Weaver *P. xanthopterus*, Southern Red Bishop *Euplectes orix*, Yellow-crowned Bishop *E. afer*, and Fan-tailed Widowbird *E. avourable.*

Ardeidae (herons, egrets, bitterns): 18 species.

All of the ardeids are primarily wetland species, with the exception of the Black-headed Heron *Ardea melanocephala* and Cattle Egret *Bubulcus ibis* which are widely distributed throughout Botswana (although both breed extensively in the Okavango Delta).
The Slaty Egret *Egretta vinaceigula* is the Okavango's only near-endemic bird species. It has the Okavango Delta as the centre of its distribution, and it is estimated that 85% of the global population of this species occurs here.

Geographic and habitat distribution of Okavango birds

The Okavango Delta falls within the Afrotropical region. However, all around the Delta to the west, east and south there is an abrupt change from tropical vegetation to Kalahari woodland or dry savannah. Consequently, the distributions of many bird species, particularly waterbirds, closely mirror the extent of the Okavango. The following three categories may be defined:

Aquatic species (112 spp.) – those that feed by diving, swimming or wading, or feed on shores or mudflats in the vicinity of water. These are all non-passerines with the exception of the coucals and some of the kingfishers, which are near-passerines.

Non-aquatic species (57 spp.) inhabiting wetland habitats such as floodplain forests, palm swamps, marshes and reed beds. The majority of these are passerines.

Terrestrial species not restricted to wetlands (275 spp.). These are mostly near-passerines and passerines, and members of the family Accipitridae (non-passerines).

Conservation status of Okavanga birds

There are eight globally threatened and near-threatened bird species which occur in the Okavango Delta (Table 2-4).

Table 2-4: Globally threatened or near-threatened bird species occurring in the Okavango Delta. (BirdLife Botswana Red Data List)

Conservation Status	Common name	Scientific name	Status
Vulnerable	Slaty Egret	Egretta vinaceigula	Resident
	Lesser Kestrel	Falco naumanni	Palaearctic migrant
	Cape Vulture	Gyps coprotheres	Vagrant
	Wattled Crane	Grus carunculatus	Resident
	Corn Crake	Crex crex	Palaearctic migrant
	Lappet-faced Vulture	Torgos tracheliotus	Resident
Near threatened	African Skimmer	Rhynchops flavirostrisi	Resident
Data deficient	Black-winged Pratincole	Glareola nordmanni	Palaearctic migrant

The Delta is also very important for the Wattled Crane – it currently supports the largest, single population of this species and over 15% of the global population. The other globally threatened species are occasional visitors to the Delta or □avourable□ migrants.

Seventeen range-restricted or biome-restricted species occur in the Okavango. One of these, the Chirping Cisticola is aquatic, and in Botswana is confined to the Okavango. The others are more widespread, and most are common in their respective habitats.

Following the criteria laid down by BirdLife International, the Okavango Delta is also of conservation importance for a substantial number of congregatory waterbirds; it supports over 1% of the global populations of 20 species, and 0,5% of the global populations of another 12 species.

The vast majority of the birds found in the Okavango Delta are breeding residents, 339 or 76%. There is, however, a significant number of □avourable□ migrants all of which are waders (29 %), that visit the Okavango specifically because of its wetland habitats.

2.3.3.5 Mammals

The Okavango Delta has a wide variety of large mammals occurring locally in high numbers, and which are the main attractions in the growing tourism industry (Mbaiwa, 2003). However, most mammals in the Delta are fairly small and often overlooked. The overall mammal biodiversity of this entire community is determined by such factors as habitat diversity, connectivity to species pools in the Southern African region and the environmental history of the Delta.

Number of species

Some 122 mammal species of 12 orders and 34 families live in the Okavango Delta (Table 15). All the larger species are wide spread across the African Savanna region. The distributional ranges of some of the larger mammals are marginally within the Delta but occur in the larger Ramsar site. One of these, the Sable Antelope (*Hippotragus niger*), is common in the broad-leaved woodlands and the grasslands close to the Delta (Skinner & Smithers 1990). Similarly, the Eland (*Taurotragus oryx*) and the Gemsbock (*Oryx □avoura*) prefer drier landscapes and rarely spend time in the Delta (Skinner and Smithers 1990). The Black Rhino (*Diceros bicornis*) and the White Rhino (*Ceratotherium simum*) were driven to extinction in the Delta and Linyanti by poachers 20-30 years ago. The latter species has recently been re-introduced.

Species composition and size distribution

Almost half of the mammal species are bats or rodents (n=57). Most of these are small and weigh less than 100 g. A third of the mammals (n=40 species) are heavier than 10 kg and 11 of these are carnivores. At least 18 species weigh more than 100 kg. These include the large African antelopes, the Burchell's Zebra (*Equus burchelli*) and the African Lion (*Panthera leo*). The four species that are heavier than 1000 kg include the White Rhinoceros, the Hippopotamus, the Giraffe (*Giraffa camelopardalis*), and the African elephant.

The two most common of these megaherbivores (Owen-Smith, 1988) significantly affect the physical environment. Elephants that feed on a large variety of plants, including trees and shrubs, modify the terrestrial habitats of other species in the Delta (e.g. Gilson and Lindsay, 2003), for instance by changing woodlands to grasslands. Hippopotami on the other hand, change both the aquatic and floodplain habitats for species living in the Delta (McCarthy et. Al. 1998) by opening up channels and facilitating flooding.

Common species and total biomass

The Impala is the most common large mammal in the Delta (Table 2-5), followed by the Buffalo and the Red Lechwe (Bonyongo, 2004). Elephants are also very abundant. This species has increased in numbers from 2300 (1975/76), to 5700 (1984/85) (SMEC, 1989),

15000 in 1988 and 35000 in 2002 (Bonyongo, 2004). Similarly, the numbers of two other large herbivores, Hippopotamus and Buffalo, have increased remarkably during the last fifteen years, while most small and medium sized herbivores have declined (op. cit.). The abundance of elephants is now so high that they may constitute a threat to woodlands, especially when considering that about 25% of the Delta is permanently wet and not used by elephants. The Hippopotamus numbers given at about 2500 are likely to be a minimum, due to the problems in aerial counting of these often submerged animals. For similar reasons the numbers based on aerial counts given in Table 2-5 for Sitatunga and Kudu, are likely to be under-estimated.

The total mammal biomass for the Moremi Game Reserve (7000 km^2) in the Okavango Delta has been estimated as being 12 000 kg/km^2 (Bonyongo, 2004), which is much higher than for most wildlife areas in southern Africa and comparable with the rich savannas in the East African Rift valley. The regression models between rainfall (Coe, Cumming and Phillipson, 1976) and rainfall + nutrient level (East, 1984) estimates the Okavango mammalian biomass to be 4-8 times lower than what direct calculations generated for a system like the Okavango Delta. The high biomass densities of the Okavango Delta compared to the rich savannas is attributed to high numbers of elephants and buffalo who jointly contribute 73% of the total mammalian biomass in Delta (Bonyongo 2004). The two moisture regimes, from the annual rainfall and the annual seasonal flooding results in two distinct growing seasons. This results to high productivity of foraging resources enabling the Delta to support high numbers of mammalian herbivores.

Table 2-5: Common species and numbers

Species	Total number
Elephant, Loxodonta africana	35 000
Zebra, Equus burchelli	14 000
Warthog, Phacochoerus aethiopicus	2 000
Hippopotamus, Hippopotamus amphibius	2 500
Giraffe, Giraffa camelopardalis	5000
Wildebeest, Connochaetes taurinus	8 000
Tsessebe, Damaliscus lunatus	3 000
Impala, Aepyceros melampus	140 000
Buffalo, Syncerus caffer	60 000
Kudu, Tragelaphus strepsiceros	300
Sitatunga, Tragelaphus spekei	500
Red Lechwe, *Kobus leche*	60 000

Number of common large mammals in the Okavango Delta in 2002, calculated for an area of 20 000 km^2, based on 10 aerial counts done 1988 – 2002 by the Department of Wildlife and National Parks, Government of Botswana (from Bonyongo, 2004). For Impala the numbers have been corrected based on ground counts

The extended productive period caused by the annual flood is certainly one of the causes for this. On the other hand the generally low nutrient levels in the Delta should limit biological production (op. cit), but the dynamic vegetation successions caused by flooding with periodically and locally high mobilization of nutrients may cause high nutrient levels for forbs and hence favourable production conditions for grazing mammals.

Habitat assemblages

All the common species mentioned above, except the Buffalo, depend on more than one habitat. For instance, the Impala inhabits floodplains and grasslands adjacent to riparian

woodlands, while the Red Lechwe prefers the seasonal floodplains close to deeper waters of the Delta (Skinner and Smithers, 1990). The Hippopotamus grazes at night often several kilometres from the rivers and lakes which it uses during the day (Skinner and Smithers, 1990). Elephants are also water dependent. They are mixed feeders and use most of the habitats in the Delta.

There are some clear differences in species composition along the wet-dry habitat gradient in the Delta. The Hippopotamus, the Sitatunga, the Cape Clawless Otter (*Aonyx capensis*) and the Spotted-necked Otter (*Lutra maculicollis*) live in the deeper, usually permanent waters of the rivers, lagoons and lakes (Skinner and Smithers, 1990). The Reedbuck (*Redunca arundinum*) occurs in the seasonally flooded areas with lower Cyperaceae species, while the Red Lechwe frequents the floodplain grasslands in large numbers (Skinner and Smithers, 1990). These wet habitats support 3 and 21 species each, and are different in species composition from each other and from the drier habitats. They have a high proportion of grazers while insectivores (mainly bats) are absent.

The drier habitats across the Delta (riverine forests, riverine woodlands, savanna woodlands, dry woodlands and dry scrub), on the other hand, support similar groups of species. These habitats are more species-rich with a total of 110 species and with a typical mammal composition of the East – South African savannas. These include the big cats (Lion, Leopard (*Panthera pardus*) and Cheetah (*Acinonyx jubatus*) which are common as well as the Spotted Hyaena (*Crocuta crocuta*); and the endangered African Wild Dog (*Lycaon pictus*) has a stronghold here. The large number of species is due to the species-rich groups of bats and rodents which predominantly occur here. The most common herbivores are listed in Table above .

Reproduction

In the Southern African region at least 75% of the species living in the Okavango Delta give birth during the summer months (Smithers 1971; 1983), while six species breed during winter only. These same species breed during winter in the Delta as well. However, another 12 species are winter breeders which are summer breeders in the region and an additional 27 species are winter breeders which breed year round in the region. This might indicate that the prolonged breeding is a response to the relative predictability in abundance of resources during the flooding and is likely to be a specific genetic modification.

Protected Game Animals

The following species have been listed as protected under the Wildlife Conservation and National Parks Act, 1992. They cannot be hunted or captured without authority.

Night ape, Pangolin, Aardwolf, Brown hyena, Cheetah, Serval, Blackfootedcat, Wilddog, Otter, Honey badger, Civet, Antbear, Rock dassie, Yellow spotted dassie, Rhinoceros, Hippopotamus, Giraffe, Klipspringer, Oribi, Sharpe's steenbok, Mountain reedbuck, Water buck, Puku, Roan antelope, Vaal rhebok, Pelicans, Egrets, Bitterns, Hammerkop, Storks, Ibises, Spoonbill, Flamingos, Secretary bird, Vultures, Falcons, Kites, Eagles, Buzzards, Sparrow hawks, Goshawks, Harriers, Cranes, Kori bustard, Stanley bustard, Jacanas, Fishing owl, Narina trogon, python.

2.4 SOCIO-ECONOMIC FEATURES

The distribution of the various socio-economic activities in the ODRS is shown in Figure 2-11. The main activities include tourism, livestock farming, arable agriculture, fishing, gathering of veld products, crafts and provision of various other services.

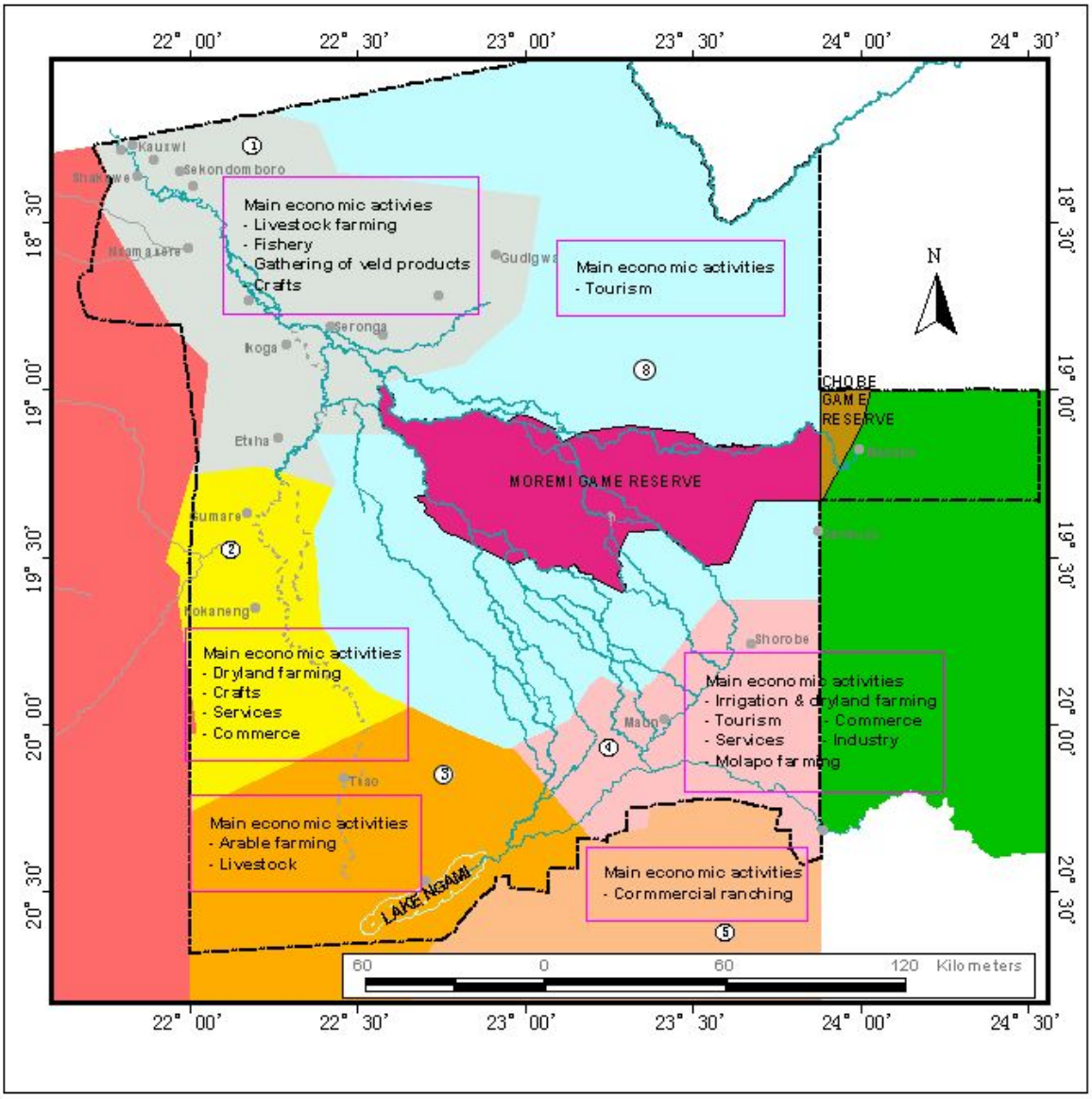

Figure 2-11: Spatial Distribution of Economic Activities in Ramsar Site (source: NDSS 2004)

The employment profile of the various sectors in Ngamiland District within which the ODRS falls is given in Table 2-7 Agricultural, hunting and forestry, which are direct uses of the Delta natural resources, account for 13.5% of employment in the district. These are followed by the service providers in the form of transport and communications, and hospitality sector at 7.5 and 7%, respectively.

Table 2-6: Employment profile by major sectors in Ngamiland District

Sector	Employment	% of Grand Total
Agriculture, Hunting and Forestry	3373	13.48
Fishing	135	0.54
Mining and quarrying	61	0.24
Hotels and restaurants	1733	6.92
Construction	2840	11.35
Manufacturing	1878	7.5

Sector	Employment	% of Grand Total
Electricity, Gas and Water Supply	130	0.52
Wholesale and Retail Trade	3441	13.75
Financial services	188	0.75
Real Estate	663	2.65
Public Administration	4462	17.83
Transport and communication	1895	7.57
Education	1896	7.58
Health and social work	814	3.25
Other community, social and personal services activities	752	3
Private households with employed persons	580	2.32
Foreign Missions, International Organisations	9	0.04
Unclassified	177	0.71
Total	25027	100

Compiled and Computed CSO, 2001 Census

2.4.1 2.4.1 PAST AND CURRENT LAND USES

2.4.1.1 Past Land Use

Households of Ngamiland have diverse livelihood activities which are natural resource and non-natural resource-based. Natural resource-based activities include livestock rearing, arable farming, collection of veld products (such as reeds, thacthcing grass, wild fruits, medicinal plants etc.), basket-making, fishing and community-based tourism. Non-natural resource-based activities include formal employment, remittances, rural trade and social protection programmes. Livelihood activities are strongly associated with ethnicity in Ngamiland. The WaYei and HaMbukushu are particularly known for their involvement in fishing. For their part, the Baherero and Batawana are associated with pastoral farming. Traditionally, Batawana are known to engage in both pastoral and arable farming. Dryland arable farming is also common among the communities of the Etsha settlements who are mainly the HaMbukushu, whereas *molapo* farming is more associated with the WaYei (Kgathi et al, 2004). The San communities are also generally known for their hunting, gathering, and fishing. The different sources of livelihoods have significant implications to the development options available to the district's population.

2.4.1.2 Current Land Use

Existing land uses and land use activities in the ODRS are largely a reflection of the area's natural endowment which gravitates around the attributes of the Okavango Delta. The soils, vegetation, the general climatic conditions and the existence of vector-borne diseases associated with Tsetse-Fly, largely contribute to the distribution of the human population and related activities within the ODRS.

The land uses within the ODRS are discussed in terms of broad land use zones. These zones comprise Communal areas, Game Reserves and National Parks and Wildlife Management Areas (Tawana Land Board, 2005). The zones are given in Figure 2-12.

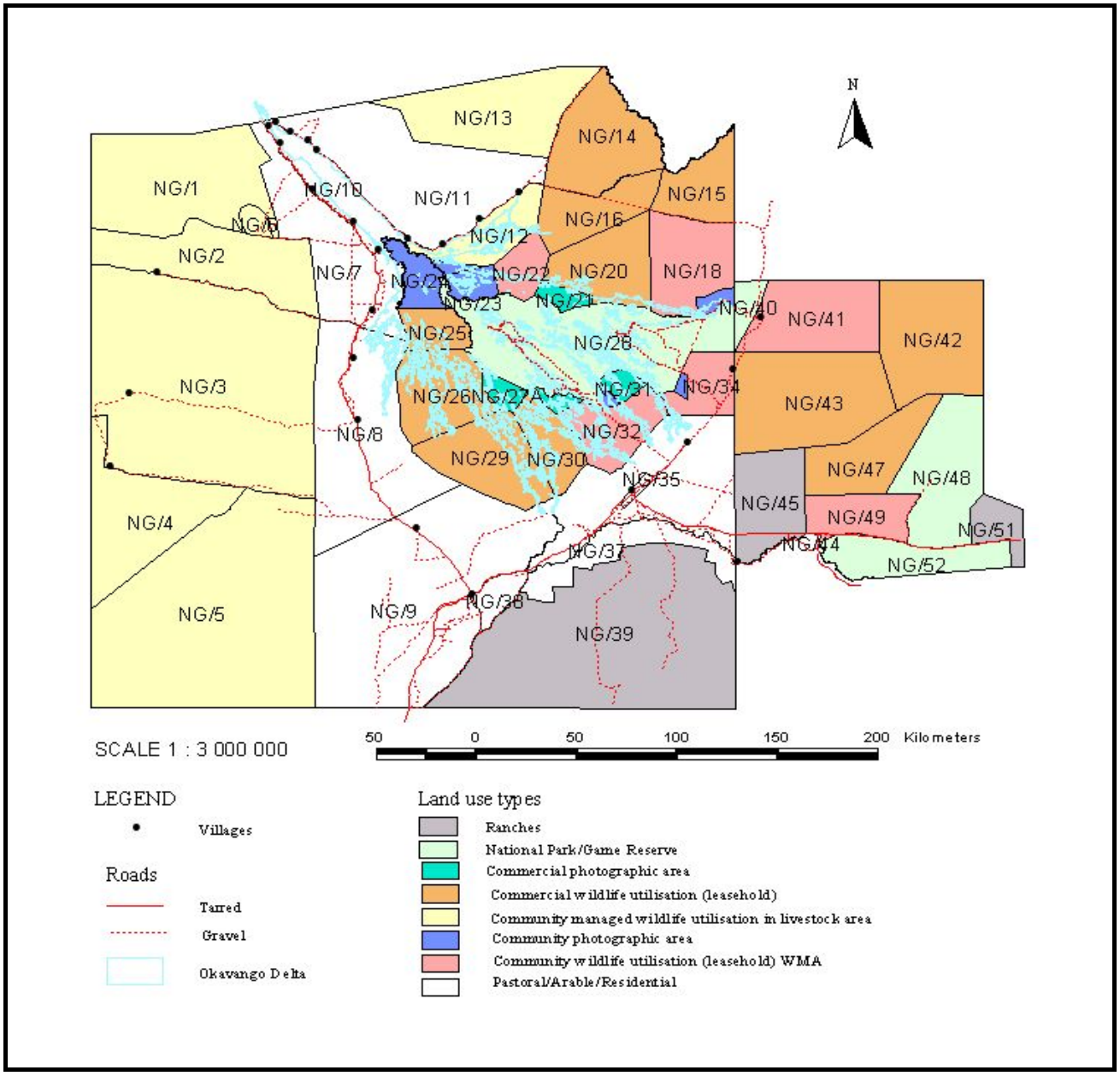

Figure 2-12: Land use map of the ORDS

These broad categories, particularly communal areas are further subdivided into smaller and more specific categories which include settlements, arable lands and grazing areas. Table 2-7 shows the land use up-take for the broad land use categories.

Table 2-7 Existing Broad Land Use Categories in the ODRS (ODMP Integrated Land Use Plan 2006)

Land Use Category	Area (km^2)
Communal Areas Settlements, Arable and Pastoral Agriculture	29 950
Game Reserves and National Parks	5000
Wildlife Management Areas	13 000
Wetlands (outside protected area)	7424

2.4.1.3 Settlements, Arable and Pastoral Agriculture

The dominant land uses in communal areas include arable agriculture, pastoral agriculture and settlements.

(a) Arable agriculture is widely practiced by communities living within the ODRS. Dryland farming and molapo farming are the dominant arable agricultural practices in the ODRS. Settlements around Etsha villages and those on both sides of the Panhandle are well known for dryland farming. Molapo farming is associated with communities around the southern parts of the Delta where both maize and sorghum are cultivated.

(b) Pastoral agriculture is widely practiced in the area and cattle herds are found at various cattle posts interspersed with villages and arable fields. Apart from those interspersed with villages and land areas, some of the cattle posts, are also found in the sandy areas to the northwestern areas towards Tobera, and the north-western boundary of Botswana and the Caprivi Strip in Namibia.

For communities in the western and southern parts of the Delta, cattle posts are located further west in an area that stretches from Gani in the north to as far down south as Botlhatlogo. The development of the pastoral agriculture is greatly limited by availability of water in areas lying far from the Delta.

(c) Settlements are small and dotted along the edges of the Delta and the main arterial road that services both the eastern and western parts of the Delta. Thus, in the case of the eastern side of the Delta for example, the area stretching from Mohembo East to Gudigwa has about thirty-five settlements- villages, cattle posts and lands areas interspersed at distances of less than 5km on average.

2.4.1.4 Game Reserves and National Parks

Moremi Game Reserve constitutes the only reserve within the ODRS and covers a total area of 4871km^2 which translates to about 7% of the ODRS. Maun Educational Park and a small portion of the Chobe National Park fall within the ODRS. These areas are total conservation areas.

2.4.1.5 Wildlife Management Areas

WMAs constitute 22% of the total area of the ODRS and these are subdivided into Controlled Hunting Areas (CHAs – administrative units used throughout the country to facilitate wildlife management).

2.4.1.6 Wetlands

There are a series of water bodies within the ODRS which are used for a variety of purposes including fishing, transport, harvesting of veld products and tourism outside protected areas.

2.4.2 2.4.2 NATURE CONSERVATION AND COMUNITY BASED NATURAL RESOURCE MANAGEMENT

2.4.2.1 Game Reserves and Wildlife Management Areas

The nature conservation initiatives within the ODRS include designating parts of the site as a game reserve, namely Moremi Game Reserve, and Wildlife Management Areas (WMAs).

Parks and Game Reserves provide for total preservation and protection of wildlife resources while sustainable utilization of wildlife resources is encouraged in WMAs.

The activities within the Moremi Game reserve are non-consumptive, i.e. do not involve natural resources off-take but include photography, education, game viewing and accommodation.

WMAs are located on the margins of National Parks and Game Reserves where they serve as buffer zones between incompatible land uses particularly livestock and wildlife and in some cases, they also serve as migratory corridors for wildlife. Within these land parcels, both consumptive (trophy hunting) and non-consumptive (photographic) based commercial wildlife operations are executed and these are classified as tourism land use. Figure 2-12 illustrates the different land use parcels.

The WMAs are divided into Controlled Hunting Areas (CHAs). Of the fifty-two CHAs within the Ngamiland District, thirty-seven are located within the ODRS. Tawana Land Board has leased out these units to either Community Trusts or individual concessionaires at a nominal land rental paid annually.

Each Controlled Hunting Area (CHA) has been zoned according to the prevailing factors, such as ecology, soils and natural resource endowments in the area. WMAs in the ODRS are located in wildlife rich areas which offer some of the most conducive environment for sustainable utilization of wildlife resources under the Community Based Natural Resource Management (CBNRM) system

2.4.2.2 Community Based Natural Resources Management (CBNRM)

One of the programmes put in place in the Ramsar site for natural resources is the Community Based Natural Resource Management (CBNRM). The programme is a joint approach towards rural development and natural resources conservation. It is based on the need for the promotion and empowerment of the local communities, by linking economic and social development to natural resource management. CBNRM is founded on the premise that all members of the community share an interest in improving their livelihoods whilst at the same time managing and using natural resources in a sustainable way.

The CBNRM programme in the ODRS is undertaken within the CHAs. The programme is run through community trusts. There are 12 registered trusts in Ngamiland. Their activities include sub-leasing their concessions to safari companies, managing cultural tourism, marketing baskets and crafts, photographic tourism, and marketing reeds and grasses. Table 2-8 shows the community trusts and their associated activities.

These tourism activities within the WMAs are given a lease period of 15 years (Tourism Lease) renewable every 5 years as a measure of monitoring whether what is enshrined in the respective management plans is adhered to. Those that fall outside the WMAs are given a lease period of 50 years (Common Law Lease).

Table 2-8: Basic Information on Community Trusts in Ngamiland, Botswana (Mbaiwa, 2002)

Name of Community Trust	Date of Registration	Villages Covered	CHAs Used	Types of Activities (2001)	Revenue Generated (2001)(P)	No. of People Employed (2001)
CGAECGAE TLHABOLOLO TRUST	1997	XaiXai	NG 4, NG5	Sale of quota, Subsistence hunting, Cultural tourism, Craft marketing, Village shop	215,000	30
KHWAI DEVELOPMENT TRUST	2000	Khwai	NG 18, NG19	Marketing hunts, Subsistence hunting, Grass and crafts	600,000	3
OKAVANGO COMMUNITY TRUST	1995	Beetsha, Eretsha, Gudigwa, Seronga, Gunitsoga	NG22 NG23	Sale of quota, Land rental	1,500,000	130
OKAVANGO JAKOTSHA COMMUNITY TRUST	2000	Etsha 1 – 13, Ikoga, Jao Flats	NG24	Photographic tourism, Development of camp site	Not stated	Not stated
NGWAO BOSWA WOMENS COOPERATIVE	1996	Gumare, Danega, Nokaneng	None	Marketing of baskets, Domestication of palm, Woodcarving	Not stated	Not stated
OKAVANGO KOPANO MOKORO COMMUNITY TRUST	1997	Ditshiping, Quxau, Daonara, Boro – Associated settlements	NG32	Sale of quota, Marketing of campsite, Mokoro, grass, reeds, and fish	1,200,000	100
BOKAMOSO WOMENS COOPERATIVE	Not stated	Shorobe	None	Basket marketing	Not stated	Not stated
BUKAKHWE CULTURAL CONSERVATION TRUST	2000	Gudigwa	Part of NG12	Eco-cultural tourism	Not stated	Not stated
SANKUYO TSHWARAGANO MANAGEMENT TRUST	1995	Sankuyo	NG34	Sale of quota, Thatching grass, Subsistence hunting, Campsite	595,460	53
MABABE ZOKOTSAMA DEVELOPMENT COMMUNITY TRUST	1998	Mababe	Ng41	Sale of quota, Subsistence hunting, Land rental	750,000	49
OKAVANGO POLERS TRUST	1999	Seronga and Gunitsoga	NG12	Tourism viewing, Sale of crafts, Restaurant	750,000	100
TEEMASHANE TRUST	1999	Kaputura, Ngarange, Ncoagom, Sekondom-boro	NG11	Cultural Tourism, Thatching grass, Development of CBNRM project, Proposal for NG13		278

2.4.3 2.4.3 WATER USE

The mean annual flow of the Okavango River at the point where it enters Botswana is approximately 10 000 million cubic metres (MCM) per year and ranges between 7 000 and 15 000MCM.

There are already a number of developments throughout the river basin with actual or potential effects on water quantity and thus potentially on the ecological functioning of the Delta.

2.4.3.1 Angola

Quantities of water being abstracted in Angola are not well recorded but are thought to be very small. Now at peace and with strong development needs and ambitions, there are currently still no plans to build dams or major abstraction infrastructure on the river; there are also currently no existing structures. This situation is, however, bound to change as Angola develops and its population resettles in the Cubango/Quito river basins. Angola's demand for abstracted water is going to rise and the possibility of other developments, such as hydroelectric schemes etc., is also bound to increase.

2.4.3.2 Namibia

Namibia has a number of existing and proposed water abstraction points for new irrigated agricultural schemes along the river between Nkurenkuru and Mohembo.

Another Namibian proposal to abstract 17 MCM per annum from the river at Rundu and to connect this to the country's Eastern National Water Carrier at Grootfontein has been mothballed for the present but remains a possibility. The total currently abstracted amount is equivalent to 0.134% of mean annual flow and this would rise to 0.154% if the Rundu – Grootfontein pipeline were constructed (ODMP – Inception Report, 2005).

From these figures it is apparent that the total combined quantity of water currently being abstracted by all three countries from the river system, and indeed proposed increases in these amounts, is still very small in relation to the mean annual flow of the river.

2.4.3.3 Botswana

Botswana currently abstracts water at several points throughout the Okavango Delta system and is preparing infrastructure to abstract more. The current locations and volumes of existing and proposed abstractions in the ODRS are shown in Table 2-9.

Under the proposed Maun Groundwater Development Project (MGDP) and Maun Water Supply and Sanitation Rehabilitation and Upgrade Project (MWSSRUP) the amount of water supplied to the village will be increased (DWA, 2004). The existing abstraction site would be decommissioned.

Table 2-9: Water abstraction in the ODRS (DWA 2004)

Scheme	Villages	Amount abstracted (MCM per annum)
Maun Water Supply	Maun	2.69
Private licensed abastractions from the river	Within the Delta	Data not available
Gumare Water Supply	Gumare, Etsha, Nokaneng, Habu, Tsau and their localities	0.62
Sepopa/Ikoga Integrated Rural Village Water Supply	Sepopa, Mowana and Ikoga	0.12
(Kauxwi/Xakao Integrated Rural Village Water Supply Project	Kauxwi, Xakao, Mohembo-east, Goa, Jejedoa, Sekondomboro and Sechenje	0.17
Shakawe Water Supply	Shakawe	0.24
TOTAL		3.84

The total quantity of water currently abstracted by DWA Botswana in the Delta is therefore circa 3.84MCM per annum (0.04% mean annual flow) although this is predicted to rise to circa 11.04MCM per annum (0.1% mean annual inflow) by 2020-25.

2.4.4 2.4.4 TOURISM

2.4.4.1 Tourist Types in the ODRS

Different tourist-types visiting Ngamiland District have been identified (Lillywhite and Lillywhite, 1991), and are differentiated by the prices that they pay for their holidays.

High Cost

These are tourists who stay at a permanent camp (normally operated by a private camp operator). The high cost tourists usually pay an expensive package in advance and are generally confined to more luxurious Safari operators and they are mostly from Europe, America, New Zealand and Australia.

Mobile Safari

They are the second most important category after the 'High Cost` tourists for Ngamiland District. They stay in private, public or HATAB (Hospitality and Tourism Association of Botswana) campsites.

Independent Low Cost

The independent travellers (low cost tourists) are basically dependent on their resources when they are touring, and do not normally form part of an organized tour group. These independent travellers, usually, do not pay a package price before entering Botswana, and generally, they use public facilities e.g. campsites run by DWNP in protected areas. They are termed 'low cost' because normally they incur low expenditure while touring the District. Such tourists mostly come from the neighbouring countries of South Africa, Zimbabwe and Namibia.

Day Visitors

A tourist who does not spend the night in a collective or private accommodation in the place visited is termed a 'day visitor'. Their overall expenditure is very low compared to previously discussed categories.

2.4.4.2 Tourism Facilities in Ngamiland

The Department of Tourism licensing list shows a number of 201 operators (camps, lodges, hotels, Mobile operators, and travel agencies) in Ngamiland District. These are shown in Table 2-10.

Table 2-10: Tourism Enterprise Licensed Facilities and their licensing categories in Ngamiland

Type of Operators	Licensing Category	Description of activities	Numbers
Hotels, motels, guest houses and apartments	A	Operations that offer facilities on-site only (accommodation). These are mostly based in Maun	12
Camps and lodges	B	Operations that offer facilities on and off site (e.g. accommodation and game drives, boat trips etc). These are mostly based in the Okavango Delta and its environs	107
Mobile Safaris	C	Operations that offer facilities off site only, such as safari or tour operators, and any enterprise that receives and transports travelers and guests, providing them with sleeping accommodation and food & beverages in equipment that is not geographically fixed.	71
Travel Agencies	D	Operations that act as agents only. These operators are mainly based in Maun.	11

Source: DoT, (2005)

2.4.4.3 Ownership of tourism operations in Ngamiland

Table 2-11 gives ownership of facilities as per the Department of Tourism Licensing list.

Table 2-11: Ownership of tourism facilities in Ngamiland

Ownership	Numbers	Percentage
Citizen	62	30.8%
Jointly	59	29.4%
Non-Citizen	80	39.8%
Total	201	100%

Source: DoT, (2005)

Note: Information reflected in Table 2-12 excludes citizen turnover proportions since the data is not available.

2.4.4.4 Tourism Activities

The tourism activities in the ODRS comprises game viewing, bird watching, mekoro trails, recreational fishing, hunting and mobile safaris.

Game viewing

The ODRS is endowed with wildlife resources. The wildlife populations include elephants, buffalo, lion, leopard, hippos, giraffe, red lechwe, crocodiles and in some areas sitatunga, antelopes, etc. This activity is normally undertaken by walking, 4 wheel drive vehicles and boats.

Bird Watching

Lagoons, lush waterways, floodplains, fast and slow moving waters provide a haven for bird species. Bird life is at its peak during spring and summer months (from October to March)(TLB, 2005). The bird species which normally attract tourists include white backed Night Heron, Bat Hawk, Wood Owl, Afican Skimmer and Bee Eater, Swamp Boubou, black breasted snake eagle, pygmy goose, wattle cranes, slaty egret, rufousbellied heroen, amongst others.

Recreational fishing

There are a number of fishing camps in the Delta in addition to some safari camps and lodges which offer fishing as part of the tourist packages. The most popular recreational fishing species is the tiger fish which is the world's largest fresh water fighting fish and the tilapia.

Hunting Safaris

There are some Controlled Hunting Areas which offer hunting. The Department of Wildlife and National Parks (DWNP) issues off-take quotas annually for each of these CHAs.

Mekoro trails

This activity is offered by most camps which are located in the central parts and margins of the Delta. These are CBOs which conduct mekoro trails such as Okavango Polers Trust and Okavango Kopano Mokoro Community Trust.

Mobile Safaris

They normally drive or fly from Maun in the morning into various parts of the Okavango Delta during the day, and come back in the evening. The activity includes game viewing, bird watching etc.

2.4.4.5 Revenue Generated By Tourism

Revenue collected by category user

Table 2-12 depicts the revenue generated by the different tourism users of Moremi Game Reserve, where adequate data is available. As compared to 2003 whereby a total of P17 021 578.50 was collected. Twenty seven percent (27%) of the money is from private visitors, 28% Mobile, 40% Fixed camps/lodges and 5% (Parks and Reserves Reservation Office, (PARRO)).

Table 2-12: Revenue by Category Of User (Moremi Game Reserve)

Category	Moremi Game Reserve (BWP)
Private	2 202 995.50
Mobile	1 644 850
Fixed Accommodation	2 470 496
Parks Revenue and Reservation Office (PARRO)	504 495
Total	6 822 836.50

Source: PARRO, 2004

2.4.5 2.4.5 HUNTING

Hunting activities include safari and citizen hunting. The hunting safari entails trophy hunting for species such as elephant, lion and leopard; plains game hunting; bird shooting; and specialised hunting by professional hunters through licenses issued by DNWP.

Hunting Safaris is a major source of revenue earner for the Government in Ngamiland District. Revenues collected in this sector between 1999 and 2003 have progressively been on the increase, with P4, 514,573.40 collected in 2003. Sale of ivory and trophies fetched P14, 555,000.70 in 1999. Adherence to CITES has limited the culling of elephants and consequently the sale of ivory.

2.4.6 2.4.6 FISHING

The Okavango Delta fishery consists of three categories of fisheries, viz; subsistence, commercial and Sport/Recreational fisheries (Tweddle, D. et al, 2003).

2.4.6.1 Subsistence fishing

This activity involves fishing at subsistence level. However, where excess fish is caught it may be sold. This activity is characterized by seasonality, involvement of large numbers of women and children, low investment levels and simple fishing technology such as traditional fishing gear (spears, traps, baskets).

2.4.6.2 Commercial fishing

The commercial fishery is characterized by the use of modern fishing gear such as powered boats, gill-nets, refrigeration facilities and also the catching of fish mainly for sale. The freezer facilities led to the establishment of centrally located marketing centres easily accessible for buyers of fish. The origins of the sector can be ascribed to the introduction of Financial Assistance Schemes in the 1980s that gave generous fishing grants to fishers.

Fish catch composition in the gill-net commercial fishery is mainly dominated by *Cichlid* species (Tilapia/Bream), *Clariid* species (Catfishes), *Hydrocynus* (Tigerfish) and *Schilbe* (Silver catfish). Cichlids are the most preferred species at the market, hence fishers always target them. The commercial fishers target mainly the large bream species that have high economic value and also are the most preferred at the market.

Table 2-13 gives indicative figures of revenue generated from fish production at Samochima. Despite the fact that fish is an important resource, it has not attracted adequate level of investment in terms of the development of the sector at both national and district level. According to DDP 5, the sector was allocated P200 000.00 between 1997 and 2003 for the development in Ngamiland. This is 0.1% of the total budget for the agriculture in the district. Therefore such low level of investment inhibits the fish resources to contribute meaningfully to the economy of the district. Indications from recent studies (Mosepele 2000 and Tweedle et al., 2003) are that the current off-take levels are within the sustainable use levels, however thorough analysis through the ODMP fish stock assessments will confirm these findings.

Table 2-13 : Fish production and revenue collection figures for Boiteko syndicate (Samochima): 1999-2005 (DWNP, 2005)

YEAR	WEIGHT (KG)	AMOUNT (PULA)	LEVY
1999	15 324.7	121 935.40	P6 141.95
2000	16 339.8	179 737.80	P7 829.40
2001	10 221.6	112 437.6	P5 133.43
2002	9 648.9	106 137.90	P4 035.43
2003	9 420.7	97 111.70	P4 855.60
2004	8 750.3	93 474.40	P4 673.70
2005	7 651.8	91 821.60	P4 244.95
TOTAL	77 357.8	802 656.4	36 914.46

2.4.6.3 Recreational/sport fishing

In the Okavango Delta angling is mainly carried out by fishing camps established in the Delta. It is characterized by the use of a fishing rod for catching fish. The anglers target the largest fish especially bream and tigerfish species. In most cases sport fishers exercise a "catch and release" technique whereby small fish are released alive into the river (Tweddle et al, 2003).

Sport fishing has a great potential in bringing considerable income into the country and also in providing employment to communities in the vicinity of the fishing camps.

2.4.7 2.4.7 LANDSCAPE, AESTHETIC AND CULTURAL HERITAGE SITES

Some significant tourist attraction sites in the ODRS include Okavango Delta, Tsodilo Hills, Moremi Game Reserve, Gchwihaba caves, Aha Hills and Maun Village (see figure 2-13). These are described in detail in NDSS (2004).

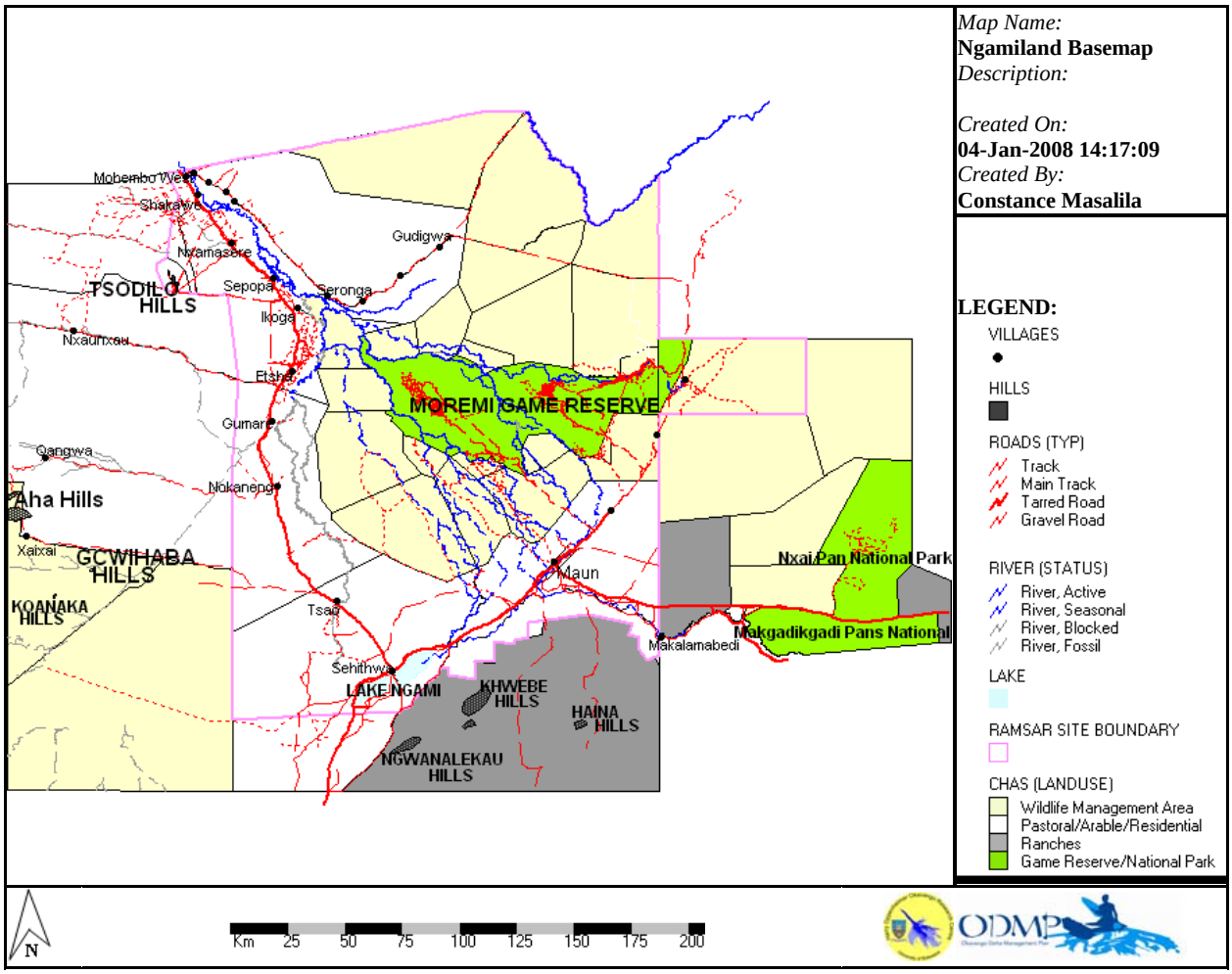

Figure 2-13: Map showing landscapes, cultural and aesthetic sites

2.4.7.1 Okavango Delta

The Okavango is one of the world's leading tourism attractions with its unique biodiversity and scenic attributes. The Delta's ecological and social functions are dependent on floods that are characterized by large variations resulting in permanent, seasonal and intermittently flooded areas.

2.4.7.2 Tsodilo Hills World Heritage Site (TH-WHS)

The Tsodilo hills are found some 50km west of Sepopa Village in the District. They rise up to a height of 410m above the Kalahari sand plains. The site was nominated on the world heritage list in 2001 as a cultural site, under criterion i, iii and iv.

At present, the Tsodilo Hills site is inhabited by two communities, namely the Hambukushu (Bantu) and the !Kung (San), both of which are either descendants or relatives of the people who were using the Hills approximately more than 150 years back (Campbell et al. 1994). The hills are of significant spiritual and cultural value to the San and Hambukushu, but more so for the latter whose ancestors are believed to have executed the paintings found on the rocks today. Both the Hambukushu and the !Kung San, have traditional beliefs associated with the site. The hills are sacred and are considered the resting place for the spirits of the dead and the home of their various gods. Archaeological studies have revealed that this area has been occupied by humans for the past 100, 000 years.

The most spectacular feature of the Tsodilo site is its rock art, concentrated in the site's three main inselbergs. A date of 1.5 million years has been attributed to the rocks (Brooks et. al. 1992). The rock paintings are unique from other sites in southern Africa in the style of their paintings in that they appear in minimally sheltered overhangs as opposed to sheltered paintings in Matopo (Zimbabwe) and Drankensburg (South Africa). There are red and white paintings. The red paintings mainly depict wild animals and are associated to the San while the white mainly depicts domestic animals and are associated with the early farmers. Archaeological evidence indicates that the hunter-gatherer life appears to be continuous through time rather than abruptly changed (Robbins 1990; Campbell et. al 1994)

As a tourist attraction site, the four inselbergs are the only outstanding features in the almost flat topography of the desert. The access road to the site has been upgraded and facilities such as interpretation centre, camping sites, ablution blocks, and availability tour guides from members of the community have improved the condition of the site (Keitumetse 2005). The Tsodilo management plan that was produced in 1994 has been revised and a recent one, 2005, adopted. The plan outlines a monitoring programme that spells out targets and Limits for Acceptable Change (pg 56) for the site. The Tsodilo Management Plan has been adopted as part of the ODMP. It also spells out an implementation plan which can be assessed against the ODMP implementation strategy. In addition, as a world heritage site Tsodilo is protected under the 1972 UNESCO *Convention for the Protection of the World Cultural and Natural Heritage.*

2.4.7.3 Moremi Game Reserve

Approximately 20% of the Okavango Delta area lies within the Moremi Game Reserve and is protected under the 1992 National Parks Act. The Moremi Game Reserve covers 4, 871 km^2 and forms part of the eastern corner/section of the Okavango Delta, and is often described as one of the most beautiful wildlife reserves in Africa. A mixture of mopane woodland and *Acacia* forests, floodplains and lagoons characterize the Reserve. The high diversity of plant and animal life of the Moremi Game Reserve is typical of the Okavango Delta.

2.4.7.4 Gchwihaba Caves

This is certainly one of the wildest and remotest of all tourist destinations in Botswana. Gchwihaba Caves are situated some 50km south east of Aha Hills on undulating Kalahari sand dunes. Inside the caves are linked passages and caverns that exist on two levels; one

raised several meters above the other, with spectacular rock formations, flowstones, stalactites, inlets, hallways apertures and fossil (frozen) waterfalls. The caves are home to a large bat population.

2.4.7.5 Maun Village

Maun Village, established in 1915 as the tribal capital of the Batawana people, is currently considered the tourism capital of Botswana. Most tourists entering Ngamiland District do so through Maun Village, which is the gateway to the Okavango Delta and Moremi Game Reserve. Maun is also headquarters of countless safari and air-charter operations whose presence in the district enhances tourism facilities. Maun hosts a population of 43 776inhabitants, and is spread out along the wide banks of the Thamalakane River, where wildlife species can still be seen grazing along side domestic livestock (donkeys, goats and cattle).

One major attraction, which is particularly given little attention by many researchers, is the culture and traditions of the Batawana. Foreign tourists are fascinated by the Batswana traditions in general. The traditional architecture (e.g. mud and reed huts) is an attraction on its own.

2.4.7.6 Maun Educational Park

Maun Educational Park is yet another area of interest found in Maun and managed by the Department of Wildlife and National Parks, covering an area of 198.5 hectares of woodland along the Thamalakane River bank. It is located on the eastern bank of the Thamalakane River and provides school pupils with an appreciation of wildlife and flora. There are four walking trails and game hides within the centre, where wildlife species such as wildebeest, impala, giraffe, zebra, and warthog can be watched or viewed.

2.4.7.7 Nhabe Museum

The museum outlines the natural history and culture of the diverse north west of Botswana, and is housed in a historic building built by the British military in 1939, and used during World War II as a surveillance post against the German presence in Namibia. It presents wildlife exhibits and cultural artefacts from around northwestern Botswana. The North West District Council and other stakeholders are in the process of initiating the establishment of a cultural village, which will be centred on a craft market.

2.4.8 2.4.8 AGRICULTURE

2.4.8.1 Livestock Management

The Okavango Ramsar site contains at least 193 997 cattle, 98 975 goats, 16 000 sheep, 7 276 horses and 12 179 donkeys (DAHP livestock census, 2005). All the above species subsist largely from the forage supplied by the Delta since the type of production system practiced is wholly extensive. Distribution of livestock is dependent on water and Mogau (*Dichapetulum cymosum*). The sector experienced a reduction livestock population in 1996 when all cattle were slaughtered during the outbreak of Contagious Bovine Pleuro Pneumonia (CBPP). However, re-stocking was effected in 1997.

2.4.8.2 Arable Farming

Arable farming is an important source of livelihood for communities in the ODRS (Scott Wilson, 2001). There are two distinct arable farming practices in the ODRS. These are molapo (flood recession) and dryland farming. The dryland farming system is practised inland and is highly dependent on rainfall while molapo is carried out along river beds and is dependent on flood waters.

The predominant crop in the molapo farming system in Ngamiland West is maize while sorghum and millet is grown in the dryland. In Ngamiland East, maize is grown in the western part while sorghum is predominant in the eastern part. Crop yields per hactare are higher in the molapo system than in the dryland because of the fertile soils in the river beds and flood plains and have high moisture content due to floods.

Dryland farming is common with the Hambukushu tribe while molapo farming is practiced by the Bayei.

2.4.9 2.4.9 VEGETATION USE (HARVESTING)

According to the socio-economic survey of the Every River Has its People Project of 2001 in 20 villages within the Ramsar site, ten vegetation resources form the basis for rural household livelihoods viz palm shoots for basket weaving, grass, reeds, water lilies, assorted wild fruits, veld products, trees for woodcarving, trees for building and fencing, trees for firewood and lastly edible papyrus shoots. These activities are reflected in Figure 2-14.

In terms of the wild fruits important tree species are *Berchemia discolor* (Motsentsela), *Strychnos cocculoides* (Mogorogorwana), Ximenia spp (Moretologa), *Diospyros mespiliformis* (Mokutshumo), *Phoenix reclinata* (Tsaro) and *Garcinia livingstonei* (Motsaudi).

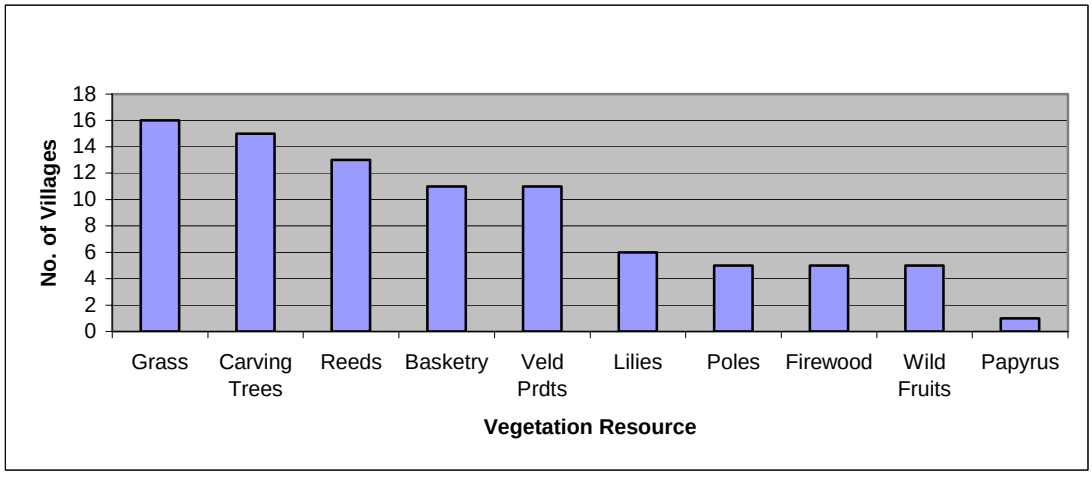

Figure 2-14: Vegetation resources use by village (Adapted from socio-ecological survey report, Every River has Its People Project, 2001)

2.4.10 2.4.10 WASTE MANAGEMENT

The main generators of solid and liquid waste are households, tourism operations, institutions and commercial enterprises. It is estimated that the solid waste generation rate for the entire ODRS is 0.39kg/capita/day with the majority of it (72%) coming from households. There are a variety of primary storage containers currently in use including backyards pits, refuse bags, galvanised metal bins with lid, pole mounted bins and

predator proof bins. Secondary storage is provided through skips in major settlements and transfer stations in small villages.

Most households do not use waterborne sanitation systems. The majority of waste water comes from institutions, commercial enterprises and tourism operations, and is collected and treated through septic tanks and soak away system.

2.5 RESEARCH AND DATA MANAGEMENT

2.5.1 AVAILABLE INFORMATION AND DATA

The available data categories include boundaries, climate, culture, demographics, ecology, environmental hazards, flora, fauna, soils, transportation, hydrology, land use, geology, landforms and geodetic features. These have been included into the Okavango Delta Information System (ODIS).

Information about the Okavango Delta and other planning processes (models from other wetland areas) available in the HOORC library include consultants' reports, news and media reports, government documents and records, journal articles, web sites of institutions, online bibliographic databases and clearinghouses, aerial photographs, books, herbarium, archival sources such as records in the Peter Smith collection and an online catalogue of the UB library.

The HOORC Library has a weblog service which is updated on a daily basis about new documents acquired and catalogued.

2.5.2 RESEARCH

Limited research has been undertaken under the three broad categories at both Delta wide and local scales (ODMP Research Strategy 2006) and these are physical and chemical (hydrological) processes and features; ecological processes linking habitats to populations of specific organisms; and social and economic processes that exploit or derive benefits from the ecosystem. The following is an extract from the ODMP Research Strategy 2006 which contextualises the role of research within the context of management of the Okavango Delta.

In the past, many studies were carried out on social, economic, ecological and management topics related to the Okavango Delta. These studies extended the collective understanding of the structure, functioning, and composition of the ecosystem components in the Okavango Delta, and broadened knowledge of the ways in which local communities rely on the system for livelihoods. However, the understanding of the different ways in which the Okavango Delta system responds to changes in the external driving forces (principally related to climatic and hydrological features) and patterns of natural resource exploitation (driven mainly by ecological and social processes) remains incomplete. This is due to the fact that earlier studies followed individual research agendas, rather than forming part of a comprehensive and carefully co-ordinated research programme. This has obvious implications for the way that research is conducted in future, and presents a challenge to the Government of Botswana who must manage the Okavango Delta and maintain the ecological integrity of its ecosystems.

Effective implementation of the ODMP will need information from two interdependent kinds of research. Neither type of research is very useful to managers when considered alone, nor

can the correct management questions be asked without the deeper understanding providedby more basic research. The two types of research are:

- First, a thorough understanding is needed of the full range of physical, chemical, ecological, socio-economic, and political factors that influence the interactions within and between society and ecosystem components. This requires basic research in many different fields such as: hydrology, climatology, ecosystem functioning, agriculture, and social dependency patterns, supported by knowledge of issues such as: culture, ethics, economics, governance and livelihood strategies.
- Secondly, effective implementation of the ODMP requires directed, management orientated research that answers focused 'cause and effect' questions. These questions address issues such as: interactions between external driving forces in the Okavango catchment; the distribution and abundance of natural resources in the Okavango Delta; the patterns of resource use; the requirements of society; and the ecological and economic implications of different resource use patterns.

While both types of research are necessary for the ODMP, it is very important to ensure that the 'mix' of research types is properly balanced to suit management needs. Often, the relevance of long-term research studies within the Okavango Delta is not immediately apparent. But, when the managers pose questions that require specific answers for decision-making, these answers will need to be based on a sound fundamental or 'academic' understanding. Typically, these types of 'academic' or 'background' studies are undertaken by university scholars, such as those at HOORC. However, all academic researchers have a wider responsibility to demonstrate that their work can guide and inform more directly applied research that must answer the types of questions posed by the ODMP.

The research will only be truly useful for its intended purpose if the research results (outputs) are converted into appropriate management outcomes. In essence, these are: better informed and better targeted management of the Okavango Delta Ramsar Site, which will enhance the livelihoods of all stakeholders while simultaneously conserving the natural resources of the system in perpetuity.

While research seeks to understand the characteristics of a particular situation and identify the key factor(s) involved, management must follow up with the desired action. However, it is also important to track the success or failure of the implementation process once a decision has been taken to implement a management action. In simple terms, management has three fundamental objectives: (i) focussed action; (ii) monitoring and evaluation of that action; and then (iii) adaptive change if the action does not produce the desired result (adaptive management" cycle).

2.6 CROSS-CUTTING ISSUES – HIV AND AIDS, GENDER AND POVERTY

Fundamental to the ODMP is the incorporation of elements of Gender, Poverty, HIV and AIDS.

2.6.1 HIV AND AIDS

According to the recent Botswana AIDS Impact Survey (BAIS II) (Central Statistics Office, 2004), the national HIV prevalence rate is 17% with disaggregated data indicating that different districts experience different prevalence rates. The HIV and AIDS prevalence in Ngamiland district is about 15%.

According to 2001 census, the population of Ngamiland was approximately 124 712 (see Table 2-1) of which seventy six percent (91 978) was based in the Okavango Delta area, (Meyer et. al., 2006). During the inter-censal decades, 1981 – 1991, 1991 – 2001, the population of Ngamiland increased by 3.3 % and 2.8 % respectively. The reduction of the population growth rate from 3.3% to 2.8% is partly attributed to HIV and AIDS (Majelantle, 2003).

According to the Botswana AIDS Impact Survey of 2004, the HIV prevalence rate amongst pregnant women in Ngamiland was; 35.3 %, 40.7% and 40.9% for the years of 2001, 2002 and 2003 respectively. The disaggregated prevalence rate (year ??) by age was as follows:

15-19 yrs = 26.0 %
20-24 yrs =37.2 %
25-29 yrs =48.7%
30-34 yrs = 40.4 %
35-39 yrs = 41.4 %

2.6.2 GENDER

According to the 2001 Botswana Population and Housing Census, Botswana's population is about 1.7 million. Within the Ngamiland district, the population is 121 924 and out of this there are 58 199 males and 63 725 females, of which 36 833 are rural women (57.8 %).

Livelihood activities for females are arable farming , fishing and gathering of veld products, formal and informal employment whereas males are into pastoral farming, fishing and employment (formal and informal) as means of livelihood. The responsibilities for livelihood are traditionally determined. This has resulted in women being over-represented among the poor. Most people in rural areas depend on natural resources for livelihood and the majority are women.

2.6.3 POVERTY

Ngamiland is the poorest district in the country and largely rural (C.S.O., 2003). The district presents a multi-ethnic setting with a diversity of cultures and ethnic groups that pursue different livelihoods and use resources differently.

Large parts of the district's population still depend directly on the utilisation of natural resources of the Delta for subsistence. Fishing, hunting, livestock grazing, floodplain cultivation and collection of veld products and raw materials for building, fuel, and the production of handicrafts are important elements of the local economy.

Arable agriculture is practised in Ngamiland mainly at a subsistence level, as soils and climate are generally not well suited for crop production. At the fringes of the Okavango Delta small-scale flood recession farming (*molapo*) is practiced locally. The grazing resources are generally good in the dry land areas. However, the availability of water and the occurrence of tsetse fly close to the Delta has, in the past, restricted the development of the livestock.

In the period 93/94, poverty rates in rural Ngamiland were about 17 %, (Ellis 2000). In 1995, there was an outbreak of cattle lung disease. This disease eroded the economic base of most farmers in the ODRS and increased poverty rates from 17 % in the period 93/94 to 43 % in the period 2002/03 (CSO 2003).

2.7 TOTAL ECONOMIC VALUE

Total Economic Value (TEV) of the Delta was considered in terms of the values generated by direct use of the delta's resources (direct use values), the values generated offsite and indirectly as a result of the delta's economical services (indirect use values), and the values associated with preservation of the delta's resources (non-use values). Direct use value was analysed in most detail and was measured in several ways. These included gross output, the contribution to national product (= gross value added) and the economic resource rent generated by each use (ODMP - Economic Valuation Report, 2006). The direct use values were calculated from both secondary sources and field surveys The direct use values were estimated for both the Ramsar Site as a whole as well as specifically for the wetland system.

In deriving the values of the Okavango Delta goods and services, the ODRS was divided into zones based on consideration of settlement patterns, land use and natural resource characteristics. The five zones are the Panhandle, the west, the southwest, the southeast and the central parts of the ORDS (Figure 2-15).

The Panhandle zone is characterised by the lack of floodplain area, the high numbers of settlements along the river, and the relatively high density and accessibility of fish and aquatic plant resources. There is little opportunity for recession agriculture (molapo farming). The west zone lies to the west of the Delta proper, and people living here have access to wetland and floodplain resources, including molapo farming areas.

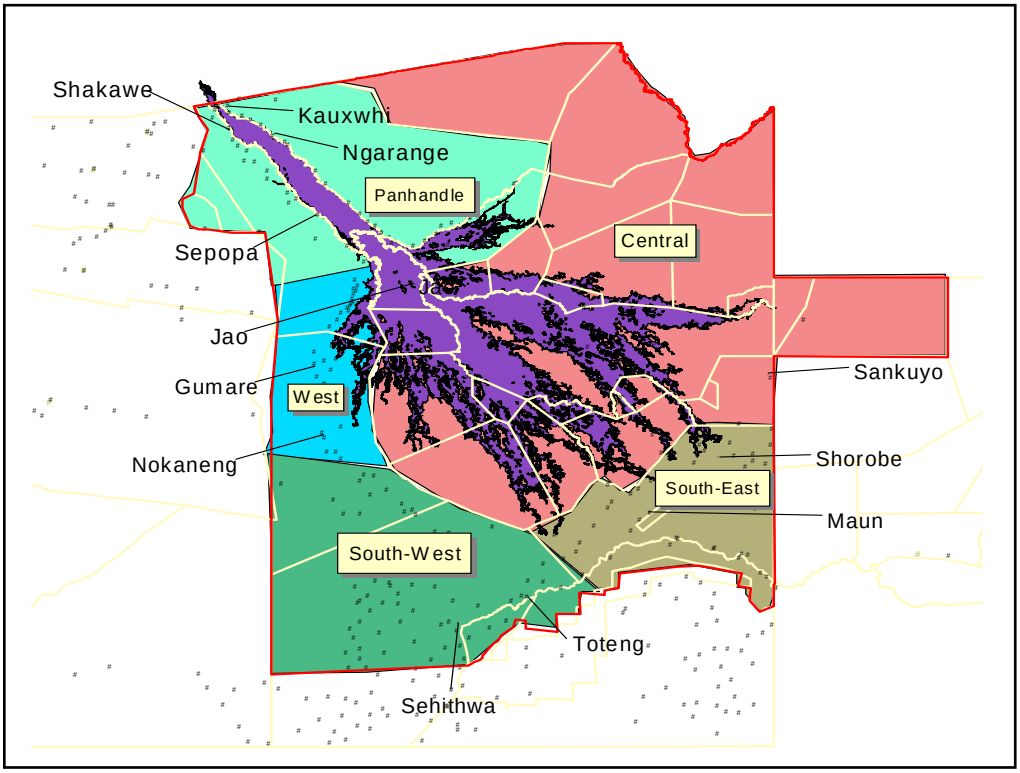

Figure 2-15: Economic valuation zones

The southwest zone is relatively arid and sparsely populated. Its settlements follow what was formerly the outer margin of the Delta, but these are now far from the wetland and floodplain areas. The southeast area covers Maun and is relatively far from the main wetland areas, but does have reasonable access to some of the distributaries and floodplain areas.

The central zone is largely delineated on the basis of the buffalo fence and has wildlife as the main land use. This zone encompasses most of the wetland area, and there is very little upland area. While dominated by the Okavango Delta, it also includes the Linyanti-Chobe wetland areas on the north eastern border of the study area. There are very few people living in this zone, in a few scattered villages as well as in association with some of the larger tourist camps.

2.7.1 DIRECT USE VALUES

In the Delta, direct use values are generated through crop production, livestock grazing, fishing, wild plant use and hunting. They are also generated through consumptive (hunting) and non-consumptive (wildlife viewing) tourism. Rather than separating consumptive and non-consumptive value, as conventionally done within the total economic value framework, household use (largely consumptive) and tourism use (both consumptive and non-consumptive) have been separated for ease of analysis. All values are in Pula for 2005 (in that year 1 Pula was worth 0,19 US$)

2.7.1.1 Household use of natural resources

In the Delta, direct use values are generated through crop production, livestock grazing, fishing, wild plant use and hunting. They are also generated through consumptive (hunting) and non-consumptive (wildlife viewing) tourism. Rather than separating consumptive and non-consumptive value, as conventionally done within the total economic value framework, household use (largely consumptive) and tourism use (both consumptive and non-consumptive) have been separated for ease of analysis. The values for direct use activities were estimated in private and economic terms (see below). These activities, resulting from the use of the delta's and the wetland's resources, contribute directly to the national product of Botswana. They also impact on the broader national product indirectly through the multiplier effect. These multipliers and the indirect impact were also calculated separately using the social accounting matrix (SAM) model for Botswana. Selected direct use values provided in tables below, do not include the broader direct impacts. All values are in Pula for 2005 (in that year 1 Pula was worth 0,19 US$)

2.7.1.1 Household use of natural resources

Households in the study area traditionally derive their livelihoods from a variety of sources (Rashem,1988):

- gathering, hunting and fishing,
- livestock
- arable farming
- crafts, and
- the formal sector.

This multi-sectoral livelihood system allows households to spread risk, so that there is something to fall back on in years of crop failure or livestock death. The livestock sector is by far the most important contributor to rural subsistence and cash income, although there is some concern that it cannot maintain this status due to population growth and degradation of pasture lands (Rashem 1988).

Table 2-14 shows the direct private and economic values associated with household agricultural activities in the Ramsar Site and the wetland. In the table, gross private value refers to the annual aggregate gross value of sales and own consumption for the activity, measured in market prices. Net private value refers to the annual aggregate profits for the

household investors after deduction of production costs from the gross private value, also measured in market prices. This is the primary financial value sought. Cash income refers to that proportion of the net private value which is made up of cash (from sales). Gross output is the annual incremental contribution of the activity to the national gross output, measured in economic prices. Gross value added refers to the annual incremental contribution made by the household activity to the gross national product in terms of gross value added. This is the primary economic value sought. As stated, the economic values do not include any indirect impacts on the broader economy, due to the multiplier effect.

Net private values amounting to P68 million are generated from the Ramsar Site but only P2.1 million of these are attributable to the wetland itself. Most of the values generated are from livestock. The contribution of agricultural activities in the Ramsar Site to the gross national product amounts to P43 million. P1.5 million of these are derived from the wetland.

Table 2-14: Summary of the private and economic direct use values for agricultural activities in the Ramsar site and the wetland (in Pula, 2005)

		Gross private value	Net private value	Cash iincome	Gross output	Gross value added
Ramsar Site						
Crops – Molapo		2, 633 828	2, 191 651	225 542	2,765,519	1,368,763
Crops – Dryland		5, 996,164	4,197,849	835,751	6,265,469	1,399,770
	Total crops	8, 29,992	6,389,500	1,061,293	9,030,989	2,768,533
Livestock – cattle posts		71,055,101	54,543,748	40,818,484	74,555,356	34,365,764
Livestock – village		8,241,681	6,622,083	2,788,007	8,653,765	5,391,954
	Livestock total	79,246,782	61,165,831	43,606,492	83,209,121	39,757,628
Total Ramsar Site		87,876,774	67,555,331	44,667,784	92,240,110	42,526,161
Wetland						
Crops – Molapo		1,132,546	942,410	96,983	1,189,173	588,568
Crops – Dryland		-	-	-	-	-
	Total Crops	1,132,546	942,410	96,983	1,189,173	588,568
Livestock - Cattle posts		-	-	-	-	-
Livestock – Village		1,604,947	1,205,482	391,050	1,685,195	869,980
	Livestock total	1,604,947	1,205,482	391,050	1,685,195	869,980
Total Wetland		2,737,493	2,147,892	488,033	2,874,368	1,458,548

Source: ODMP – Economic Valuation Report (2006)

The direct private and direct economic use values derived from use of natural resources in the Ramsar site are summarized in

Table 2-15. In total, households derive a net private value of about P27 million from natural resources harvesting and processing in the study area. These activities contribute P28 million in gross value added to the gross national product.

Table 2-15: Summary of the total direct use values derived from natural resources use in the study area (in Pula, 2005)

Aggregate values (Pula)	Gross private value	Net private value	Cash Income	Gross economic output	Gross value added
Clay posts	151 416	149 492	-	158 987	157 833
Upland grass	1 636 657	1 600 496	45 406	1 718 489	1 702 171
Wetland grass	1 541 534	1 487 264	119 193	1 618 611	1 593 054
Grass brooms	118 952	117 064	86 380	124 900	124 333
Reeds	2 346 010	2 252 361	433 723	2 463 311	2 326 969
Reed mats	6 999	6 776	3 181	7 349	7 290
Reed fish gear	18 703	3 300	-	19 638	4 235
Papyrus	24 851	16 6581	-	26 094	22 407
Papyrus mats	106 154	105 531	46 626	111 461	111 297
Palm leaves	1 792 090	1 787 837	5 331	1 881 695	1 878 505
Palm products	1 513 400	1 508 336	1 345 705	1 589 070	1 587 731
Wetland veg	43 579	43 579	12 756	45 758	45 758
Wetland fruits	55 628	55 628	1 466	58 409	58 409
Upland veg	1 084 129	1 084 129	117 700	1 138 335	1 138 335
Upland fruits	221 755	221 755	77 372	232 842	232 842
Fruits-based drinks	2 406 624	2 406 624	2 225 709	2 526 955	2 526 955
Medicinal plants	281 882	277 730	55 322	295 976	291 616
Firewood	8 822 904	8 581 022	787 548	9 264 049	8 911 897
Poles and withies	1 794 388	1 681 222	21 329	1 884 108	1 727 193
Timber	572 008	568 697	174 545	600 608	596 230
Wood products	277 822	190 569	267 715	291 713	223 981
Traditional fishing	726 079	657 883	70 661	762 382	759 349
Modern fishing	2 315 803	2 007 637	1 310 092	2 431 593	2 399 054
Honey	1 264	1 031	-	1 327	1 083
Wild animals	357 843	125 494	-	375 735	-305 469
Upland birds	707 014	481 706	23 602	742 364	66 441
Wetland birds	168 763	-51 601	58 685	177 201	-483 890
Total Upland	18 434 658	17 487 031	3 882 628	19 356 388	17 395 441
Total Wetland	10 659 593	9 881 189	3 407 419	11 192 572	10 310 168
TOTAL	29 094 247	27 368 220	7 290 048	30 548 960	27 705 608

Source: ODMP – Economic Valuation Report (2006)

Table 2-16 summarizes the net private values associated with all household activities in the different zones of the Ramsar site, and it also shows the proportion of these values derived from the wetland. Overall, the Delta contributes 31% of the value gained from agriculture and natural resource use. It should be noted that there are also costs associated with the Delta that have not been quantified explicitly, but which are accounted for in the above values. These include the transmission of disease and predation on livestock, and the loss of crops to wild animals (Barnes, 2006).

Table 2-16: Summary of the annual private values associated with household natural resources use and agricultural activities in the five zones of the Ramsar site and the contribution of the wetland itself (in Pula, 2005)

	Pan-handle	West	South West	South East	Central	TOTAL
Upland resources	4 455 802	2 647 276	1 603 807	7 818 836	1 439 804	17 965 525
Livestock	9 507 254	17 071 621	9 407 181	25 142 602	37 173	61 165 831
Upland crops	1 797 892	332 514	319 151	1 733 447	-	4 183 004
Molapo crops	43 375	1 350 992	129 373	644 534	23 377	2 191 651
Wetland plants	2 727 891	1 554 821	91 199	2 834 808	63 856	7 272 574
Fish	2 253 711	20 766	10 639	263 441	116 963	2 665 520
Wetland birds	8 860	18 073	-9 558	-68 976	-	-51 601
Total Ramsar Site	20 794 735	22 996 062	11 551 793	38 368 692	1 681 173	95 392 505
Total from wetland	5 009 113	14 978 302	147 910	9 592 073	190 871	29 918 270

Source: ODMP – Economic Valuation Report (2006)

2.7.1.2 Tourism economic value

Three methods were used to estimate turnover in the tourist industry attributable to the Delta and the average value was used. The first two were based on the estimated relative size of each enterprise, and the third was based on estimated occupancy rates.

Tourism in the Okavango Delta Ramsar Site is estimated to generate direct output of P1 115 million, and directly contributes some P401 million to the GDP (Table 2-17). These results represent the gross output (turnover) and the gross value added (GDP contribution) resulting from turnover generated by tourism in the study area. They represent the direct first-round expenditures of tourists on tourism facilities, as well as associated linkages (see below).They do not include any indirect impacts, which also result in the broader economy, from these tourism expenditures due to the multiplier effect.

Table 2-17: Estimated value of annual gross output and gross value added in the Okavango Delta-based tourism industry using three methods, and average value used in this study (in P million, 2005)

Method 1 Gross output / Gross Value added			Method 2 Gross output / Gross value added		Method 3 Gross output / Gross value added		Average Gross output / Gross value added	
Non-consumptive tourism	910.8	320.7	853.0	340.8	935.3	270.4	899.7	310.6
Hunting tourism	151.5	58.1	170.9	77.9	195.2	65.5	172.5	67.2
CBNRM tourism	20.9	12.7	46.1	20.0	53.3	17.7	40.1	16.8
TOTAL	1 093.6	403.5	1 070.0	442.9	1 183.8	356.5	1 115.8	401.0

Source: ODMP – Economic Valuation Report (2006)

Table 2-18 and Table 2-19 show average values of the gross output, gross value added (gross national product contribution) and economic resource rent produced in Okavango Delta-based tourism broken down by type of product. The products are the different services that tourists visiting the Delta spend money on, and include accommodation and various linked services. The tables show values for the Ramsar site as a whole as well as for the wetland part of the site only. It can be seen that the wetland produced some 90% of the GNP contribution of the Ramsar site as a whole.

Table 2-18: Estimated direct gross output, direct contribution to the gross national product and the economic natural resource rent produced as a result of tourism activities in the Ramsar site (in 1000 Pula, 2005)

RAMSAR SITE Direct use values	Direct gross output	Direct GNP Contribution	Natural Resource rent
Tourism accommodation			
Lodges/Camps (non-consumptive)	445 580	209 460	102 480
Camps (trophy hunting)	103 190	56 890	29 930
Mobile & self-drive safaris	93 290	43 230	18 660
Guest houses, B&Bs, motels	19 660	12 240	4 520
Hotels	13 640	6 170	2 860
Tourism linked activities			
Restaurants/bars (independent)	110 180	15 930	7 710
Transport (air charter, airline, road)	105 480	17 980	8 440
Travel agents, guiding services	47 220	9 470	4 250
Shopping	166 590	24 270	11 660
Additional CBNRM income	10 980	5 330	1 100
TOTAL RAMSAR SITE TOURISM	1 115 810	400 970	191 610

Source: ODMP – Economic Valuation Report (2006)

Table 2-19: Estimated direct gross output, direct contribution to the gross national product and the economic natural resource rent produced as a result of tourism activities in the wetland (in 1000 Pula, 2005)

WETLAND Direct use values	Direct gross output	Direct GNP Contribution	Natural Resource rent
Tourism accommodation			
Lodges/Camps (non-consumptive)	422 340	198 520	97 140
Camps (trophy hunting)	73 200	40 290	21 230
Mobile & self-drive safaris	88 340	40 940	17 670
Guest houses, B&Bs, motels	18 180	11 330	4 180
Hotels	12 320	5 510	2 590
Tourism linked activities			
Restaurants/bars (independent)	99 470	14 390	6 960
Transport (air charter, airline, road)	95 170	16 230	7 610
Travel agents, guiding services	43 730	9 090	3 940
Shopping	150 460	21 940	10 530
Additional CBNRM income	9 330	4 530	930
TOTAL FOR WETLAND TOURISM	1 012 530	362 760	172 780

Source: ODMP – Economic Valuation Report (2006)

2.7.2 INDIRECT USE VALUES

In this study, the indirect use values are based on the regeneration function (breeding and biodiversity), absorption function (water purification, waste assimilation and CO2 sequestration) and information function (ecosystem as an indicator of environmental change as well as role for scientific research and education) (ODMP – Economic Valuation Report, 2006).

The most important indirect use values in the Okavango Delta are groundwater recharge, wildlife nursery/breeding, carbon sequestration, water purification and research and education.

The results of the estimated indirect use values are given in Table 2-20. Given the large number of assumptions that had to be made, the estimated figures are indicative. The indirect use value of the wetland is estimated to be P199 million, compared to P230 million for the entire Ramsar site. Carbon sequestration accounts for the largest component of the indirect use value followed by wildlife refuge, scientific and educational value, groundwater recharge and water purification. The wetland is critical to the indirect use value, as can be seen from the much higher indirect use value: the average IUV per ha is about P69 for the wetland and P41 for the Ramsar site as a whole.

Table 2-20: Summary of estimated indirect use values for the Ramsar site and the wetland (in Pula, 2005)

Service	Wetland	Rest of Ramsar site	Whole Ramsar site
Groundwater recharge	16 million	0	16 million
Carbon sequestration	86 million	72 million	158 million
Wildlife refuge	77 million	0	77 million
Water purification	2.2 million	0	2.2 million
Scientific and educational value	18 million	6 million	24 million
Total	199.2 million	78 million	230.2 million
Area	28 782 km2	26 765 km2	55 547 km2
Average per ha /year	69	29	41

Source: ODMP – Economic Valuation Report (2006)

The results show that carbon sequestration and wildlife refuge are the most valuable indirect uses accounting together for over eighty percent of the indirect use value of the wetland and Ramsar site. The scientific and educational value is significant, and exceeds that of groundwater recharge and water purification. The wetland and Ramsar site is a major focal point for research, documentaries and education.

2.7.3 NON USE VALUES

Non-use values can be separated into option value, bequest value and existence value.

Option value is the 'future use value" that could be derived from the area, but which as yet has to be realised. Maintaining biodiversity is believed to retain the option to generate yet unknown values in future. These values could be, for example, from the exploitation of hitherto unexploited species, the discovery of important genetic material of use in the pharmaceutical industry, or the future tourism or development potential of the area. It is not possible to measure option value, since no-one can predict the future, but it is important to bear this in mind as a potential opportunity cost of degradation.

Existence value is the appreciation people derive from the knowledge that something exists, while bequest value is the value derived from knowing that one's children will be able to enjoy something in the future.

The growing popularity of the environmental movement indicates the substantial worth of biodiversity, particularly verified by people's willingness to donate to help protect species and ecosystems they have never, and will never, directly interact with. The Okavango Delta contains noteworthy biodiversity, although it is not particularly well endowed with endemicity. Perhaps the greatest attribute of the Delta in this regard is its extent and intactness as a wilderness area. Anything that impinges on this pristineness is likely to affect the utility derived by people from this area.

Value may also be placed on the intactness of traditional peoples and practices. Much of the traditional culture persists and is a source of pride. Degradation of the wetland and its resources might ultimately lead to an element of cultural decay. This decay may result from the loss of traditional plants for food and medicine, for example. Other more abstract impacts may result from the breakdown of gender roles without re-enforcement of such activities as hunting and collecting or a widening rich-poor disparity.

Estimating the existence value (including bequest value) of the Okavango Delta would require a substantial undertaking, involving the use of contingent valuation, a survey based method (Arrow *et al*. 1993). It would involve eliciting a willingness to pay from all those who derive such utility from the area. Since the Okavango Delta is of world renown, this should ideally be a global study. It is probable that the existence value among the international community far exceeds that of Botswana nationals' existence value of the Delta, or their 'willingness to pay' for its continued existence.

The measurement of existence value was beyond the scope of this study. However, at least two studies have considered this problem at some level. Barnes (1996) surveyed visitors to Botswana and ascertained the amount they were willing to pay towards a conservation fund for Botswana's wildlife. Tourists were willing to pay P125 on average, suggesting a total aggregate willingness to pay (WTP) among users alone of some P8 million (equivalent to about $4 million at the time).

Mmopelwa (2005) and Natalie Mladenov (2002) conducted a contingent valuation survey in the Delta area in which both resident households and visitors were asked what they would be willing to pay to a conservation fund to ensure conservation of the Okavango Delta. Households were allowed to express this in terms of livestock or produce. 70% of households and 33.3% of tourists had a positive WTP. Households had a mean WTP of just under P50, amounting to a total of about P53 000. Tourists had a mean WTP of about P1050, amounting to an estimated total of P13 million. Note that in both of these studies this is a once-off payment, and not an annual value.

These estimates greatly underestimate the existence value of the Delta, however, as they only reveal the WTP of those people that happened to be visiting the Delta in a particular year. In this regard, one could assume that similar WTP prevails for each new visitor to the Delta, and given that most visits are once-off, that the values could be assumed to be annual as a minimum estimate. However, this still only considers visitors to the Delta. There is a great deal more people, including many who cannot afford to visit the area, who would express a willingness to pay for conservation of this area. This would include both Botswana nationals and the global community. For example, the existence value of South African biodiversity is estimated to be at least $263 million per year to South Africans alone (Turpie 2003). Indeed, many studies have found that existence value far exceeds the direct

use value of ecosystems (refs). Thus there is a strong case for conducting a proper study of the existence value of the Okavango Delta that takes the non-user community into account.

3 EVALUATION OF STATUS AND CONDITION

Evaluation is a means of identifying the institutional, ecological, socio-economic and other characteristics that need management interventions. The evaluation is conducted at two levels. The first level raises natural resource management planning issues observed and compiled through the consultation processes in the district both during ODMP project design and the development phases (ODMP – Project Proposal, 2002; ODMP – Community and Feedback Report; 2004, ODMP -). The second assesses the potential to effectively deliver the management interventions on the basis of strengths, weakness, opportunities and threats analysis and is presented in Chapter 4.

3.1 INSTITUTIONAL PLANNING ISSUES

3.1.1 VISION FOR THE DELTA

Any management planning process must have broad stakeholder "buy-in" in order for it to be successful. It was realised during the ODMP project design that for this to happen in the Okavango Delta Ramsar Site, it was essential to develop a clear, common vision (ODMP – Project Proposal, 2002). The vision shared by all stakeholders should outline the views, aspirations, and values of managing the ODRS now and in the future.

A common and shared vision was developed during the development of the management plan through a participatory process. This entailed engagement of national stakeholders, private sector and communities (ODMP – Okavango Delta Ramsar Site Shared and Common Vision for 2016, 2006).

The challenge during the implementation of the plan is to ensure that the management of the Ramsar site is guided by the vision.

DEA as the coordinating institution for the implementation would have to ensure that sectoral and district management plans and strategies are aligned with the vision.

3.1.2 DEA CAPACITY TO COORDINATE AND MONITOR IMPLEMENTATION OF THE ODMP

The absence of the DEA office in Maun as an overall authority to coordinate environmental management activities in the Ngamiland district was a cause for concern in terms of the sustainability of the implementation of the ODMP (ODMP – Framework Management Plan, 2006).

The role of DEA through the Project Secretariat was focussed only on the development of the Okavango Delta Management Plan. The DEA has since positioned itself permanently within the ODRS to deliver on its full mandate. This presents a challenge in terms of the department's capacity to coordinate and monitor the implementation of the plan over and above coordinating other environmental management activities in the district (ODMP – Draft Management Plan Workshop Proceedings, 2006).

There is a need to strengthen the capacity of the DEA to deliver on its coordination role and monitor the implementation of the plan in addition to its various mandates. This would require a collaborative approach through developing formal linkages with the existing structures such as the Okavango Wetland Management Committee (OWMC) and the proposed District State of the Environment Reporting to augment the required capacity.

HOORC-UB has developed into a resourceful institution in Maun during the last 10 years. They have capacity to assist in implementation of the ODRS in areas like research, environmental monitoring, auditing of project progress, data base management (ODIS) and training. For this to be effective suitable institutional arrangements need to be arranged between the Government and the University.

3.1.3 CAPACITY OF SECTORS TO IMPLEMENT THE ODMP

The ODMP project has highlighted institutional weaknesses with regard to those institutions envisaged to assume responsibility for implementation of the ODMP components (ODMP – Inception Report, 2005).

Capacity issues include physical lack of manpower resources and limited skills base. Capacity weaknesses, attributed to the government moratorium of zero growth in the public sector and government staff turn-over policies, remain a major challenge to implementing the plan.

Financial resources for out-sourcing are also a major constraint due to competing development and social needs e.g. the HIV and AIDS scourge is consuming a major part of the country's financial resources. This limits the opportunities for outsourcing to augment required capacity, as well as for procurement of necessary resources such as transport and equipment to enable institutions to deliver on their mandates.

Institutions may have to review the deployment of their existing manpower and where possible rationalise their manpower resources. The other option is to outsource some of the activities to augment the required capacities if financial resources permit.

3.1.4 POLICY FRAMEWORK

The ODMP will operate within the existing national policy and legal framework. The National Biodiversity Strategy and Action Plan (NCSA, 2004) and ODMP – Policy Review Report (2006) highlight specific gaps and conflicts within the legal system for the protection of ecosystems and species, and the need for updating of Acts, ensuring policy harmonisation containing incentives for sustainable ecosystems management and the removal of disincentives, e.g. some of the current agricultural subsidies.

It is also recognised that future policy formulation should be based on the principles of Strategic Environmental Assessment (SEA) in accordance with the EIA Act of 2005.

The ODMP cannot change laws or policies in itself, but outlining the obvious gaps and other shortcomings and making the findings available to the relevant institutions (line ministries responsible for various Acts and the DEA) will help to instigate the necessary changes.

Limited law enforcement and adherence to policy is another key issue affecting the ODRS. Related to this is the issue of limited monitoring of adherence to conditions of resource allocation and permits for resource use (hunting and harvesting of veld products). Inadequate monitoring and resource allocation of protected veld products in accordance with the Agricultural Resources Act need to be addressed. The allocation of hunting quotas is another issue which is under constant discussionas well as the related poaching of wildlife.

3.2 BIO-PHYSICAL PLANNING ISSUES

Development planning in most human societies strives towards stability and predictability, which in the case of the Okavango Delta is in direct conflict with its inherently unstable nature. This is a major challenge for the management of ODRS.

3.2.1 ECOLOGICAL FUNCTIONS AND SERVICES

Gumbricht and McCarthy, 2002, have succinctly summarised the functioning of the Okavango system by equating it to a physiological system. They have described it as follows*;*

"The Okavango is a good example of a complex middle number geo-physiological system, which has many similarities with physiological systems. The Okavango Wetland with its distributary channels is like the bloodstream and lymphatic system, with fast turnover and transporting nutrients and other dissolved substances. The Islands Mosaic is like the internal organs, processing the nutrients and energy, keeping the balance of the "blood". The Fan is the skeleton and the skin, the bodily envelope and backbone keeping the organs in place. What comes in via the Panhandle is like the food intake. The superswell and the climate it fosters is the general environment."

The seasonal flooding is recharging the groundwater aquifers which also causes a high biological production of wildlife and livestock as well as of veld products and fish.

The shifts in flooding patterns, the duration and extent creates a Delta that is much larger than the annual flooded area; it provides fresh water to communities surrounding the Delta and facilitates molapo farming.

Islands are important ecological function of the Delta, they create habitat mosaic which is responsible for the high biodiversity that is found in the Delta. The resultat high habitat diversity results in the internal ecological resilience of the Okavango Delta syste. Many islands form as a result of the subsurface precipitation of calciste and armophous silica which produces vertical expansion creating a topographic relief which is mainly due to transpiration from trees in riparian fringes (McCarthy et al., 1993). This process has resulted in the creation and growth of islands whereby salts are permanently removed from water. This process does also concentrate the remaining salts to centrums of islands where it sinks permanently to deep groundwater. These processes maintain the Delta as a fresh water system. The Delta does permanently remove organic matter and nutrients from the water and by that it is producing crystal clear waters of high quality.

3.2.2 BIODIVERSITY

The Okavango Delta features as one of the world's important biodiversity areas. In particular the numbers of plants, mammals, reptiles and birds are high (see Ch 2…..). This is firstly because of the flood pulse without which the seasonal floodplains with its entire flora and fauna would disappear, and the biological productivity would dramatically be reduced. The second process is the shift in flood distribution and size over different time scales. This creates a dynamic patch system of different nutrient levels and at different stages of biological succession.

The major factor organizing the Delta habitats is the depth and duration of flooding. There is a typical gradient from permanent waters (streams and lagoons) and swamps, seasonal floodplains, occasional floodplains, riparian woodlands and dry woodlands. This pattern is repeated across the Delta resulting in a mosaic landscape.

The habitat diversity is high and the habitat patches small causing a large edge effect which favours species dependent on more than one habitat. The largest habitat diversity is

found in the fringes of the Delta where the hydrological gradients are steepest. It is very likely that the total biodiversity is highest here as well.

The biomass of large mammals in the Delta is 4-8 times higher than in surrounding drylands. This is caused by a much longer growth period of vegetation with a rainy season during summer and a flooding period during winter, and a higher nutrient status due to nutrient accumulation during wet periods and release during dry periods.

The most numerous large mammals are Impala with 140 000 individuals, Buffalo and Red Lechwe with 60 000 individuals each and elephants with 35 000 individuals.

The crystal clear waters favour fish-eating species hunting by the aid of eyesight such as otters and cormorants. There are more than 40 species of that kind in the Delta.

There are no known endemic species in the Delta. This is probably because the Delta during wetter periods was directly connected to the large wetlands in the upper Zambezi. There are many similarities in biodiversity between all these wetlands.

There is however a significant number of winter breeding mammal species (39) in the Delta. This is probably a genetic trait as an adaptation to the winter flooding of the Delta as opposed to other ecosystems that flood during the wet season offering favourable conditions. A number of genetically distinct mammal species may thus occur in the Delta.

The identified keystone species in the Delta that have a decisive impact on the environment and on other species are elephants, hippopotamuses, termites and papyrus. Elephants modify in particular the woody vegetation and open up the landscape. Hippopotamuses open up water courses and/or change water flow and flooding patterns. Termites construct mounds during dry phases that during wet phases become growth points for islands. Papyrus confine water in channels, build up peat that store nutrients, filter and purify water, and create vegetation blockages and flood switching.

The elephant population has increased over the past 30 years from 2 300 to 35 000. Their impact on the Delta environment is debated.

There are eight globally threatened or near-threatened bird species which occur in the Delta. An estimated 85% of the global population of the Slaty egret (*Egretta vinaciegula*) is restricted to the Okavango Delta and thus near endemic.

Globally threatened mammals found in Okavango Delta are the White Rhino (*Ceratotherium simum*), the Wild Dog (*Lycaon pictus*) (Spriggs, 2001), and the Cheetah (*Acinonyx jubatus*). In addition there are about six large mammals species classified as rare.

The Delta is also an important habitat for the Nile Crocodile (*Crocodylus niloticus*) which is of international importance.

3.2.3 POTENTIAL THREATS TO OKAVANGO DELTA RAMSAR SITE FUNCTIONING

Processes driving the functions and biodiversity of the Delta are water inflow, sedimentation and nutrients. These in turn are affected by both natural and anthropogenic factors. The natural impacts include climate change, tectonic activities and large scale changes in the flooding of the Delta. The anthropogenic factors mainly entail large scale water abstractions and obstructions and eutrophication.

3.2.3.1 Climate change

The issue of the potential impact of climate change on the ecosystem has regularly been raised in meetings and was captured during the ODMP project design phase (ODMP – Project Proposal, 2002). In order to address this issue, an integrated hydrological model was developed during the ODMP planning phase to assess the Okavango Delta hydrological response to various natural and anthropogenic scenarios (ODMP – Integrated Hydrological Model, 2006).

The scenario simulations showed that projected climatic change has potentially the greatest impact on the basin and the Delta reducing both inflows from upstream and rainfall over the Delta, and increasing temperature and the rate of evapotranspiration. The lower envelope of flooding is reduced by 68%, from 2,770km^2 to 900km2 (ODMP – Analysis of Water Resources Scenarios, 2006). It is believed that climatic change in Southern Africa will result in decrease in rainfall and temperature increase in the longer term, leading to reduced flows and high evaporation rates (ODMP – Water Resources Scenarios, 2006).

It is important that the sectors such as tourism, agriculture, susbsistance and commercial use of vegetation resources, water and fisheries which are likely to be affected by the impact of climate change initiate the development of coping strategies.

3.2.3.2 Seismic Activities

The Delta area is tectonically active and the last major earthquake in Maun 1954 had a magnitude of 6.4 on the Richter scale. At that time most buildings were low, made of mud, reeds and grass so the damage was probably limited (NDSS, 2004). Now an earthquake of the same magnitude could cause major damage to the modern building structures.

The impact of such seismic activities may also accelerate the river channels and flood distribution in the Delta which otherwise are moving over time scales of decades and decennia. Gumbricht and McCarthy (2002) attribute the present sediment accumulation in the Panhandle, the Xho flats, and the secular water distribution changes on the fan surface from Jao-Boro towards Xudum to small scale tectonic activities. Areas that now are dry with developments and buildings on them may again come under water. Developments like tourist lodges that are located close to scenic water ways may find that the river suddenly has taken another route.

Although geotechnical investigations indicate a 100 year maximum probability of such an earthquake event happening (Patridge, Maude Associates, 1998), there is need to introduce building codes which would specify special requirements for foundations and structural designs in the district.

In as far as the impacts on the tourism business are concerned, a precautionary principle should be applied in the sector's business and management plans.

Sesmic events have a potential to have profound impacts on the functioning and dynamics of the Okavango Delta. Small sesmic activities will possibly afecte the flooding partterns while large ones will have far reaching consequences. It is crucial that predictive models are developed that can be used to inform responsive actions.

3.2.3.3 Fires

Fire plays a major part in the ecological functioning and processes of the Okavango Delta. The fires that occur in the Delta are a result of two causal agents, anthropogenic and

natural factors. There are two major types of natural fires, namely surface fires which are caused by lightening and peat fires which are caused by combustion of peat.

Frequency of burning

The floodplains in the Seasonal Swamps in the Okavango Delta are more frequently burnt than the dryland areas because of greater grass fuel loads due to their higher production potential and lower grazing pressure caused by the occurrence of less palatable grasses. The mean fire return period for these floodplains during the 14 year period between 1989 - 2003 was 6.6 years and for the drylands 22.2 years. The highest fire frequency occurred in the floodplains that are inundated approximately every second year resulting in a mean fire return period of 5 years. Generally the dryland areas rarely burn however the frequency of burning varied greatly in the different habitat types in the drylands with some areas being burnt more frequently than biennially particularly with fires spreading into the drylands from adjacent more frequently burnt floodplains (Heinl 2005)

Type and intensity of fires

Little information is available in the scientific literature on the types and intensities of fires occurring in the Okavango Delta Ramsar Site. There is some information of ground fires burning accumulations of organic peat material (peat fires) in areas where the channels have dried out as part of the normal dynamic variations in the water flow through the fan of the Delta (ODMP Fire Management Strategy 2006). A general description of the formation and accumulation of organic peat material in wetlands like the Okavango Delta is provided by Roggeri (1995).

The plant photosynthesis processes consume CO_2 which is partly transformed into organic carbon and accumulated in plant tissue. Under certain conditions (increased acidity, lack of oxygen, lack of nutrients or low temperatures) the organic matter is only partially decomposed and accumulates in the soil. The peat formed in this way forms a reservoir of organic carbon. Once stored in this form, carbon can only be returned to the atmosphere by oxidation or by combustion of the peat. Swamps, and in particular peat swamps, thus trap large amounts of carbon.

Therefore burning of peat soils lead to the destruction of natural carbon reservoirs that could have moderated the increase in atmospheric CO_2 contributing to the greenhouse effect and global warming. This, if confirmed could give a special significance to this function performed by some wetlands.

It is estimated that the blockage of the Thaoge River has gradually occurred since the 1870's and the drying of the peat deposits flanking the channel has resulted in the occurrence of peat fires, which have destroyed the original plant communities and peat deposits (Ellery *et al* 1989). This has resulted in the release of nutrients into the soil which improves forage quality. In addition more recently there has been the cultivation of crops such as tropical fruit and sugar cane in this area because of the elevated soil fertility associated with the former burning of the peat deposits in this area

Thus a conflicting set of circumstances exists regarding the occurrence of peat fires in the Ramsar Site. On the one hand these fires are releasing CO_2 into the atmosphere thereby contributing to the greenhouse effect and global warming. On the other hand the peat fires have and are raising the nutrient levels of highly infertile soils resulting in the production of grass forage with significantly improved quality for grazing animals. Therefore these fires are playing a significant role in the normal nutrient cycle occurring in the Okavango Delta ecosystem (ODMP Fire Management Strategy 2006). It should also be considered that these fires are probably not a recent occurrence but have been occurring since time immemorial

and are therefore a part of the normal cycle of the release and absorption of CO2 into and from the atmosphere associated with fires in African ecosystems.

It is important therefore that there is improved research on the role and effects of fire in the functioning of the Okavango Delta ecosystem.

3.2.3.4 Large scale water development

These impacts are discussed in detail in ODMP – Analysis of Water Resources Scenarios (2006) and these are summarised below.

The basin and Delta are presently in a near natural state. To date, land use changes and abstractions from the basin upstream and the Delta have a minimal impact on the Delta as whole, though local impacts may be significant.

Upstream irrigation plans in Namibia and especially Angola are predicted to have a significant impact. The lower envelope of flooding, i.e. the area that remains flooded throughout, is reduced by 40% in dry years.

Present and future local surface and ground water abstractions from the Delta are minimally significant, amounting to 0.3% and 0.5% of the inflow respectively. Under future conditions, the upper envelope of flooding, i.e. the area that may be flooded at some time is decreased by around 70 km^2, or 0.6%.

The combined water resources developments with climate change have the most severe impact on the Delta. In years with normal inflows, the range of flooded area declines from a maximum of 12,825km^2 to 4,695km^2, and from a minimum of 2,944km^2 to 158km^2.

3.2.3.5 Eutrophication

The Okavango River Basin is still in a relatively undisturbed state, also when it comes to pollution. The entire population of the Basin is in the order of 600,000 people. There are no major industrial sources of pollution in the basin.

The only urban centres are Menongue and Cuito Carnevale in Angola with an estimated population of 30,000 and 20,000 respectively, Rundu in Namibia with a population of 42,000 and Maun in Botswana with a population of around 44,000. Locally these urban areas may cause pollution that would affect the water quality, but when considering the effect on the entire basin the effects on water quality are negligible (ODMP – Analysis of Water Resources Scenarios, 2006).

Agriculture is another potential source of pollution in the Okavango River Basin that may discharge nutrients, mainly nitrogen and phosphorus, as well as toxic substances such as pesticides and herbicides into the river and Delta system. The use of fertilisers, herbicides and pesticides is still very limited in the Basin. The nutrient levels in the Okavango River are very low, and the Delta system can be characterised as oligotrophic, except in isolated pools.

Another pollution issue is the presence of a relatively large number of camps and lodges that cater for tourists visiting the Okavango Delta. The Government of Botswana has adopted a low volume, high cost tourism policy that has so far limited the number of tourists visiting the Delta. In addition, to obtain a license a lodge has to adopt environmentally friendly management, including proper handling of solid and liquid wastes.

However, there are indications that the authorities responsible for issuing licenses and monitoring adherence to the agreed environmental practices suffer from lack of resources to carry out the required inspections.

3.2.3.6 Pesticides

A major pollution issue is the spraying of tsetse flies. These flies occur widely in tropical Africa from where they extend to their most southerly limits in the Okavango Delta. The biting flies transmit blood parasites called *Trypanosoma*, which affect cattle and people (sleeping sickness). A variety of control methods has been used, including the killing of wildlife hosts, clearing of bush, and ground and aerial spraying with DDT and endosulphan. The application of insecticides from the air was first stopped in 1992, partly in response to concerns that the chemicals caused considerable environmental damage, including the loss of biodiversity and fish in the Delta.

In recent years an integrated Tsetse eradication programme was initiated. This includes aerial spraying of almost the entire Delta and the use of sterile male flies, which has eliminated the problem to the great satisfaction of people living in and around the Delta. During and after these sprayings research and monitoring of the effects on the biodiversity have been carried out. Results show a marked reduction in insects, invertebrates, etc immediately after spraying, but also indicate that re-colonisation of sprayed areas takes place rather efficiently afterwards.

The possible negative side effects of this control measure have led to controversy among environmentalists, tourism operators, the local population and Government Institutions. Disease control programmes with broad ecological, social and political implications need to be considered in long term planning.

3.3 SOCIO-ECONOMIC PLANNING ISSUES

It is quite evident that the Delta's goods and services provide an important source of livelihood. However there are conflicts emanating from use of the resources. This section describes the prominent conflicts and benefits from resource use that have been identified through stakeholder consultation process and literature review (ODMP – Design Mission Report, 2001, ODMP – Community Consultation and Feedback Report, 2004 and ODMP – Inception Report, 2005).

3.3.1 LAND USE

The continued benefits accruing in terms of land use is dependent on assured sustainable access to land. Every citizen has a right to own land which is easily accessible for different uses as contained in the land board regulations or integrated land use plans. However there are serious land use conflicts within the ODRS. Some of the significant ones are outlined in the consultation reports.

Inconsistencies, delays in and haphazard land allocation coupled with the observed incidents of double land allocation and poor record keeping by the Tawana Land Board are overwhelming in the ODRS. This is exacerbated by lack of an integrated land use plan and the absence of surveyed detailed layout plans, resulting in wasteful and inefficient use of land.

There is no clear separation of land uses particularly between settlements, grazing areas and arable fields. This manifests itself in the seemingly mushrooming and growing of non-gazetted settlements.

It is increasingly emerging that the traditional access rights to resources within concessions for subsistence use are not observed.

3.3.2 UNSUSTAINABLE USE OF VELD AND RANGE RESOURCES

There is general concern that the Okavango Delta natural resources may be depleted or become scarce in the long run due to unsustainable practices. Scarcity in resources is being observed with respect to *mokola* palm for basket weaving, thatching grass and river reeds (Kgathi, et al., 2002). It is also emerging that pre-mature harvesting of the same resources is increasingly becoming a problem and this is further compounded by lack of harvesting permits (ODMP – Community Consultation and Feedback Report, 2004).

Veld fires can be used as a management tool. However, if not used properly they cause extensive damage in terms of exposing the land to erosion, altering the ecological balance and loss of plant species in the fragile environment of the Okavango Delta (ODMP – Inception Report, 2005).

An important aspect in the management of vegetation resources is the impact of wildlife and livestock especially cattle on rangelands. There is generally a problem of overstocking of rangelands especially in the Gumare area. This could be attributed to the high density of the boreholes in the area (ODMP – Inception Report, 2005).

Another important issue that needs closer scrutiny is the donkey population which has slowly been building up in the District due to Arable Lands Development Programme (ALDEP) (ODMP – Inception Report, 2005).

3.3.3 WATER USE

Upstream water obstruction and abstraction may lead to reduced flows, smaller peak flows and lower sediment transport (see section 3.2.3.4). This will reduce the flooded area in the Delta, water will less frequently reach its distal parts, and flooding patterns will change less frequently.

The water flow and growth of aquatic vegetation in the Delta are dynamic processes leading to the realignment of river channels and larger scale flow patterns. In the past as well as currently, attempts are made to clear channels. This is done or proposed for different purposes. On the local scale small channels are kept open for access to tourist lodges, villages, fisheries and other natural resources of the Delta.

Tourist operators as well as the Government are keeping streams or sections thereof free from vegetation for long distance boat traffic. Attempts have been made in the past, such as clearing of the Thaoge, as well as recently (Gomoti), to create and keep permanent streams to villages (Shorobe) that in the past have had better water supply. While these large scale channel clearings of vegetation in the past have been largely ineffective, the proposed use of modern machinery – if successful - may be damaging for the ecological functioning of the Delta in that it will reduce the flooded area and flood switches. The environmental effects of opening small channels are probably insignificant.

Intensive agricultural activities and urbanisation in the upstream catchment may cause eutrophication, with resultant stronger growth and re-distribution of key stone species such as *Cyperus papyrus,* which play an important role in channel switching and habitat self renewal. Higher nutrient content in the water will promote the growth of *Salvania*

molesta as well as of planktonic and attached algae. The water will become turbid and the whole guild of fish-eating birds, mammals and reptiles will be negatively impacted.

There is a need for reliable supplies of domestic water to the larger villages around the Delta and above all for Maun itself, which has a very high growth rate. The groundwater aquifers in the Thamalakane and Kunyere faults are large but difficult to use. The substrate is often very fine grained so pumping and flow rates are slow. Deeper groundwater is often salty and sometimes with high levels of organic material and high levels of arsenic content. The changes of river flow patterns and flooding means that the recharge is not predictable. Flexible systems are needed that are designed for adaptive management.

The integrated hydrological model of the Okavango Delta indicates that whilst the present surface and groundwater abstractions are minimally significant amounting to only 0.25% of the inflows, the potential for upstream developments are likely to reduce the permanently flooded areas by 38% (ODMP – Analysis of Water Resources Scenarios, 2006).

3.3.4 TOURISM

There is no doubt that tourism as an industry makes very substantial contributions to virtually all spheres of Ngamiland District economic prosperity, since it is the main driver of the district's economy. However, there are problems in terms of sustainable tourism in the district and these are articulated below.

There has been minimal or no sustained research on tourism carrying capacities and as such the level of impacts caused by tourism activities in the Delta is not known.

There is little done to monitor tourism activities despite the perception that illegal consumptive use of resources and unacceptable waste management practices may be taking place in the Delta. Moreover, lack of capacity within the NWDC and DoT to carry out regular inspections to ensure that operators comply with provisions of the lease agreements and regulations is evident.

DoT does not have an appropriate database and information system to capture tourism related information, such as ownership status and tourism statistics.

It is evident that Batswana are not meaningfully participating, in terms of ownership, management levels, skills and requisite capital to invest in the tourism industry, hence not appreciating the benefits thereof.

The current tourism activities are largely wildlife based. There are serious concerns that this poses a major risk to the tourism industry as it is dependent on a single product.

3.3.5 WILDLIFE USE

The issues with regard to wildlife use include human-elephant conflict, wildlife-livestock conflicts, declining population of certain species, and lack of baseline information on certain species.

Human-Elephant Conflicts in the form of crop damage are common and wide spread within the Okavango Delta. Crop damage by elephants is widely reported in the Panhandle area. It is clear that compensation does not solve the problem; rather, effective mitigation measures could reduce the Human-Elephant Conflict.

The buffalo fence has generated a lot of controversy in terms of proximity to grazing areas, its inefficiency in separating buffaloes from cattle and poor fence maintenance by DAHP.

Another contentious issue within the ODRS is livestock predation by wildlife such as lions, leopard, cheetah and other carnivores. The main concern is with regard to the issue of the perceived low compensation and a moratorium on the killing of lions after predation.

Lake Ngami is a habitat for a variety of bird species. There has been uncontrolled hunting in the area which has resulted in a moratorium imposed on hunting of birds pending the declaration of Lake Ngami as a bird sanctuary.

Whilst illegal hunting has been contained to a larger extent, it continues to be a problem. DWNP need to find ways of derterming the extent to which illegal hunting may be taking place.

The hunting quota are normally determined by the DWNP and there is a concern that it may not be based on scientific data and does not seem to be transparent.

3.3.6 FISHERIES

There is limited information on the Okavango fish stocks and this has resulted in uncertainties in the management of fish resources.

The overlap of commercial fishing and angling/ recreational activities on the same fishing grounds have often resulted in conflicts.

The only piece of fisheries legislation that exists is the Fish Protection Act of 1975, which is very outdated. The Okavango Delta fishery is still an open-access fishery with no regulatory mechanisms in place.

3.3.7 LIVESTOCK

Despite the contribution and potential shown by the livestock sub-sector, a number of concerns and challenges relating to its long-term viability have emerged over the years. The major concerns and challenges include, but are not limited to, the following:

Recurring droughts have had a negative impact on the livestock sub-sector by reducing water and grazing availability and thereby negatively impacting on livestock condition and numbers.

As a result of competition between livestock and wildlife for grazing pastures and open water sources, there is evidence of overgrazing, trampling and consequent depletion of the resource around the periphery of the Delta. These problems are also exacerbated by the occurrence of *Dichapertatalum simosum (mogau)* in the sandveld areas which tend to confine livestock in smaller areas of the Delta.

Ngamiland district is prone to livestock diseases outbreaks which are predominantly introduced through the interaction between livestock and wildlife. In particular, Foot and Mouth Disease (FMD), Nagana in cattle (*Trypanosomiasis*) and Contagious Bovine Pleuro Pneumonia (CBPP). With respect to nagana the control of tsetse fly (*Glossina morsitans centralis*) has attracted controversy around the environmental impacts of the measures

employed. Cross-border re-invasion from Namibia or Angola where healthy Tsetse populations still exist could negate all Tsetse fly eradication efforts.

The fences provide boundaries for three disease control zones in Ngamiland but controversies surround the utility and effectiveness of these fences. Major issues of concern relate to both environmental and social issues. Related to this there is the potential for increased predation as wildlife are forced to concentrate in certain areas and exacerbation of water shortages during drought years.

3.3.8 WASTE MANAGEMENT

The resource limitations and capacity constraints within NWDC make it difficult to adequately service all recognised villages in the ODRS. In addition to these, there are 478 unrecognised settlements which do not qualify for such services and are also generating waste.

Mechanisms employed for management of waste generated in the Delta, e.g. at tourism businesses such as lodges and campsites, is determined by the lease agreement signed between concessionaires and the Tawana Land Board. There are inadequate monitoring mechanisms in place to determine if such agreements are being honoured and how waste is actually being disposed.

Although a North West District Waste Management Plan was completed in 2002, it did not address the unique and complex issues of waste management in the Delta.

Litter is a serious concern in the ODRS, and the major difficulty is to change attitudes of people to refrain from this bad habit.

There is a serious worry about sewage and grey water disposal from houseboats.

3.4 EDUCATION AND PUBLIC AWARENESS

The ODMP requires that the aspirations of each stakeholder should be known to each other and the exchange of information organised systematically. Negotiations will need to start and trade-offs must be made. These processes require an extensive communication programme for the implementation of the ODMP.

Information gathering and communication methods traditionally used tend to be ineffective and often fall short of expectations in terms of their inability to accurately target desired groups; difficulties in adequately conveying the intended message; presenting different messages about the same issue by different institutions; the time taken for the message to reach the target groups; inaccuracies and inconsistencies in the intended or actual content; the inappropriateness of the communication and information exchange methods used; and difficulties in ensuring and achieving information flow from “bottom to top”.

The vast nature of the ODRS, let alone of the whole Okavango River Basin (ORB) that is equally the target of the ODMP communication strategy, and the unique problems these areas experience in terms of difficulties in physical and remote (radio, telephone, email, internet etc.) access, present enormous problems in maintaining effective dialogue and implementing the communication strategy. This is compounded by the huge diversity of views and opinions among stakeholders, which range from local communities to international governments and include the tourism private sector operators and tourists

about appropriate action. Such factors also make effective and efficient communication and information exchange, and especially reaching consensus, a very difficult task.

3.5 RESEARCH AND DATA MANAGEMENT

Information on the Delta is widely scattered, formats are not standardised and many data are not easily accessible. There is a lack of updated information on present land use, socio economic, hydrological and ecological conditions of the Delta for planning purposes and some of the available data are of poor quality.

In addition, uncoordinated research activities and limited use of local knowledge for resource management might lead to research results that are less useful for planning.

There are uncertainties around data updating and expectations during the implementation of the ODMP.

There is need for continuous training of stakeholders on how to use the Okavango Delta Information System (ODIS) given the staff turn-over and the availability of a GIS technician at HOORC.

The ODMP research strategy proposed research activities which are designed to reflect the closely interlocking nature of the three components, namely hydrology, ecology and socio-economics, with several cross-cutting themes and a common need for multidisciplinary and interdisciplinary approaches (ODMP – Research Strategy, 2006).

At present the long-term basic hydrological and water quality monitoring system are in a relatively poor state both within the Okavango Delta and worse in the upstream especially in Angola. Monitoring in Angola has not been properly undertaken for the last 30 years because of the civil war. The spatial and temporal coverage of the basic monitoring data is relatively poor.

There is no systematic Delta-wide long term ecological monitoring carried out in the Delta despite the extraordinary scenic beauty of the Okavango Delta and its component ecosystems except for annual aerial surveys of larger herbivores by DWNP, small monitoring studies on rare and endangered species and limited bird surveys by Birdlife Botswana. DWA has carried out limited monitoring on the occurrence of channel blockages.

Despite the fact that Botswana has a comparatively progressive and well-resourced programme to combat HIV and AIDS, monitoring of the pandemic is still inadequate. The most reliable data comes from testing pregnant women at ante-natal clinics. There is some degree of monitoring the impacts of the pandemic through the provision of food baskets to orphans and Home-based Care programmes but this does not extent to the broader livelihood impacts such as households coping strategy.

There is very little research focused on poverty status and livelihoods trends in the Okavango Delta Ramsar Site despite the presence of the country's Poverty Reduction Strategy. The measure and prevalence can only be indirectly deduced from recent research on livelihoods in the area.

There has been considerable research on governance issues at international and regional level; however there seems to have been less governance research done at the national and local level with regard to Okavango Delta (ODMP - Research Strategy, 2006). An example is the perpetual tension between national and local interests in the ownership, governance

and use of the area's resources, or the functions and performance of district-level development and resources management institutions such as the Tawana Land Board and District Development Committee.

3.6 ECONOMIC VALUATION

Evaluation of the status and condition of the Delta and its resources must incorporate consideration of the economic characteristics of the Delta and its development. The economic valuation of the Okavango Delta and the Ramsar Site as a whole was undertaken based on the concept of total economic value (see Ch. 2.7) which includes direct use values, indirect use values and non-use values (ODMP – Economic Valuation Report, 2006). Non-use values (option, existence and bequest values) have not been included in this analysis for budgetary and time reasons. The values are calculated with the intention that they should be, as far as possible, compatible with the national accounts of Botswana and the natural resource accounting procedures being practiced by the Department of Environmental Affairs.

Values have also been calculated for the whole Ramsar Site, which includes some surrounding drylands as well as the Delta wetlands, as well as for just the wetlands component of the Site (i.e. the Okavango Delta wetlands system). Values were estimated for 2005 in Pula, which at the time was worth US$0.19. Direct use values associated with the Okavango Delta Ramsar Site include those generated by non-consumptive tourism, hunting tourism, household livestock production, household crop production, and household harvesting and processing of natural resource products. The values are overwhelmingly dominated by those generated by tourism, which takes place in the central zone of the Delta, and which contributes P401 million annually to the gross national product (see Table 2-18). Eighty percent of the tourism direct value is from non-consumptive activities. Ninety percent of tourism value is attributable to the actual wetland within the Ramsar Site.

Agricultural pursuits take place mainly in the northern, western and southern zones of the Ramsar Site, and contribute P43 million annually to the gross national product (see Table 2-14). Ninety three percent of this is from livestock, and only 3% of it is derived from the wetland itself. Household harvesting and processing of natural resources also takes place in the north west and south of the Ramsar Site, and contributes P28 million annually to gross national product (see Table 2-15). Fifty three percent of this is derived from the wetland.

Indirect use values in the form of carbon sequestration, groundwater recharge, water purification, wildlife refuge functions and provision of scientific and educational value, are provided by the Ramsar Site. These were estimated to amount to some P230 million per year, dominated by the carbon sequestration and wildlife refuge functions (see Table 2-20) . The indirect use value specific to the wetland system within the Ramsar Site is estimated to be P199 million. Estimates for these values are, however difficult to make and are thus fairly uncertain.

As stated earlier, non-use values were excluded from the study. Given the high profile of the Okavango Delta, these values are expected to be very high internationally. These values require specific study. Once they have been better established and estimated, and with the development of appropriate market mechanisms, they could be captured to contribute significantly to Botswana's income. Thus, increased capture of donations or marketing of easements internationally can be transferrred to Botswana, and invested in conservation of the Delta's resources, via for example local Community-based Natural Resource Management (CBNRM) programmes. Planning for the Delta needs to ensure that these values are preserved.

The direct use values generated by the Ramsar Site also have a wider impact on Botswana's economy through the multiplier effect. Thus, for example, tourist accommodation facilities in the Delta spend money on food and supplies from the agricultural and manufacturing sectors elsewhere in Botswana, and these second-round backward-linked expenditures contribute further gross value added to the national economy. A modified social accounting matrix (SAM) model of the Botswana economy was used (ODMP – Economic Valuation Report, 2006) to determine that for every P1.00 that direct uses contribute to the gross national product, another P1.50 in gross national product contribution is generated in the wider economy through demand created in backward linkages. Thus, the Ramsar Site has a total annual (direct and indirect) impact on the gross national product amounting to P1.2 billion, or 2.6% of the total national gross national product. Eighty one percent of this total impact is contributed by the wetland.

The multiplier effect is higher for the formal tourism sector activities than for household agriculture and natural resource use. However, policies aimed at reducing the fairly high import component of tourism linkages, might increase the multiplier effects further.

The Ramsar Site contributes to livelihoods of its people through profits (both cash and in-kind) from agricultural and natural resource use, through wages and salaries in the tourism sector and from rentals and royalties in the tourism sector. Poor households in the study area benefit from profits amounting to P99 million, from wages and salaries amounting to P102 million, and from rentals and royalties amounting to an estimated P25 million (ODMP – Economic Valuation Report, 2006). The wetland contributes less than 3% of profits, but nearly all the wages and royalty benefits. Of the direct contribution made to the gross national product by the Ramsar Site (P472 million per annum), 31% accrues to low income elements of society. In the total (both direct and indirect) contribution made to the gross national product by the Ramsar Site, this figure is lower, being some 18%.

Botswana has a natural resource accounting programme and in this framework, the Ramsar Site and the wetland were treated as natural assets within land or ecosystem accounts. The direct use values measured in this study represent the production or flow accounts. The asset or stock value of the Delta, measured as the present value in 2005 prices, of the expected future flow of resource rents from the Delta, was estimated at P3.9 billion for the Ramsar Site and P3.4 billion for the wetland.

In a preliminary qualitative analysis, the economic valuation study examined the likely effects of three future land use options on the direct use values. These involved the currently proposed land use plan (ODMP – Land Use and Management Plan, 2005), a second option where the emphasis was put on the expansion of agricultural lands, and a third option where the emphasis was put on protection of the natural assets of the Delta.

In this preliminary scenario analysis, the currently proposed land use plan, which gives emphasis to complementary land use and wise use of the resources, emerged as the most economically efficient, contributing the greatest amount of national product. The plan thus appears optimal for the Ramsar Site. The likely effects of external factors, involving water extraction plans and climate change predictions were tested in two further scenarios. These factors, particularly climate change, will reduce the value of the Ramsar Site. Therefore attention should be given in planning to any possible ways of ameliorating these effects.

3.7 CRITERIA FOR DETERMINING MANAGEMENT INTERVENTIONS

3.7.1 MANAGEMENT INTERVENTIONS DURING THE DEVELOPMENT OF THE PLAN

3.7.1.1 Criteria for prioritising management interventions

The issues discussed in the previous sections were identified during the project design phase and confirmed during the inception phase (ODMP – Design Mission Report 2001), ODMP – Community Consultation and Feedback Report, 2004) and ODMP – Inception Report, 2005). In order to ensure buy-in and create ownership of the plan by the stakeholders a hot spot approach was used where a few issues were identified and addressed during the development of the plan. Prioritisation of issues was undertaken by stakeholders, that is the communities, the private sector and the implementing institutions.

Issues were ranked according to prioritisation of criteria adopted by both communities and the private sector. The criteria were based on ranking the issues according to the frequency at which they were raised by the stakeholders. Table 3.1 below presents the selected priority issues and the interventions that were undertaken during the development of the plan.

Table 3-1: Summary of prioritised issues and interventions during the development of the ODMP

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
1	Policy, planning and strategy	Lack of an overall management plan to address the interaction and relationships between the various sectors in the Delta in such a way, that the functioning of the Delta in the longer term can be conserved.	Development of an integrated management plan	An integrated management plan has been developed.	DEA to coordinate the implementation of the plan
			Review Ramsar site boundary	The boundary has been reviewed and the incorporated into the Ramsar information sheet (ODMP – Okavango Delta Ramsar Site Boundary Revision Report, 2004)	DEA to submit the revised Ramsar Information sheet and updated map to the Ramsar Secretariat. DEA to erect signs at the main entry points of the Okavango Delta Ramsar site
		Conflicting plans, policies, laws, strategies on the use of resources of the Delta occur.	To review all policies	The policies have been reviewed and recommendations made for future policy harmonization and policy formulation (ODMP – Policy Review Report, 2006)	DEA to spearhead the process of policy harmonization. Policy formulation should be based on the strategic environmental assessment framework and some selected policies need to be subjected to SEA
		Stakeholders have expressed a wish for pro-active guidance on issues concerning the use of the Delta and its resources.	Develop a shared vision	A common and shared vision has been developed (ODMP – A Common and Shared Vision Report, 2006)	The vision should guide the implementation of ODMP as well as other plans and programmes
		Limited knowledge of economic and ecological values.	Economic valuation of the Okavango Delta Ramsar Site values and functions	An economic valuation has been undertaken, however only the use values were estimated (ODMP – Economic Valuation Report, 2006).	DEA to carry out a study to determine the non-use values of the Okavango Delta Ramsar site (ODRS). The wise use scenario to be adopted for future economic development in the ODRS
2	Dialogue, communication and networking	The need for an appropriate communication programme where key stakeholders including those that represent the upstream interests in the river basin, will share the knowledge about the functioning of the Okavango ecosystem and its importance for the different resource users	Develop communications strategy in order to ensure shared knowledge about ecosystem functioning and importance; and mutual understanding strategic choices for conservation and sustainable use	A communication strategy has been developed (ODMP – Communication Strategy, 2006).	The communication strategy to be used to guide the communication programme

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
3	Research, data management and participatory planning	Information on the Delta is scattered, formats are not standardized and many data are not easily accessible.	Development of a comprehensive and user friendly data and information management system for development and implementation of ODMP.	The Okavango Delta Information system (ODIS) was developed and is operational (ODMP – Data Management Report, 2006, ODMP – ODIS Technical Report, ODMP – ODIS Evaluation Report)	The database should be updated regularly through periodic data input from the users. There is need to have data quality controls in place. Most of the existing data have a lot of quality issues. ODIS training or refresher sessions need to be a carried out continually to encourage/motivate the users to use the application effectively. The ODIS accessibility to be improved through internet access
			Improvement of a library service	Books, publications and literature on the Okavango Delta Ramsar Site were acquired. The HOORC library was upgraded to accommodate these additional materials on the Okavango Delta Ramsar Site. Additional library staff was recruited by the University of Botswana.	HOORC library should be a repository for all documents on the Okavango Delta
		In addition, uncoordinated research activities and limited use of indigenous data for planning will lead to research results that are unsystematic and less useful for planning.	Development of the ODRS research strategy	A research strategy detailing with the research gaps and priority areas for research was developed. (ODMP – Research Strategy, 2006)	Development of an action plan to operationalise the research strategy Establishment of an ODRS Research Advisory Group Undertake research in priority areas.
		Limited participation of local communities in the planning and implementation of rural development interventions leaves room for improvement and would require specific attention in a project of such magnitude as the ODMP.	Engagement of stakeholders through participatory process	Series of kgotla meetings and workshops were held to engage communities and the private sector as well as district and national authorities (ODMP – Proceedings of the Kgotla Meetings, 2004, ODMP – Community Consultation and Feedback Report, 2004, Proceedings of the Shakawe Workshop, 2005, Proceedings of the Gumare Workshop, ODMP – Proceedings of the Inception Workshop, 2004, Proceedings of the Framework Workshop, 2005, Proceedings of the Draft Management Plan Workshop, 2006)).	Participatory process should be continued during the implementation of the plan and HOORC to provide the services at a cost recovery on a need basis.
4	Hydrology & water resources	Limited understanding of current hydrological and future impacts of hydrological changes	Develop hydrological model.	An integrated hydrological model has been developed and was used to analyse water resources scenarios (ODMP – Integrated Hydrological Model, 2006, ODMP – Analysis of Water Resources Scenarios, 2006)	The impacts of water development on the Delta should be communicated to concerned parties from local communities through government organizations to OKACOM representatives in order to jointly come up measures to mitigate adverse impacts.

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
			Improve hydrological monitoring	In total, four climate stations have been proposed in addition to the three presently operated by the Department of Meteorological Services (DMS), 13 automatic rain gauges and 26 automatic water level stations. 24 groundwater (ODMP – Recommendations for Improved Hydrologic Monitoring, 2004)	At least monthly discharge is recommended at all discharge stations in the Delta but the seasonal flow shall be monitored with a higher intensity in flood periods. The daily discharge measurements at Mohembo should be carried out every second day using the cableway All measured and recorded data in hardcopy (cross section, velocity, etc) shall be entered in a database. Quality checks on the raw data be done in Maun, and prompt remedial action as required
			Improve water quality monitoring	The requirement for improvement of the water quality monitoring has been undertaken and recommendations are being implemented (ODMP – Recommendations for Improved Hydrologic Monitoring, 2004, ODMP – Analysis of Water Resources Scenarios, 2006).	A fairly simple water quality monitoring programme should fit into the hydro-climatic monitoring Water quality sampling should carried out at Mohembo, at the Boro River (Junction) near Maun and Khwai River at North Gate with a frequency of twice a month for analysis of basic parameters, anions/ cations and nutrients In-situ measurements of conductivity, pH and temperature at all stations where discharge is measured on a regular basis. The DWA has rationalised its staff to undertake water quality monitoring.
			Control of invasive aquatic weeds	The programme is ongoing. How much has been removed and the area covered.	
			Understand nature and effects of channel blockages	Channel clearing in the Delta were simulated with the integrated Delta model (ODMP – Analysis of Water Resources Scenario, 2006). The main impact of clearing blockages is the increase of the flow through the channels, thus reducing the water level in the channel and surrounding swamp area upstream, and increasing the water level downstream. Nqoga-Maunachira-Khwai-Santantadibe subsystem water balance showed the increased outflows from the Delta. from 70Mm^3/annum under Baseline conditions, to 150Mm^3/annum with the blockages cleared.	An appropriate approach to a finer resolution of the grid is to set up a model of an area of particular interest within the Delta. The present Delta model would provide the boundary conditions at the perimeter of the “nested” model. This will be carried out for the Maunachira-Mboroga system to study in particular the clearance of channel blockages.

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
5	Wildlife management	Unsustainable management of the wildlife populations in relation to the well-being of communities and interactions with the livestock sector and tourism industry:	Conduct baseline surveys of the buffalos	Baseline survey of buffalos was undertaken (ODMP – The Numbers and Distribution of the African Buffalo in the Okavango Delta, 2004). A total of 14 575 animals (minimum) were counted during the survey. The estimate based on a 20% correction of the observed total was 17 430 animals.	A helicopter should be used for photography as it provides stable platform for this purpose. In addition, observers are also afforded a much better opportunity to give more accurate estimates. A dry season count when buffalo are confined to a smaller area due to the restricted water availability would be more preferable in future.
			Conduct baseline survey of the Cheetah and Leopard	Baseline survey was conducted (ODMP - Leopard and cheetah baseline inventory in the Okavango Delta particularly in relation to areas of Human Wildlife Conflict, 2006) Leopard density was highest in the Moremi sampling area with an estimate of 3.2 individuals/100km2. The Kwando area had less than half this density with only 1.5 individuals/100km This equates to a density of approximately 1.3 leopards per 100/km2. The cheetah population for the Ramsar Site is estimated at 247 individuals (208 excluding swamp areas) representing 9% of the total estimated National population. Cheetah density for the Ramsar site is estimated at 0.7 cheetah per 100/km2.	It is recommended that the ODMP integrate cheetah and leopard population monitoring activities into a larger Predator Monitoring Framework. Leopard and cheetah population surveys should be conducted twice annually to identify seasonal variation. Area surveyed and transect lengths should not be overwhelming but of a size which will facilitate completion twice a year realistically identifying the multitude of responsibilities that DWNP officers have. Consistent long-term data sets are more valuable than once off mass data collection exercises.
			Conduct baseline survey of slaty egret	The survey has been completed (ODMP - Baseline Survey, 2006).	Existing and potential breeding sites should be protected. Further research is needed to locate all nesting sites, and then these sites should be protected against factors that impact on them *i.e.* fire, reed-cutting and human disturbance. It is crucial to maintain the seasonal floodplains that form the Slaty Egrets' major feeding habitat.
			Conduct baseline survey of African skimmer, Sitatunga	The survey had to be deferred due to lack of funds	
			Human-elephant interactions	The study is still ongoing	

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
			Predators-livestock interactions	The baseline study on cheetah and leopard predation has been completed (ODMP – Leopard and cheetah baseline inventory in the Okavango Delta particularly in relation to areas of Human Wildlife Conflict, 2006). Leopard and cheetah conflict with community occurs, as in other localities, predominately along the interface between wildlife habitat and communal land areas. Number of livestock deaths due to leopard and cheetah predation was statistically insignificant in terms of total herd size for Ngamiland District. However, households experience conflict from a wide spectrum of wildlife species such that the household impact of conflict is cumulative and compounded The compensation rates were comparable with prices of donkeys and were well under selling parity prices for calves, cows and goats.	Management effort should be directed at participatory development of conflict mitigation policy and strategy and the strengthening of resource value and ownership at the community level. DWNP Research portfolio should be focused on strengthening monitoring activities and focusing the research agenda to outcomes based approach in predator management.
6	Sustainable tourism and CBNRM	To create enabling environment for conservation, sustainable utilization and management:	Assess carrying capacity and limits of acceptable change for tourism business	Study ongoing and due for completion in March 2007	
			Diversify tourism and CBNRM	Study ongoing and due for completion in March 2007	
			Citizen engagement	Study ongoing and due for completion in March 2007	
			District tourism development plan	Study ongoing and due for completion in March 2007	
			Tourism monitoring and information system	Study ongoing and due for completion in March 2007	
7	Sustainable fisheries tilization & management	Ensure sustainable use of OD's fish resources:	Revise and implement draft fisheries regulations.	The regulations have been revised and stakeholder consultations have been completed.	
			Undertake fish stock assessment and fish frame survey	Fish stock assessment is still underway as well as analysis of fish frame survey.	
			Improve stakeholder participation conflict resolution through the Okavango Fisherman Management Committee.	The revival of the Okavango Fishermen Management Committee is awaiting the results of the fish stock assessment and fish frame survey.	

No.	Management Area	Key issues	Key Activities	Status and documentation	Recommendations
8	Vegetation resources management	Ensure sustainable management of vegetation resources and resolution of conflicts:	Undertake biomass assessment	The bio-mass assessment has been undertaken, the report is still being compiled	
			Undertake a vegetation profiling survey	The vegetation profiling survey has been undertaken and the report is still being compiled	
			Undertake baseline survey of rare and endangered plant species	The study has been completed and an action plan developed for the protection of the species (ODMP – Assessment of occurrence and distribution of threatened and endangered plant species in the Okavango Delta Ramsar Site, 2006)	Implementation of the Action Plan to conserve the species has been recommended.
			Undertake baseline survey of alien and invasive plant species	Study to be undertaken.	
			Develop a vegetation management plan	To be consolidated after completion of bio-mass assessment, vegetation profiling and study on alien and invasive plant species.	
			Develop a fire management plan	The plan has been drawn	
9	Settlement development planning	Settlement development plan for the village of Shakawe, as pilot for other settlement and infrastructure plans across the unique environment of the Delta.	Prepare Shakawe settlement plan		
10	Sustainable land-use	Lack of an integrated land use plan	Develop an integrated land use management plan of the entire Ramsar site.	The plan has been drawn and is awaiting input from the Tourism component (ODMP – Land Use and Land Management Plan, 2005).	
11	Waste management	Develop a solid and liquid waste management system for the OD Ramsar Site.	Develop a waste management strategy for the district.		
12	Sustainable livestock management	Ensure sustainable management of livestock and the concomitant conservation of wildlife:	Mount public education on disease control strategies Assess the buffalo fence maintenance programme Assess feasibility of providing livestock watering points away from Delta to reduce livestock wildlife interactions.		

3.7.2 MANAGEMENT INTERVENTIONS DURING THE IMPLEMENTATION OF THE PLAN

3.7.2.1 Criteria for prioritising management interventions

A prioritisation exercise was done during the Framework Management Planning Phase to select a maximum of three key issues per sector. Operational objectives to address these key issues are translated further into activities which constitute the ODMP action plan.

The prioritization criteria used were based on elements which relate to the survival of the Okavango Delta and the information required for management of the Delta respectively (ODMP – Framework Plan Backstopping Mission Report, 2005).

Survival of the Delta
The issues under this criterion are critical to the maintenance of the ecosystem, for example, determination of carrying capacities for both range and tourism, reduction of certain animal species, human-wildlfie conflicts, eutrophication and reduction in inflows due to potential abstructions and daming upstream.

Information required for ODRS management decisions
There is evidence of baseline information gaps which should inform management decisions. The deficiencies in information include lack of reliable data, insight into the functioning of the Delta's ecosystem and its interaction with human wellbeing. Table 3.2 presents the selected priority issues and the interventions that will be undertaken during the implementation of the plan

Table 3-2: Priority issues to be addressed during the implementation of the plan

No.	Component	Key issues
1	Policy, planning and strategy	1.1 There is need to establish a DEA office in Ngamiland and strengthen its capacity to coordinate and monitor the implementation of the ODMP.
		1.2 There is need to harmonize legislation and policies applicable to the ODRS.
		1.3 There is need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.
		1.4 There is need to facilitate the approval of Draft National Wetlands Policy and Strategy by Parliament.
		1.5 There is need to establish the non-use economic values for the ODRS
2	Dialogue, communication and networking	2.1 There is need to establish effective communication amongst stakeholders at all levels.
		2.2 Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process
3	Research, data management and participatory planning	3.1 Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS need to be addressed.
		3.2 Uncertainties about stakeholders continuing to meaningfully participate in the implementation of the ODMP need to be addressed.
		3.3 Research in the ODRS needs to be coordinated.
4	Hydrology & water resources	4.1 The need to manage channel blockages to sustain communities access to livelihood activities
		4.2 Water quality and sedimentation monitoring needs to be improved
		4.3 There is need to continue to engage Namibia and Angola in the sustainable use of the Okavango River Basin.
5	Wildlife management	5.1 The human/wildlife conflicts continue to be a problem and need to be addressed.
		5.2 There is need to carry out baseline surveys on keystone species.
		5.3 The limited awareness of the ecological impacts of tourism activities in the ODRS need to be addressed.
		5.4 Lake Ngami needs to be declared a bird sanctuary
		5.5 The existing and potential breeding sites for slate egret need to be protected.
6	Sustainable tourism and CBNRM	6.1 There is need to address the possible impacts of tourism activities on the ODRS ecosystem.
		6.2 The level of citizen participation in the tourism sector needs to be improved.
		6.3 The tourism products need to be diversified from being wildlife based to other areas.
		6.4 There is need to build the capacity of communities for delivering management and sustainable use of natural resources
No.	Component	Key issues
7	Sustainable fisheries utilization & management	7.1 Manpower capacity of the fisheries division needs to be addressed
		7.2 The inadequacy of base line data on fish stocks in the ODRS needs to be addressed.
		7.3 The long standing problem of fisheries conflicts need to be resolved.
8	Vegetation resources management	8.1 There is need to reduce the impact and frequency of uncontrolled veld fires.
		8.2 Vegetation degradation by wildlife needs to be assessed
		8.3 Overgrazing by livestock needs to be addressed
		8.4 Sustainable use of veld products need to be addressed
9	Settlement development planning	9.1 Capacity to monitor infrastructural developments needs to be improved.
10	Sustainable land-use	10.1 Haphazard and delays in land allocations as well as poor record keeping need to be reduced.
		10.2 Traditional access rights to natural resources in concession areas need to be upheld.
		10.3 The level of inspections to ensure adherence to lease conditions need to be improved
11	Waste management	11.1 The solid waste collection services within the ODRS need to be improved.
		11.2 The solid and liquid waste infrastructure in the district needs to be improved.
		11.3 The institutional capacity of the district waste management needs to be improved
12	Livestock Management	12.1 The livestock/wildlife interactions need to be reduced.
		12.2The risk of Tsetse re-infestation needs to be reduced.

3.7.2.2 Development of thematic areas for integrated management planning

In order to move away from sectoral planning to integrated management planning, the analysis in this section demonstrates the inherent need for inter-sectoral interventions to address the priority issues during the Plan implementation.

To facilitate this process, a further analysis was carried out on the issues with regards to the type of management interventions required. The analysis revealed that the issues fell into three broad areas. These areas were management, natural resources base and natural resources use and these required institutional, bio-physical and socio-economic approaches in their intervention respectively. For

expediency in planning, it is worth noting that the three agreed thematic areas are not distinct but rather they overlap.

The management interventions were clustered into three thematic areas and seven sub-thematic areas in order to ensure a collaborative approach and integrated management planning. The process of clustering is described in the ODMP – Framework Plan Backstopping Mission Report (2005). The clustering is given in Table 3-3.

Table 3-3: Clustering of issues for integrated management planning purpose

Thematic Areas	Sub-thematic area	Key issues
Institutional	Institutional strengthening	1.1 There is need to establish a regional DEA office in Ngamiland and strengthen its capacity to coordinate and monitor the implementation of the ODMP.
		6.4 There is need to build the capacity of communities for delivering management and sustainable use of natural resources
		7.1 Manpower capacity of the fisheries division needs to be addressed
		9.1 Capacity to monitor infrastructural developments needs to be improved.
		11.1 The solid waste collection services within the ODRS need to be improved.
		11.2 The solid and liquid waste infrastructure in the district needs to be improved.
		11.3 The institutional capacity of the district waste management needs to be improved
	Regulatory and planning framework	1.2 There is need to harmonise legislation and policies applicable to the ODRS.
		1.3 There is need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.
		1.4 There is need to facilitate the approval of Draft National Wetlands Policy and Strategy not by Parliament.
		3.1 Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS need to be addressed.
	Regulatory and planning framework	3.3 Research in the ODRS needs to be coordinated.
		7.3 The long standing problem of fisheries conflicts need to be resolved.
		10.1 Haphazard and delays in land allocations as well as poor record keeping need to be reduced.
	Communication, Education and Public Awaress	2.1 There is need to establish effective communication amongst ODMP stakeholders at all levels during plan implementation.
		3.2 Uncertainties about stakeholders continuing to meaningfully participate in the implementation of the ODMP need to be addressed.
		4.3 There is need to continue to engage Namibia and Angola in the sustainable use of the Okavango River Basin.
		5.3 The limited awareness of the ecological impacts of tourism activities in the ODRS need to be addressed.
Bio - Physical	Natural Resources Conservation	4.2 Water quality and sedimentation monitoring needs to be improved
		5.2 There is need to carry out baseline surveys on keystone species.
		5.4 Lake Ngami needs to be declared a bird sanctuary
		5.5he existing and potential breeding sites for slate egret need to be protected.
		7.2 The inadequacy of base line data on fish stocks in the ODRS needs to be addressed.
	Restoration of ecosystem	8.1 There is need to reduce the impact and frequency of uncontrolled veld fires.
		8.2 Vegetation degradation by wildlife needs to be assessed
		8.3 Overgrazing by livestock needs to be addressed
		12.3 The risk of Tsetse re-infestation needs to be reduced.
Socio-economic	Sustainable Use of Natural Resources	1.5 There is need to establish the non-use economic values for the ODRS
		6.1 There is need to address the possible impacts of tourism activities on the ODRS ecosystem.
		7.3 The long standing problem of fisheries conflicts need to be resolved.
		8.4 Sustainable use of veld products need to be addressed
	Livelihoods Improvement	2.2 Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process
		4.1 The need to manage channel blockages to sustain communities access to livelihood activities
		5.1 The human/wildlife conflicts continue to be a problem and need to be addressed.
		6.2 The level of citizen participation in the tourism sector needs to be improved.
		6.3 The tourism products need to be diversified from being wildlife based to other areas.
		10.2 Traditional access rights to natural resources in concession areas need to be upheld.
		12.2 The livestock/wildlife interactions need to be reduced.

3.7.2.3 Proposed criteria for future priority setting

One of the guiding principles of the ODMP is that the plan should be dynamic and adaptive to address emerging issues during implementation or recommendations from studies undertaken during its development phase. In order to guide future priority setting of issues, the recommended criteria, in order of importance is given in Table 3-4.

Table 3-4: Criteria for future priority setting

Priority	Criteria	Notes
I	Survival of the Delta with collaborative (inter-sectoral) approach	This relates to an issue critical to the survival of the Delta being addressed by more than one sector.
II	Livelihoods improvement with collaborative approach	This relates to issues targeting economic upliftment of people in the Delta
III	Survival of the Delta with sectoral approach	Issue critical to the health of the Delta addressed by one secto.r
IV	Livelihoods improvement with sectoral approach	Generation of immediate benefits to the targeted groups in the Delta
V	Improvement of knowledge through inter-disciplinary approach	Encourages learning and broadens planning capacity across disciplines
VI	Sectoral improvement of knowledge	Improved efficiency on targeted sectoral programmes

3.7.2.4 Proposed tool for evaluating and ranking land use optins/activities

The current land use activites and options in the delta have hitherto been largely compatible with the principles of wise-use and sustainability. It is recognised however that the situation may change in the future. In order to make optimum use of the Okavango Delta and its resources there is a need to develop a mechanism to evaluate and rank these activities in a more transparent and objective manner. Table 3-5 presents a matrix to evaluate and rank future activites that should take place in the ODRS. This provides a way of analysing the impact of a particular programme/land use activitiy on the environment, social issues and economic returns of such an activity. This tool should be used in conjunction with the criteria outlined in section 3.7.2.3 above.

Table 3-5: Matrix for evaluating and ranking land use options/activities in the future

LAND USE ACTIVITY/OPTION	SCALE OF USE/ OPERATION	SUSTAINABILITY CRITERIA – ENVIRONMENTAL IMPACT	WEIGHTED SCORE	SOCIAL BENEFITS	ECONOMIC BENEFITS	AGGREGATE SCORE
FISHING	Subsistance					
	Commercial					
	Recreational/ sport					
IRRIGATION	Small scale					
	Large scale					
ARABLE FARMING	Subsistance					
	Commercial					
MOLAPO FARMING						
VELDT PRODUCT HARVESTING	Subsistance					
	Commercial					
LIVESTOCK FARMING	Subsistance					
	Commercial					
GAME RESERVES/WILDLIFE MANAGEMENT AREAS						
WATER DEVELOPMENT PROJECTS	Hydropower					
	Large scale abstraction					
	Large scale obstruction					
TOURISM	Low volume					
	High volume					
HUNTING	Safari					
	Subsistance					

The key that should be used is as follows:

Environmental sustainability

1 = Low negative impact on the sustainability of the Delta in the medium to long term (negligible)

2 = Moderate negative impact on the sustainability of the Delta in the medium to long term (Low mitigation measures)

3 = High negative impact on the sustainability in the medium to long term (intense mitigation would be reqired)

4 = Severe negative impact on the sustainability of the Delta in the medium to long term (irreversible damage)

Social Benefits

It is important when using this criterion to define what is meant by social benefits (e.g distribution, equity and access to benefits, etc.)

1 = High social benefits

2 = Moderate social benefits
3 = Low social benefits

Economic and financial returns

1 = High economic/financial returns
2 = Moderate economic returns
3 = Low economic returns

Projects which score higher should be discouraged and it is also recommended that the three criterion be weighted to enhance decision making process. Projects which would contribute to the maintenance of the wetland ecosystem should carry a higher weight.

3.7.2.5 Demonstrations/Pilot activities

The hotspots approach is a method used to identify ideas which canbe tested in pilot projects that address some of the key issues. The approach in this respect took into consideration the following key elements: devolvement of management responsibilities to communities, capacity building, enhanced level of understanding of the ecosystem dynamics, potential for sustainability, enhanced livelihood status, potential for resolving conflicts, opportunities for learning and replication. Table 3-6 and Figure 3-1 describe and illustrate the ten chosen interventions and their locations respectively.

Table 3-6: Pilot projects to test management options

Theme	Key Issues	Proposed Pilot Sites
Improved Fisheries Management	Conflict emanating from uncoordinated use of common fishing grounds by both commercial and angling lodges as well as the perceptions on the status of the Okavango fish stocks. An improved fisheries management system will be developed and tested which will include conflict resolution and monitoring of fish stocks.	Panhandle up to Samochima
Veld Resources Management	Veld product harvesting for both commercial and subsistence use in concession and communal areas is highly unregulated and as a result creates conflict among users. The conflict leads to over-harvesting of resources and hence impacts negatively on biodiversity.	1. Tubu/area NG 25 2. Shorobe/area NG 32
Riparian Woodland Monitoring (Intervention by OWBC project	There is a concern that riparian woodlands are being affected by anthropogenic factors, herbivory and other natural processes such as climate change. A pilot project to establish baseline, monitoring indices and carry out monitoring of riparian woodlands (recruitment rates, structure, composition, crown cover, etc.) will be developed to address this concern. Monitoring is to be carried out by the tourism establishments and local communities.	1. along the Boro River 2. Chitabe/Santawane area (Gomoti/Santantadibe channels)
Monitoring of the tourism impacts	The Governement of Botswana (through the ODMP) will provide funds to develop a comprehensive District Tourism Strategy that encompasses tourism guidelines, and Limits to Acceptable Change (LAC) criteria. GEF funded BIOKAVANGO project will complement the tourism private sector and GOB resources to strengthen capacity of the tour operators to incorporate biodiversity considerations in systematic monitoring of impacts and adapt management practices at the CHA and district level. This will include identification of biodiversity indices and training of tour operator personnel in monitoring. In community concession areas monitoring is already being carried by DWNP through Management Oriented Monitoring Systems (MOMS) which are being piloted in community managed CHAs.	Sites to be agreed upon with the tourism operations

Theme	Key Issues	Proposed Pilot Sites
Solid and liquid waste	Solid and liquid waste management systems in tourism facilities and villages in and around the Delta are of concern. Some tourism establishments are deep in the Delta and the terrain and structure makes it difficult to access waste collection facilities. The waste management costs are therefore high and in some cases discourage waste management efforts of such establishments. Waste collection services are not widely provided to all settlements especially the un-gazetted ones. a) A sewage effluent polishing system which utilises locally available wetland resources will be designed and tested in some tourism establishments. This system should be ecologically sound, affordable and easy to implement in tourism facilities. b) A pilot project surrounding solid waste management in one or more ungazetted settlements in the eastern panhandle.	Okavango Polers Trust – Seronga and Thuso Rehabilitation Centre. Eastern Panhandle
Manual Control of Salvinia molesta	People have observed that the biological control alone is not effective and suggested a combination of physical and biological control. Manual control of Salvinia *molesta* could improve access to wetlands goods and services thereby increasing income generation opportunities for local communities to alleviate poverty.	South Eastern Delta
Clearing of small access channels	There is a growing concern from local resource users that access channels are being blocked. A pilot project to unblock small access channels to certain areas or resources that communities are dependent on will be developed. This intervention would enhance livelihoods opportunities in several sectors such as fishing, veld products harvesting, tourism (poling), etc. This project will bring together different sectors (water, vegetation, tourism, etc) and therefore addresses the integration aspect which is one of the key principles of the project. This intervention will improve accessibility for the collection of raw material of craft production mainly used by women	Western Delta fringes
Active Use and Management of Fire by Resource users	According to the Herbage Preservation Act, it is illegal and punishable by law to set the veld on fire on land that one does not have legal rights over. However local resource users (communities and tourism operators) see and use fire as a traditional management tool and this leads to uncontrolled burning in terms of area affected and timing. Many different sectors have expressed an interest in the use of fire to manage resources, e.g. fishermen, photographic and hunting tourism, reed harvesters, etc. In a pilot project responsibility could be given to communities and safari operators to manage fire and monitor its impact. The multi-sectoral approach will be applied as a resource management strategy.	NG 11 - The Tovera area is unique in that it is affected by cross-border fires from Namibia and the communities in this area use it for harvesting thatching grass Alternative - Concession area in the Delta.
Human/Elephant Conflict	The increasing human-elephant interaction is one of the key issues raised by local communities throughout the consultative process. Novel ways to reduce human-elephant conflict are being tried elsewhere (Caprivi Strip) but such interventions should be tried specifically in the Ngamiland context. Local knowledge should be used to identify various factors influencing elephant migration and map migration routes to guide land allocation processes and inform alignment of fences and other regional planning decisions in a way that reduces incidents of human/elephant conflict.	Eastern Panhandle
Tourism and CBNRM	Tourism and CBNRM was considered to be another area which requires intervention by a pilot project. The current eco-tourism activities within the Ramsar Site are predominantly wildlife based. The communities have expressed the need to venture into tourism while on the other hand there are concerns that wildlife tourism might be over subscribed. It is from the foregoing that Department of Tourism is encouraging the diversification of the tourism product into other areas such as cultural tourism.	1. Tsodilo 2. Eastern Panhandle

The project could only fund three pilot projects. The lessons drawn from these projects will guide future management options. The projects are:

- Tsodilo community cultural tourism,

- clearing of small access channels to improve livelihoods within the zone NG24 for Jakotsha Community Trust and
- liquid waste vegetation based polishing system at Thuso Lutheran Rehabilation Centre in Maun.

The mobilisation and full implantation of the three projects was concluded in December 2006. Positive results are being obtained from the implementation of these projects. The projects are intended to be sustainable in the long-term.

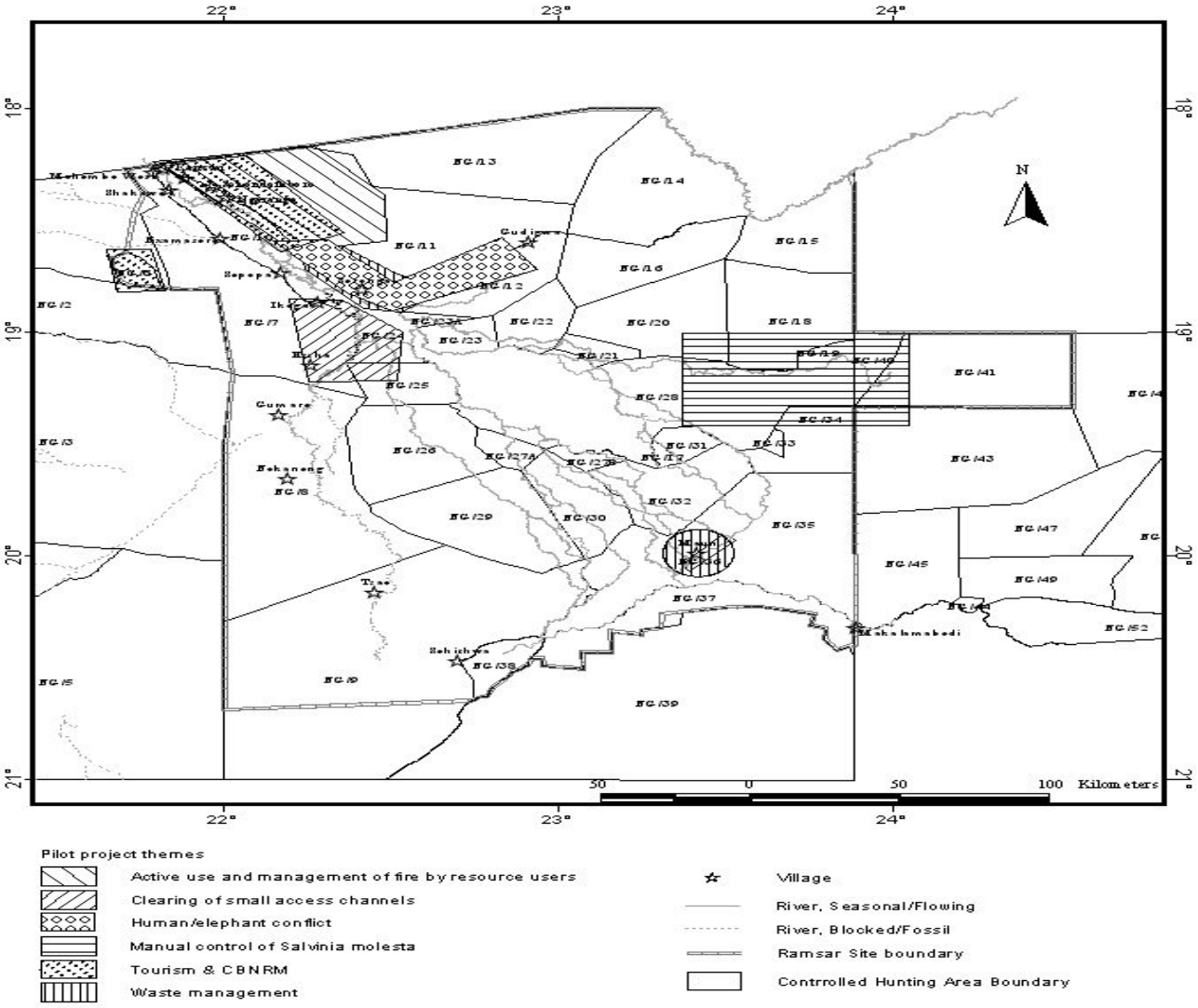

Figure 3-1: Map of Pilot Projects/Demonstration Sites in the ODRS

4 GOALS, OBJECTIVES AND ACTION PLANS

The process of developing objectives has involved identifying the long-term objectives or principal/ideal objectives, which for purpose of alignment with Botswana government planning guidelines and nomenclature have been called strategic goals. The development of these goals is based on the evaluation of the status of the ecosystem resources as described in Chapter 3.

The strategic goals represent what needs to be achieved and set a broad, balanced framework from which to design and develop strategic and operational objectives as well as management action plans. This presents a hierarchy in descending order through which the evaluation process and emerging issues can now be addressed. This process will lead to specific and distinct management interventions directed at addressing identified hotspots or management issues, both in the immediate future and the long term.

The attainment of these goals requires close partnership and collaboration between all stakeholders, enhanced awareness of the long-term benefits, supporting legislation and an enforcement framework as well as a strengthened institutional base.

The strategic goals are supported by strategic objectives. The potential to achieve these objectives is weighed against a set of constraints or limitations. These limitations do not change the objectives but they do change the way in which they are achieved and this is defined by operational objectives. These operational objectives form the basis for individual management activities.

4.1 DEVELOPMENT OF STRATEGIC GOALS

The ODMP sets out to practically demonstrate the application of the ecosystem approach in wetland management. The principles of this approach are in agreement with the national wetlands management framework as contained in the Draft National Wetland Policy and Strategy.

Under the ecosystem approach, the Okavango Delta Ramsar Site is treated as an ecosystem comprising three subsystems, the *institutional, bio-physical* and *socio-economic* subsystems. These are depicted as an overlap of three circles where each circle represents one of the three subsystems (Figure 4-1). It illustrates not only the interdependence of these subsystems as shown by the overlapping parts, it also underlines the fact that ecosystem management is not about the natural system alone, but about the entire complex of nature, people and their management systems.

The institutional subsystem describes the institutions and the management tools (e.g. legislative instruments), employed at the different levels (from the local level up to the international level).

The bio-physical subsystem is composed of the abiotic and biotic components and their interactions that constitute what often is referred to as the natural system.

The socio-economic subsystem includes the different uses that man makes of the components of the bio-physical subsystem. These are often referred to as the ecosystem products and services, which man is dependant upon.

The overall goal of the ODMP sets the basis for integrated management planning within which the three subsystems are subsumed.

The overall goal of the management plan of the Okavango Delta Ramsar Site is "*to integrate resource management for the Okavango Delta that will ensure its long-term conservation and that will provide benefits for the present and future well being of the people, through sustainable use of its natural resources".*

The following strategic goals have been developed for each subsystem:

The strategic goal for the institutional subsystem is *"to establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels".*

The strategic goal for the bio-physical subsystem is "*to ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it".*

The strategic goal for the socio-economic subsystem is "*to sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders".*

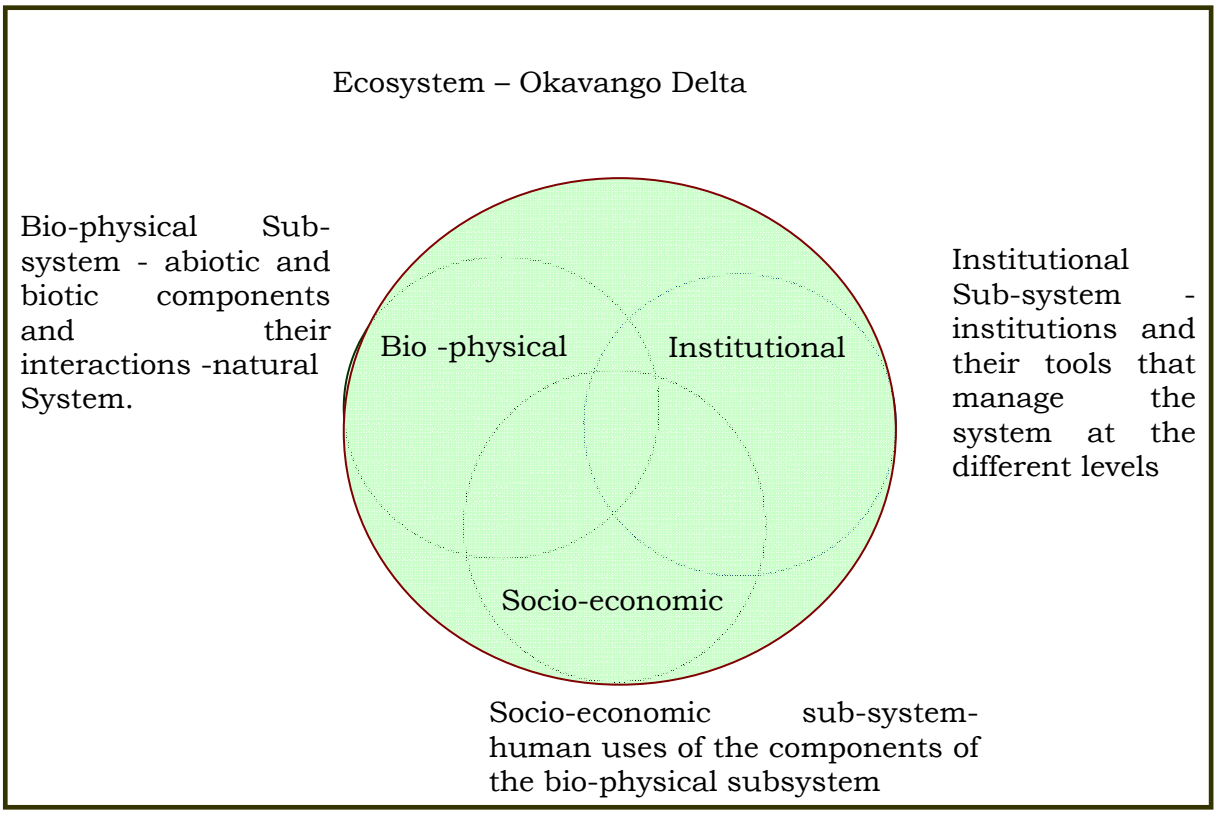

Figure 4-1: Ecosystem subsystems

4.2 DEVELOPMENT OF STRATEGIC OBJECTIVES

Strategic objectives provide a framework for achieving strategic goals and at the same time integrating sectoral operational objectives. Their development involves a

process of analysing the strategic goals to determine how they can be attained and at another level how sectoral operational objectives can be packaged to reach the strategic objectives. The strategic objectives for the three subsystems are presented below.

4.2.1 STRATEGIC OBJECTIVES FOR THE INSTITUTIONAL SUBSYSTEM

The strategic goal for institutional subsystem has three elements; the management infrastructure (institutions, related manpower and financial resources), management tools (policies, laws, regulations) and communication.

Strategic Goal:

- To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels.

Strategic Objectives:

- To establish viable management institutions for the sustainable management of the Okavango Delta.
- To improve the planning and regulatory framework for sustainable management of the Okavango Delta.
- To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.

4.2.2 STRATEGIC OBJECTIVES FOR THE BIO-PHYSICAL SUBSYSTEM

The strategic goal for the subsystem has elements of maintenance and conservation of biodiversity, monitoring of biodiversity as well as restoration and rehabilitation of wetland habitat and ecosystem that characterize the Okavango Delta.

Strategic Goal:

- To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all organisms dependent on it".

Strategic Objectives

- To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them.
- To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.

4.2.3 STRATEGIC OBJECTIVES FOR THE SOCIO-ECONOMIC SUBSYSTEM

The strategic goal for this subsystem relates to the sustainable use of the Delta resources as well as derivation of benefits from the use of the resources and these are given in table

Strategic Goal

- To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.

Strategic Objectives

- To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders.
- to develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.

4.3 STRENGTHS-WEAKNESSES-OPPORTUNITIES-THREATS (SWOT) ANALYSIS

The SWOT analysis involves close examination of factors that are likely to constrain or limit achievement of the strategic objectives through a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. SWOT is a simple framework for generating realistic and achievable sets of operational objectives and associated management actions from a situational analysis. This approach to evaluation focuses on internal and external environments.

The internal analysis is a comprehensive evaluation of the internal environment's potential strengths and weakness, whilst external evaluation provides the external environment opportunities and threats.

When developing the operational objectives and the associated actions, the interaction between the four columns of the SWOT profile become important. The strengths can be leveraged to pursue opportunities and reduce threats, and at the same time planners and managers can be alerted to the weaknesses that may need to be overcome in order to successfully pursue the opportunities.

The weaknesses in general form the basis for the development of operational objectives and actions using the available strengths and opportunities. The threats become the risks or assumptions.

4.3.1 INSTITUTIONAL SWOT ANALYSIS

The SWOT analysis is given in Figure 4-1. The environmental profiling for the institutional subsystem indicates that institutions with clear mandates are in place. These institutions enjoy government support and some, such as government departments and certain NGOs, have a relatively good financial base and access to external funding. The major threat to the institutional strengthening is the zero growth moratorium, which government has put on the public sector and competing needs for financial support such as HIV and AIDS. However, with the advent of privatisation policy, strong private sector, NGOs and Community Based Orga nisations (CBOs), the manpower capacity could be augmented by taking advantage of these opportunities and strengths.

Botswana being a stable country with a record of good governance and prudent fiscal management as well as high credit rating, can benefit from opportunities for external funding. These opportunities are to a large extent negated by the middle income status of Botswana accorded by the international community.

Table 4-1: Institutional Subsystem SWOT Analysis

Strategic Goal: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels.			
Strategic Objective 1.1: To establish viable management institutions for the sustainable management of the Okavango Delta			
Strengths	Weaknesses	Opportunities	Threats
Well established institutions (govt., NGO, CBO, private)	Manpower capacity limitation	Political support	Zero growth moratorium
Clear mandates	Poor institutional collaboration and communication as well as uncoordinated planning	Good governance	Staff turnover due to transfers and resignation, furthering education
Good financial support for govt. institutions	Inadequate financial resources	Access to external funding	Financial ceilings and competing needs for funds
Organized community governance structures (Village Development Committees (VDC), Bogosi (chieftainship), Councillors, etc)	Conflicts amongst and within community structures such as CBOs and VDCs	Structured national and district planning framework	
High level of interest from institutions (private sector, communities, etc.)	Conflict amongst institutions and stakeholders emanating from resource utilization and management	Regional governance structures in place (OKACOM)	Limited external supp ort due to Botswana's development status as middle income
	Inadequate transport	Collaboration with other initiatives	
		Strong private sector base	
		Possibility of outsourcing through private policy	
Strategic Obective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta			
Strengths	Weaknesses	Opportunities	Threats
Good coverage of laws, policies, plans and strategies	Gaps, conflicts in regulatory framework	Support from the international community by being signatory to several conventions	Willingness by govt. to harmonize regulatory framework
Legislative and policy formulation participatory	Long lead time for policy formulation and enactment	SEA is provided for in the EIA Act	Limited manpower capacity to undertake SEA
Capacity to formulate policies and acts	Unclear institutional roles in enforcement	Democratically elected legislative body	Provisions of certain conventions not in line with the country's development objectives (e.g. "elephant problem")
	Inadequacy of legislative framework in punitive measures	Independent judicial system	Regional disharmony of regulatory framework
	Legislative framework not subjected to SEA	National vision as a blue print for sustainable development	Uncertainty of the future of OKACOM.
	Manpower and financial constraints to implement and monitor legislative instruments		

Strategic Object 1.3: To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.			
Strengths	Weaknesses	Opportunities	Threats
Access to public/private media	Limited coverage by radio, electronic and print media	Presence of Public Relations officers in government departments	Mistrust
Some level of outreach programmes in place	Inadequate coverage of communications infrastructure	Presence of NGOs and CBOs to facilitate communication	Low literacy level
ODMP Communication strategy in place	Limitation of certain communication tools (e.g kgotla)	High national and international profile of the Okavango Delta	HIV and AIDS
Funds available to support implementation of the communication strategy for two years.	Accessibility to certain parts of the area	Trans-boundary river basin forms the basis for engaging with other riparian states	Sustainability of funds for communication
	Inadequate skilled communication personnel		Lack of buy-in of the communication strategy by riparian states

A major strength with the regulatory framework is that there is a good coverage of legislative instruments such as multi-lateral environmental agreements, acts, policies, plans and strategies. The major weakness is that some of these have gaps in terms of addressing environmental issues, whilst others are conflicting as well as limited enforcement. The greatest challenge is that of getting commitment from government institutions to harmonise these legislative instruments.

In terms of raising public awareness on the importance of wise use of the Okavango Delta ecosystem, some institutions have outreach programmes and in addition a two year fully funded communication strategy is in place. There are opportunities for collaboration with other riparian states through the OKACOM process. Though the OKACOM agreement is in place, the challenge is the buy-in of the riparian states as well as uncertainties about of OKACOM. Another challenge is the sustainability of the continued engagement of stakeholders at all levels in terms of availability of manpower and financial resources in the long term.

4.3.2 BIO-PHYSICAL SWOT ANALYSIS

The analysis is given in Table 4-2. In summary, the environmental profile for the bio-physical sub-system reflects that the Okavango Delta is almost in a pristine state. The conservation status of the Delta can be enhanced through enforcement of existing legislative instruments especially in non-protected areas, and the opportunities provided by existing multi-lateral environmental agreements as well as building upon traditional conservation knowledge within communities in the Delta. There is also the need to ensure that environmental management plans are developed and implemented through the provisions of the EIA Act of 2005.

A major gap in the conservation and rehabilitation of the Okavango Delta natural resources is the understanding of the dynamics of the ecosystem. There is a need to enhance the capacity of those institutions dedicated to management of specific abiotic and biotic features to collect baseline information as well as implement the existing Okavango Delta research strategy.

Table 4-2: Bio-physical System SWOT Analysis

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services			
Objective 2.1: To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them			
Strengths	Weaknesses	Opportunities	Threats
High biodiversity	Fragility (adapted to low nutrient)	Conservation guided by CBD, Ramsar, CITES, WHC, etc.	Negative impacts of upstream developments
Relatively pristine	System not well understood	Presence of HOORC and other national and international research institutions	Climate change
High resilience (flow dynamics, variety of habitats)	Limited financial and human resources to implement and monitor conservation measures	Govt commitment to synergise related conventions	International trade in endangered species
Presence of high profile and indicator species	Presence of globally Threatened and endangered species		Incompatible trans-boundary activities (fires, land use)
Certain national departments dedicated to management of specific biotic and abiotic aspects of the system	Unsustainable and illegal water abstraction		High poverty levels
Okavango Delta Research strategy in place	Limited baseline information on the components of ecosystem (physical and biological and their interactions)		Potential changes in land use (e.g. mining, irrigation agriculture)
Endemic species			Increasing and unregulated tourism
Availability of traditional knowledge on conservation			Eradication of Tsetse – its presence was barrier to human encroachment and removal of tsetse from the ecosystem.
Availability of legislative instruments (herbage preservation act etc)			
Large parts of the system fall under protected areas			
Strategic objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta			
Availability of legislative instruments (herbage preservation act, waste management, EIA, etc)	Presence of threatened and endangered species	Willingness of communities to participate in management (e.g. trusts)	Increasing self-drives – vehicle traffic
Relatively pristine	High elephant population		Inadequate monitoring of implementation of environmental management plans.f for development projects
Certain departments dedicated to restorative interventions (e.g. DWA – Aquatic weed control)	Inappropriate waste handling and disposal practices		Introduction of invasive species
Buffalo fence prevents human/livestock encroachment	Topography of the Delta (very flat) makes impacts of minor disturbance huge (construction of bridges, road network		Outbreak of diseases
Current land use practices compatible with conservation			

4.3.3 SOCIO-ECONOMIC SWOT ANALYSIS

The analysis is given in Table 4-3. The environmental profiling derived from the above table indicates that the Okavango Delta has a very good natural resource base. Most natural resources are used within their generative capacities.

Table 4-3: Socio-economic Subsystem SWOT Analysis

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders			
Strategic Objective 3.1 To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders			
Strengths	Weaknesses	Opportunities	Threats
Good natural resources base	Limited use regulations	Diversification of CBNRM offerings	Lack of CBNRM Policy
Structures such as conservation committees in place	Limited understanding of wise-use concept	Multi-lateral environmental agreements which facilitate wise use.	Recurrent droughts
Existence of CBNRM Programme	Disempowerment of traditional leaders in regulating resource use.	Conservation legislative instruments in place	Increasing human population
Most of the natural resources are still within their regenerative capacity.	Over-harvesting of some resources resulting in reduced regenerative capacity.	Eradication of Tsetse fly has resulted in increased access to resources	Outbreak of diseases
High level of indigenous traditional knowledge on the use of the natural resources		Largely open access natural resources management regime	Cross border off-take of resources
			High poverty levels
			Re-invasion of tsetse.
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders			
Existence of CBNRM Programme	Skewed benefit sharing	Govt recognition of tourism for economic diversification	Leakage of tourism benefits
Good tourism base	Lack of business, marketing and management skills	Availability of financial and skill enhancement programmes (CEDA, Enterprise Botswana, etc)	Lack of markets
Good natural resources base	Denial of traditional access rights	Govt. commitment through policies on Rural Development as well as other investment policies (i.e. Direct Foreign Investment) in place	Globalization – resulting in competition
Economic value of the Delta goods and services relatively well known	Mistrust between tour operators and communities	Existence of Multi-lateral agreements and commitments such as UN Millennium Development Goals, World Summit on Sustainable Development	Regional instability may negatively impact on tourism
Presence of NGOs and CBOs to facilitate use of resource for improving livelihoods	Sensitivity of the tourism industry to market forces		Increase in HIV and AIDS infections
	Lack of capacity to determine the level of payable royalties		High level of illiteracy rate
	Lack of compliance in maintaining the books of accounts within the country		High poverty levels

Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders			
	Limited knowledge on other livelihoods opportunities (high dependence on livestock and arable farming)		Outbreak of diseases
	Tendency of citizens to depend on government assistance.		
	Gender bias towards males and lack of youth involvement.		High tourism capital investment

These resources are spread over the four management regimes: open access, common property, state property and private property, but the dominant one is open access. Therefore the resources are available for both subsistence and commercial purposes. The opportunities availed by open access are negated by limited regulation in the use of some of these resources resulting in unsustainable off take.

There are, to some extent, investment policies in place which stakeholders can take advantage of to use the natural resources to improve their livelihoods; however, this is counteracted by lack of entrepreneurial skills and low literacy levels. This has resulted in continued dependence on government assistance (drought relief programme, food baskets, etc) as well as traditional livelihood activities such as livestock and arable farming which are highly susceptible to drought and outbreak of diseases.

The Delta has provided a good tourism base due to endowment of natural resources. Tourism is contributing to enhancement of livelihoods, however it faces a threat of being dependent on almost a single product line, which is wildlife. There is a need to counteract by taking advantage of the existing natural resource base. The other threat is that the sector is highly capital intensive resulting in low citizen participation. This has resulted in conflicts and mistrust due to inequitable benefit sharing from the utilization of the Delta resources.

Communities are using the CBNRM programme to improve their livelihoods; the major hurdle is that there is no policy to support it. In addition to this the performance leaves much to be desired due to lack of business management and marketing skills as well as inequitable benefit sharing.

4.4 DEVELOPMENT OF OPERATIONAL OBJECTIVES

Operational objectives set the framework for converting the strategic objectives into a series of practical management measures within the context of the strengths, weaknesses, opportunities and threats reflected in Table 4.1 to 4.3.

The development of operational objectives was linked to the strategic objectives and key issues given in Table 3.3. Therefore they were categorised according to strategic goals of the thematic areas and strategic objectives of the respective sub-thematic areas (Table 4-4).

Table 4-4: Operational Objectives to address key issues

THEMATIC AREA: INSTITUTIONAL				
Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
To establish viable institutional arrangements to support integrated resource management in the Okavango Delta s at local, district, national and international (River Basin) levels	To establish viable management institutions for the sustainable management of the Okavango Delta	I.1.1	There is need to establish a regional DEA office in ODRS and strengthen its capacity to coordinate and monitor the implementation of the ODMP.	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP by March 2008
		I.1.2	There is need to build the capacity of communities for delivering management and sustainable use of natural resources	NWDC to strengthen the capacity of the communities in the management and sustainable use of the natural resources by 2012
		I.1.3	Manpower capacity of the fisheries division needs to be addressed	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources by 2012
		I.1.4	The solid waste collection services within the ODRS need to be improved.	NWDC to improve solid waste collection within the ODRS
		I.1.5	The solid and liquid waste infrastructure in the ODRS needs to be improved.	NWDC to improve the solid and liquid waste infrastructure in the ODRS
		I.1.6	The institutional capacity of the district waste management needs to be improved	NWDC to improve the institutional capacity of the district waste management.
	To improve the planning and regulatory framework for sustainable management of the Okavango Delta	I.2.1	There is a need to harmonize legislation and policies applicable to the ODRS.	DEA to facilitate the process of harmonizing legislation and policies applicable to the ODRS
		I.2.2	There is a need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation
		I.2.3	There is a need to facilitate the approval of the Draft National Wetlands Policy and Strategy by Parliament.	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy
		I.2.4	Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS.	HOORC to improve accessibility and updating of data and information for resources planning and management
		I.2.5	Research in the ODRS needs to be coordinated.	HOORC to implement the recommendations of the Research Strategy
		I.2.6	The long standing problem of fisheries conflicts needs to be resolved.	DWNP to put in place fishery conflict resolution mechanisms
		I.2.7	Haphazard and delays in land allocations as well as poor record keeping need to be reduced.	TLB to allocate land in an orderly and timely manner through the use of a land management database.

Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district, national and international (River Basin) levels	To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.	I.3.1	There is a need to establish effective communication amongst ODMP stakeholders at all levels during plan implementation.	DEA to promote effective communication amongst stakeholders.
		I.3.2	Uncertainties about stakeholders continuing to meaningfully participate in the implementation of the ODMP.	HOORC to provide participatory services to the ODMP implementing institutions.
		I.3.3	There is a need to continue to engage Namibia and Angola in the sustainable use of the Okavango River Basin.	DEA to facilitate engagement of Angola and Namibia through the OKACOM process.
		I.3.4	Limited awareness of the ecological impacts of tourism activities in the ODRS.	DWNP to put in place an awareness raising campaign to reduce the negative ecological impacts of tourism activities in the ODRS
THEMATIC AREA: BIO-PHYSICAL				
To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all organisms dependant on it	To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them	B.1.1	Water quality and sedimentation monitoring needs to be improved	DWA to improve the water quality and sedimentation monitoring
		B.1.2	There is need to carry out baseline surveys on keystone species.	DWNP to carry out baseline surveys on keystone species
		B.1.3	Lake Ngami needs to be declared a bird sanctuary	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary
		B.1.4	The existing and potential breeding sites for the slaty egret need to be protected.	DWNP to protect existing and potential breeding sites for the slaty egret
		B.1.5	Inadequacy of base line data on fish stocks in the ODRS.	DWNP to develop and implement fish stock monitoring programme
	To maintain or restore the wetland habitats and ecosystems of the Okavango Delta	B.2.1	Impact and frequency of uncontrolled veld fires.	DFRR to implement the guidelines relevant on appropriate fire management practices as contained in the Fire Management Plan
		B.2.2	Limited knowledge on the impact of large herbivores on sensitive habitats	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats
		B.2.3	Overgrazing by livestock	DAHP to reduce overgrazing developing and implementing range carrying capacity guidelines
		B.2.4	The risk of Tsetse re-infestation needs to be reduced.	DAHP to reduce the risk of Tsetse re-infestation by promoting dialogue with Angola, Namibia and Zambia to create a tsetse free zone.

THEMATIC AREA: SOCIO-ECONOMIC				
Strategic Goal	Stategic Objective	Key Issue ID	Key issues	Operational Objectives
T To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders	To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders	S.1.1	There is a need to establish the non-use economic values for the ODRS	DEA to undertaken estimation of non-use economic values for the ODRS
		S.1.2	There is need to address the possible impacts of tourism activities on the ODRS ecosystem.	DoT to monitor and mitigate the impact of tourism in the ODRS
		S.1.3	Sustainable use of vegetation resources	DFRR to develop regulations for sustainable use of vegetation resources
	To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders	S.2.1	Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation
		S.2.2	Management of channel blockages to sustain communities access to livelihood activities	DWA to manage small channel blocks primarily for communities access to livelihood activities.
		S.2.3	The human/wildlife conflicts continue to be a problem.	DWNP to assess and mitigate the human/wildlife conflicts
		S.2.4	The level of citizen participation in the tourism sector needs to be improved.	DoT to develop and implement strategies to enhance citizen participation in the tourism sector
		S.2.5	The tourism products need to be diversified from being wildlife based to other areas.	DoT to develop and implement strategies for tourism product diversification
		S.2.6	Traditional access rights to natural resources in concession areas need to be upheld.	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected
		S.2.7	The livestock/wildlife interactions need to be reduced.	DAH to develop programmes for the reduction of livestock/wildlife conflicts.

4.5 ACTION PLAN

The Action Plan is given in Appendix I. For the purposes of future reference in the action plan, these issues are given identity numbers (ID). The first letter represents the thematic area in which the issues are classified (I - Institutional, B – Bio-physical, S – Socio-economic), the first number after letter is the sub-thematic area, the last number reflects the key issue. For example I.1.1 refers to the institutional issue under the sub-thematic area institutional strengthening on the need to establish a regional DEA office and strengthening its capacity

5 MANAGEMENT PLAN AND IMPLEMENTATION STRATEGY

The implementation strategy is guided by the common and shared vision of the Okavango Delta Ramsar Site. The vision is designed to provide guidance to policy development and execution of the various sector programmes that bring sustainability to the Okavango Delta Ramsar site. Moreover, it is designed to help inform the Government and its partners of the stakeholder priorities for future action and provide a common focus and direction for the diverse stakeholders utilising and managing the natural resources within the Ramsar site (ODMP – Okavango Delta Ramsar Site Common Vision for 2016, 2006).

A set of parameters has been developed to provide the context for future actions in the wise use and management of the ODRS. These are largely premised on the values shown in Box 1 which support the common and shared vision. The parameters are in the form of management strategies, zoning, prescriptions and action plans (projects).

VISION:

A carefully managed, well functioning ecosystem that equitably and sustainably provides benefits for local, national and international stakeholders"

VALUES

Maintained as a clean and beautiful place to all local and national people, and visitors

Maintained as a wilderness area of national and international importance for its biodiversity, geological, social and cultural significance

Developed and managed as a flagship tourism asset, shaped and stewarded by sustainable tourism that provides active engagement of native citizen entrepreneurs, rewarding employment to local people and sustained revenue to the treasury.

An area with dynamic, responsible and vibrant communities whose members have secure and sustainable livelihoods, and enjoy a high quality of life.

Valued and understood by all those who live in, work in, or visit, so that they contribute positively to the shaping of the future.

A wisely used area, where there is fair access to natural resources, equitable distribution and sharing of benefits derived from the Delta from livelihoods of current and future generations.

Box 1: Vision and values of the ODRS

5.1 IMPLEMENTATION STRATEGIES

These implementation strategies provide the framework for achieving the seven strategic objectives linked to the realization of the vision (ODMP – Okavango Delta Ramsar Site Common Vision for 2016, 2006) and discussed also in Section 4.2. The objectives are given in Box 2.

Strategic objectives

To establish viable management institutions for the sustainable management of the Okavango Delta

To improve the planning and regulatory framework for sustainable management of the Okavango Delta.

To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.

To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them.

To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.

To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders

To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.

Box 2: Strategic objectives

5.1.1 ESTABLISHMENT OF VIABLE MANAGEMENT INSTITUTIONS FOR SUSTAINABLE MANAGEMENT OF THE OKAVANGO DELTA ECOSYSTEM

The strategies for the establishment of management institutions should focus on strengthening management structures in order to ensure sustainability of the ODMP process during its implementation. The sustainability issue continues to be a concern which has been raised during all the deliberations and ODMP platforms. This requires strong implementation of management structures with clear mandates, adequate manpower and financial resources.

5.1.1.1 Coordination and monitoring of the implementation of the plan

The implementation of the ODMP will be coordinated and monitored by the Department of Environmental Affairs. The DEA efforts need to be strengthened through the proposed structures in the Draft Strategic Framework for District/Urban State of the Environment Reporting (DU/SOER 2006) and the Okavango Wetland Management Committee (OWMC).

The D/USOE proposes that at district level, the mandate structure, roles, responsibility and composition of the District Land Use Planning Unit (DLUPU) will incorporate D/USOER as a District Development Planning requirement.

The OWMC is a district multi-sectoral structure set up during the development of Plan. The establishment of the OWMC is provided for in the Draft National Wetlands Policy of 2000. This committee like any other committee in the district should be answerable to the District Development Committee (DDC).

Coordination of the implementation of the ODMP is being strengthened through enhanced collaboration between DEA and HOORC-UB to provide the required technical support.

5.1.1.2 Implementation of Action plans

The ODMP recognises the sectoral mandates of the institutions which were involved in the development of the plan with respect to the sectoral responsibilities outlined in the action plans. While the current institutional arrangements still hold, inter-sectoral collaboration needs to be strengthened. It is critical that the institutional inadequacies in terms of manpower capacity, financial and other resources which may hinder implementation be addressed during the implementation of the plan

5.1.1.3 Financial Resources

The ODMP recognizes the standing financial arrangements and processes in government and this sets the premise for the financial and budgetary requirements for ODMP implementation.

In order to secure financial resources for implementation, government departments and institutions follow the normal budgeting procedures. This entails that activities undertaken during the implementation of the plan be mainstreamed into other existing or on-going programmes as planned under the current DDP6 and NDP9 as well as the subsequent plans.

5.1.2 IMPROVEMENT OF THE REGULATORY FRAMEWORK FOR ODMP IMPLEMENTATION

In pursuit of its objective of sustainable use and management of the Okavango Delta ecosystem resources, it is desirable for the ODMP to be guided by a sound and consistent planning and policy framework. The strategy aligns the ODMP with overarching planning processes and addresses issues of policy harmonisation and appropriate formulation mechanisms.

5.1.2.1 Alignment of the ODMP with national and district planning processes

The ODMP is aligned to national and district planning processes. In this respect, its planning horizon coincides with those of the District Development Plans (DDP) and National Development Plans (NDP), which span a period of six years. This requires therefore that the ODMP action plan be incorporated into the District Strategic Plan, and to the subsequent District Development Plan 7 and National Development Plan 10.

5.1.2.2 ODMP Review and Audit

The planning horizon of the ODMP is aligned with the normal planning requirements so that its review and audit coincides with those of overarching plans. A major review and audit will be undertaken during the mid-term review of DDP 7 and NDP10 in 2012. This will also ensure that projects under the ODMP are subjected to annual reviews. Projects conceived under the ODMP will be absorbed as part of the normal project management framework.

Policy harmonisation

It is crucial that efforts geared toward policy harmonisation embrace the ecosystem approach directed at the following:

- Reducing adverse effects on natural resource base
- Upholding the principles of wise use
- Uplifting of livelihoods
- Devolving of management responsibilities at all critical levels
- Promoting a balance amongst social, economic and ecological aspects of development
- Appreciating local values/ knowledge
- Sound legislative backing.

5.1.2.3 Future Policy Formulation

Future policy formulation should be based on the principles of Strategic Environmental Assessment (SEA) in accordance with the EIA Act of 2005. The SEA provides for integrating sustainability into the implementation of existing legislation, policies and programmes.

5.1.3 RAISING PUBLIC AWARENESS, ENHANCING KNOWLEDGE AND CREATING A PLATFORM FOR INFORMATION EXCHANGE AND LEARNING ABOUT THE OKAVANGO DELTA ECOSYSTEM

The ODMP addresses the needs and interests of a large number of local, national, regional and indeed international stakeholders. A number of these needs and interests are of a potentially conflicting nature (e.g. tourism and irrigated agriculture, wildlife and cattle production etc.). This obviously applies at the local and national level within the Okavango Delta itself but it is equally true of the

upstream – downstream interactions in the whole river basin and thus also at both the regional and international scale.

Both Angola and Namibia have, among other aims, legitimate water resources needs and interests and the potential and/or actual effects of realizing such needs will have to be balanced with the sustainable conservation and use of the resources in the Okavango Delta within Botswana.

Therefore it is within this context that ODMP communication strategy should be fully implemented.

5.1.3.1 Empowerment of local and national stakeholders to implement ODMP

Empowerment of communities to take decisions on issues that affect them require that they are fully able to understand the issues affecting their environment. This understanding will be achieved through access to relevant information, communication, dialoguing and networking among themselves and with other stakeholder groups in addition to undertaking environmental programmes themselves.

For the local stakeholders to participate in the implementation of the ODMP the strategy would require that effective information exchange and communication products should be used. It is important that the stakeholders should be fully engaged to support the implementation. Moreover, it is crucial that capacitating line ministries, government departments and officers effectively communicate with stakeholders.

Platforms for information exchange, shared learning and best practices within and among institutions and communities within the ODRS should be created.

5.1.3.2 Active engagement of basin wide, regional and international stakeholders

Engagement of basin and regional stakeholders such as OKACOM, SADC Directorates, other river basin authorities and commissions, line ministries in Angola and Namibia is paramount in supporting the implementation of the ODMP and balancing the needs of the riparian states. Focus should be given to the establishment of platforms for communication and information exchange as well as sharing of lessons from the Okavango basin wide initiatives. Bi-lateral arrangements for sectoral exchange across the boundaries need to be strengthened.

The Government of Botswana through OKACOM intends to be proactive in facilitating the principle of co-ownership of the entire basin with Riparian states. This could be realised through the use of agreed benefit sharing mechanisms. In addition the Government of Botswana should assist the other riparian states in securing the support of international development partners to invest in sustainable development programmes in the upstream reaches so as to reduce upstream development which could negatively impacts on the survival of the Delta downstream. Through existing and appropriate OKACOM structures transboundary collaboration initiatives are being conceived through the Okavango Basin Steering Committee (OBSC), technical task forces (hydrology and biodiversity) and the Basin Wide Forum (BWF) for community level interventions. Initiation of joint management projects such as hydrological monitoring, policy

harmonisation, enforcement of legislation, data management systems, basin wide strategic environmental assessment and institutional capacity building.

5.1.4 TO MAINTAIN AND CONSERVE THE BIOTIC AND ABIOTIC STATUS OF THE OKAVANGO DELTA AS WELL AS THEIR INTERACTIONS.

The strategy for achieving this objective should focus on increasing knowledge about the different components of the physical and biological diversity of the Okavango Delta ecosystem, the operational limits of the ecosystem functioning and development and implementation of monitoring protocols. The use and management (to include updating) of the established information system should be maintained. The ODMP research strategy and sectoral monitoring programmes should be fully implemented.

5.1.4.1 Increasing knowledge on physical and biological diversity of the Okavango Delta Ramsar site

The research strategy for the ODMP has identified priority research areas (ODMP – Research Strategy, 2006). The highest hydrological priority topics include sediment transport, water quality, factors affecting flood distribution and frequency. In terms of the ecology, the following topics were identified: detailed knowledge of elephant ecology, impacts of fire, resource exploitation, aquatic invertebrates, important vertebrates' species and biodiversity indicators.

In addition to these, the inflow stream requirement studies have been identified as a highest priority area which links hydrology to ecology. These studies include specific water and sediment flows required at key points in the Delta, seasonal patterns of aquatic habitat availability as well as distribution and abundance of key species of aquatic invertebrates and vertebrates keys areas in the Delta.

Therefore the strategy for increasing knowledge for effective management and conservation of the bio-physical component of the Okavango Delta Ramsar site should focus on the priority areas discussed above.

5.1.4.2 Bio-physical Monitoring

It is critical that a monitoring programme with clear protocols be put in place in order to ensure that the bio-physical system is functioning within its operational limits. It is even more important that these limits are set. Therefore the monitoring strategies should include setting operational limits as well developing and implementing monitoring protocols and programmes.

5.1.4.3 Water Quality Guidelines for the Okavango Delta

The water quality standard for the Okavango Delta should be defined in terms of the goals for the utilization of the water. The standard would then be referred to when issuing and renewing permits for old and new projects. This should be aimed at ensuring that water use in the delta is consistent with the standard, so that the water resources are protected. In order to come up with a standard, the current and future uses of the water should be taken into consideration. These could include: water supply (domestic, agricultural and industrial), fishing, wildlife habitat (both plants and animals), commerce and navigation (hunting,

photography, birding, sightseeing etc) and aesthetics. The standard should also protect the Delta's functions (e.g. groundwater recharge) and values.

In developing any standards, a committee of experts and stakeholders is usually set up by the appropriate authority. It is recommended that the same process be followed for the water standard of the Okavango Delta, because all the issues raised above will have to be taken into account, including natural fluctuations in the Delta's water quality and quantity due to seasons and flooding.

It is also necessary to determine which water quality parameters need to be incorporated into the standard. The priority for the Okavango Delta is the collection of spatial and temporal baseline data once the parameters have been identified.

5.1.5 MAINTAINANCE AND RESTORATION OF THE OKAVANGO DELTA RAMSAR SITE HABITATS AND ECOSYSTEM.

The strategy for the maintenance and restoration of the ODRS focuses on factors which are detrimental to the health and existence of the site's habitats and ecosystem. These may be natural or anthropogenic.

The natural factors include climatic change and natural fires. In order to deal with these factors, coping strategies should be put in place. The anthropogenic factors include eutrophication, decreased inflows by water abstraction and veld fires, just to name a few. Sectoral manangement plans and regulatory frameworks should be implemented and enforcement improved.

5.1.5.1 Eutrophication

The Okavango Delta is a nutrient poor system. Therefore an increase in nutrient levels will lead to eutrophication, which in turn may result in large-scale vegetation changes. For example eutrophication may lead to the disappearance of the papyrus which is a keystone species regulating the hydrological functioning of the nutrient poor Okavango system with the resultant invasion of opportunistic species such as water hyacinth (Gumbricht and McCarthy, 2002).

Eutrophication may be induced by pollution from waste and raw sewerage being discharged into the system as well as the use of fertilizers within the Okavango Delta system. Therefore such activities should be discouraged and preferably prohibited through implementation of, among others, waste management strategies, and arable and livestock management programmes.

5.1.5.2 Decrease water and sediment inflows

The hydrological modelling has shown the basin and the Delta are in near natural state in the sense that present land use changes and abstractions from the basin upstream and locally in the Delta have a minimal impact on the Delta as a whole though local impacts may be significant (ODMP – Analysis of Water Resources Scenarios, 2006). However the modelling further indicates that upstream irrigation in Namibia and especially in Angola has a significant potential impact which would manifests itself in a 40% reduction of the permanently flooded area of the Delta. This would also result in the reduction of sediment flow into the Delta.

As the Okavango is a transboundary river basin, the strategy to counteract these impacts should focus on effective engagement of the two upstream riparian states of Namibia and Angola in the joint management of the basin and identification of areas for possible trade offs.

5.1.6 SUSTAINABLE USE OF THE OKAVANGO DELTA WETLAND RESOURCES FOR THE LONG TERM BENEFIT OF STAKEHOLDERS

The economic valuation exercise has demonstrated that people living in the ODRS derive roughly equal benefits from natural resources and from tourism, the latter being slightly higher (ODMP – Economic Valuation Report, 2006). The study goes further to differentiate the form that these benefits take. Natural resources provide subsistence value which contributes to peoples' livelihoods, as well as some cash income. Perhaps more importantly, they have the capacity to provide a safety-net for households that suffer shocks and provide a risk spreading mechanism for poor households that are vulnerable to the vagaries of environmental variability.

Tourism, on the other hand, generates hard, reliable cash income to households, providing the type of income that most households aspire to having. Thus both aspects are important. Tourism also makes a substantial contribution to Botswana's GNP, which in turn provides more revenue and social security to households all over the country.

Therefore the strategy should ensure the sustainability of current resource use by households so that they can continue to provide the livelihood and other social benefits into the future, and enhance the value of the Delta for low impact – high value tourism through maintaining the extent and integrity of the conserved area.

Unsustainable use of natural resources poses a major threat to the integrity of the Okavango Delta Ramsar site ecosystem. These include over-harvesting of the veld products, overgrazing and unsustainable levels of hunting.

It is important that the strategy addressing aspects of unsustainable use of natural resources should focus on regulating their use through setting of thresholds, permit system and harvesting seasons as well as establishing monitoring systems.

5.1.7 SUSTAINABLE WATER RESOURCES UTILISATION

The utilisation of the waters of the Okavango Delta is a very delicate and sensitive issue. The significance of water to the system cannot be over-emphasised. Water is the main driver of the Okavango Delta ecosystem. High species diversity and habitat diversity is a result of the variability in flooding regimes, which lead to different temporal saturation states of the system, i.e. flood extent, duration and timing of flooding. This variability makes it difficult to be definitive on how much water could be removed from the system without negatively affecting the functioning of the Delta.

Water resources use and management in the Delta manifest itself in a variety of ways such as dredging, channel clearing, obstruction (daming) and abstraction. The magnitude of implementation of these water management scenarios has huge implications on the survival and function of the Delta as a national resource and international icon. The modelling studies under the ODMP have predicted future scenarios that may occur under a variety of water development options.

The maintance of this delicate balance against other socio-economic pressures that are in most cases driven by short-term benefits, is crucial. The economic valuation study has shown that the current use options and levels where tourism is the main economic activity are the economically efficient and sustainable use options. The strategy is for Botswana to be conscious of potential impacts of any water resources management intervention that may be implemented either nationally within the Okavango Delta or by upstream riparian states. The strategy should be based on the precautionary principle of ecosystem management.

5.1.8 IMPROVEMENT OF LIVELIHOODS OF THE DELTA STAKEHOLDERS THROUGH IMPROVED SOCIO-ECONOMIC OPPORTUNITIES

The strategy for addressing improvement of livelihoods should focus on the economic opportunities and incentives, traditional access rights, equitable benefit sharing and mainstreaming livelihood issues such as HIV/AIDS, gender and poverty reduction. Demonstration projects or activities, the result of which could inform livelihood enhancement strategies and provide lessons on best management practices, should be encouraged.

5.2 MANAGEMENT ZONES AND GUIDELINES

The area delineated by the site boundaries will be treated as a single unit for the implementation of the ODMP. However, the impacts from the areas in the vicinity of the ODRS should also be taken into account during the implementation of the ODMP.

There are several management zones in the ODRS. The zones are delineated according to the management objectives and strategies. They allow for the development, introduction and enforcement of regulations to avoid conflicting uses. These include planning zones, land use, controlled hunting areas, tourism, livestock and fire ecological zones.

5.2.1 ODRS PLANNING ZONES

The planning zones in the Ramsar site are shown in Figure 5-1 and are described in Table 5.1 (NDDP6, 2003-2009). According to NDDP6, the planning zones have been useful in prioritizing areas for development and defining areas for land use and resources assessment studies.

Table 5-1: Planning zones within the Ramsar Site

Planning Zone No.	Planning Zone Name	Description and General Resource Endowment	Major Settlements
1	Okavango River Panhandle	Permanent water source, pockets of fertile soils, timber trees, veld products, wildlife	Shakawe, Sepopa, Seronga
2	Ngami West	Fertile Soils and potential for dryland farming	Gumare, Etsha 6, Nokaneng
3	Ngami	Are there no available resources here?	Sehithwa, Tsau, Toteng,
4	Maun	Good alluvial soils, some natural sources of permanent water. Has potential for irrigation and dryland farming	Maun, Shorobe, Makalamabedi, Matlapana
5	Hainaveld	Cattle Ranching Area	Somela
6	Western Communal	Cattle Ranching, wildlife and veld products	Nxauxau, Xai Xai, Qangwa
7	Stateland	Wildlife	Phuduhudu
8	Delta	Abundance of wildlife	Sankoyo, Khwai Mababe

Source: Ngamiland District Settlement Strategy, 2003.

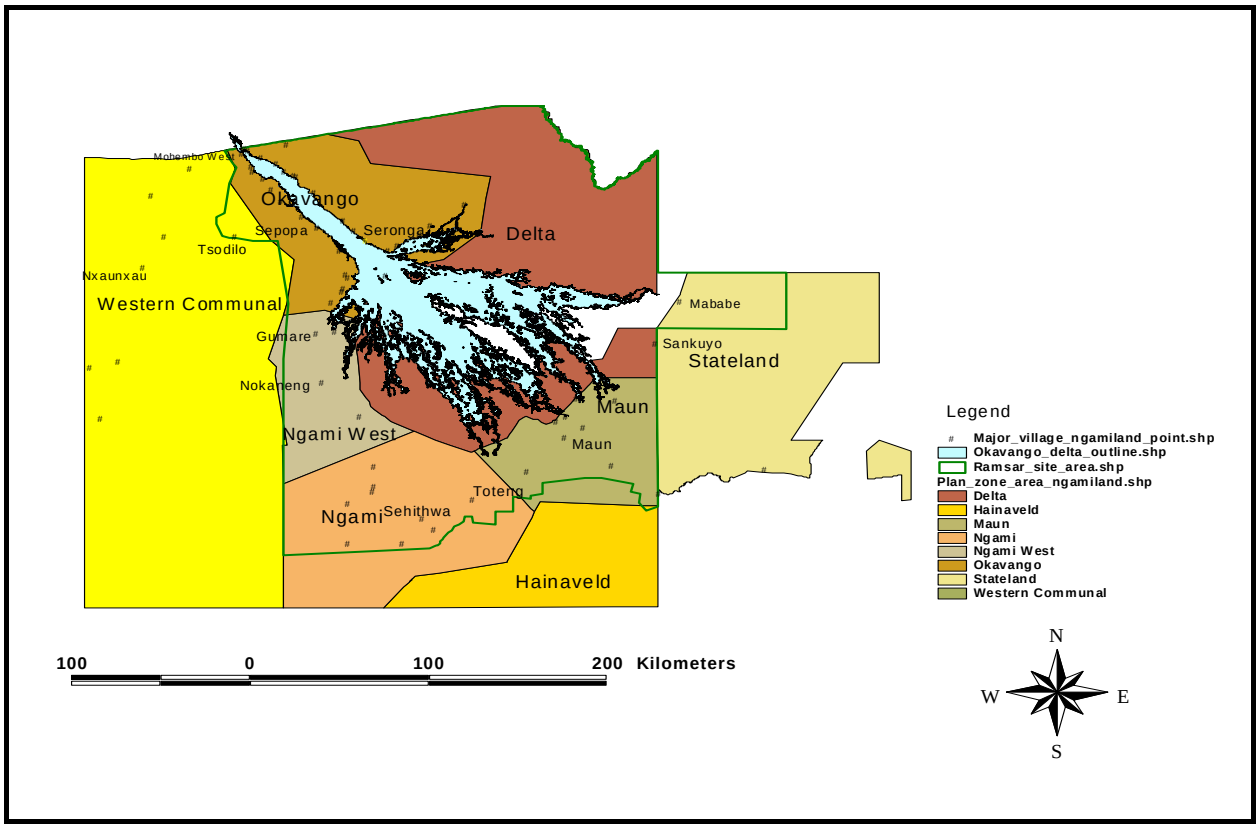

Figure 5-1: Map of Planning Zones

5.2.2 LAND USE ZONING

The Tawana Land Board has prepared an Integrated Land Use Plan (ILUP) for the ODRS. The integrated land use and land management plan calls for the adoption and modification of some recent and site-specific land use and management plans.

It also provides for their integration into the overall land use and land management plan for the ODRS. In this regard, the following plans have been integrated into this plan including their zonations:

- Okavango River Panhandle Management Plan
- Revised Moremi Game Reserve Management Plan (August 2005)
- Management and Development Plan For Community Multi-purpose Controlled Hunting Areas (CHA)NG 41 (February 2005)
- Tsodilo Management Plan (Draft 2005)

The other areas' specific land use plans have been reviewed and the findings of the review have informed the preparation of the ILUP.

The land use plan developed under the ODMP addresses issues of land use compatibility, resolution of land use conflicts, promotion of conservation and sustainable utilisation of natural resources, safeguards livelihood strategies of communities and stakeholders, and is sensitive to ecological and environmental concerns. In view of all the foregoing (Figure 5.1), the implementation of the plan should be within the context of the guidelines (ODMP – Land Use and Management Plan, 2005). The following guidelines and regulations for land utilisation and development are recommended to be applicable in the Ramsar Site as a whole.

i. For all major developments in the ODRS to proceed, an acceptable Environmental Impact Assessment shall be a requirement.

ii. For the orderly growth and development of settlements in the ODRS, settlement development plans shall be prepared for all settlements in fulfilment of the requirements and provisions of the TCPA, which states that development plans shall be prepared for settlements not later than 2 years after the declaration of an area as a Planning Area. Though this might be difficult to achieve, given the vastness of the Ramsar Site and funding and manpower constraints, attempts should be made at prioritisation of settlements. For small rural communities, simple land use layout plans should be initiated by the VDCs and assisted by Council and Land Board officials for their preparations. All land utilisation and developments in villages will therefore be guided by such simple land use layout plans.

iii. Due to the presence of fault lines in the ODRS and the probabilities of seismic activities, foundations for buildings should be reinforced, with building plans duly approved by Council Engineering Department.

With regard to plot sizes, the following is recommended

i. Residential plots – $900m^2$ - $1000m^2$.: The calls for residential plot sizes of $1600m^2$ are not sustainable, considering that land is a scarce resource. Moreover, smaller plot sizes will mean that more plots would be made available to satisfy the ever growing demand for residential plots, and also the provision of infrastructure services to plots would be more cost-efficient.

ii. Commercial plots: Commercial plots sizes shall range from $400m^2$ (10x40) to $5000m^2$ (50x100m) to accommodate small retail outlets to chain stores. This should be applicable to the centres of Maun and Gumare. For rural communities the range shall be between $400m^2$ – $500m^2$.

iii. Industrial plots: Large scale industrial plots should be above $20,000m^2$; medium scale industrial plots should be between $5000m^2$ and $20000m^2$; and small scale industrial plots should range from $800m^2$ to $5000m^2$. These should be applicable only to Maun and Gumare. For rural communities industrial plots sizes should range between $800m^2$ and $5000m^2$.

iv. For civic and community facilities, factor ratios based on population thresholds, as provided by the Urban Development Standards shall be applied in the allocation of civic and community plots in the ODRS.

To address the issue of delays in land allocation by TLB, the following guidelines in allocation procedures for different types of land uses under various types of grants, together with time frames, are recommended:

i. Citizen application for Customary Law land grant for residential use, traditional grazing, rainfed or molapo farming

When a citizen applies for a land right for residential use, traditional grazing, rainfed farming or molapo farming, his/her application shall be submitted to the respective Subordinate Land Board. Final decision on such applications should be made known to the applicant not later than two months after the application was made.

ii. Citizen application for Customary Law land grant for borehole/well

When a citizen applies for a land right for a borehole/well point, his/her application shall be submitted to the respective Subordinate Land Board, which will then make recommendations to the Main Land Board. Final decision on such applications should be communicated to the applicant not later than three months after the application was filed.

iii. Citizen application for Common Law land right for all other uses

When a citizen applies for a Common Law land right for any other use than mentioned above, his/her application shall be submitted to the respective Subordinate Land Board to be recommended to Tawana Land Board. This type of application should be accompanied by a project memorandum which addresses such elements as skills, production system, and availability of capital, market survey, cash flow projections, and environmental impacts. Time frame for the decision should be four months.

iv. Non-citizen application for Common Law land right for residential use

When a non-citizen applies for the above mentioned land right, the appropriate form should be filled in and submitted to the respective Subordinate Land Board to be recommended to Tawana Land Board. Time frame for a decision should be six months.

v. Non-citizen applications for Common Law land right for all other uses

All other applications for the Common Law land rights by a non-citizen should be submitted to the respective Subordinate Land Board to be recommended to Tawana Land Board. This type of application should be accompanied by a project memorandum as indicated earlier. Time frame for a decision should be four months.

The economic valuation has confirmed that the above land use plan, which places emphasis on complementary land use and wise use of the resources, is the most economically efficient and should be used as framework for economic development (ODMP – Economic Valuation Report, 2006). However, the following factors should be considered before any economic activity is undertaken:

a) Emphasis should be put on sustainable resource use, such that utilization is within the regeneration capacity of resources and does not alter the ecological balance of the Delta.

b) Land uses in ecologically vulnerable areas, such as Molapo farming and resource harvesting, should be subjected to more intensive management, monitoring and enforcement.

c) Existing lodges would continue, but new ones should only be allowed if this is within the carrying capacity of the Delta.

d) Non consumptive activities should be carried out in the buffer zone around Moremi.

e) The need to balance protection and tourism use should be carefully examined in order to avoid disruption of livelihood strategies.

5.2.3 TOURISM

The Limits of Acceptable Change (LAC) process has been designed to be used as a management tool to monitor for unacceptable changes to key systems and processes within the tourism related operations of the ODRS. It should be noted that LACs do not lead to the determination of fixed 'carrying capacities' for tourism development activities. It is a dynamic process that will merely indicate when the 'limits of use' have been exceeded, leading to adverse conditions in the environment or with the visitor experience. It is therefore in essence more responsive than proactive. Should such demands place unacceptable loads on the ODRS; the LACs will indicate such excesses – leading to responsive management action. Figure 5-2 gives the LAC categories and tourism opportunity classes.

These conditions and set of categories for 'status of the land' are Pristine, Semi-pristine, Modified, Development Node or Area and Sanctuary. The proposed conditions for each of these categories are given in Table 5-2.

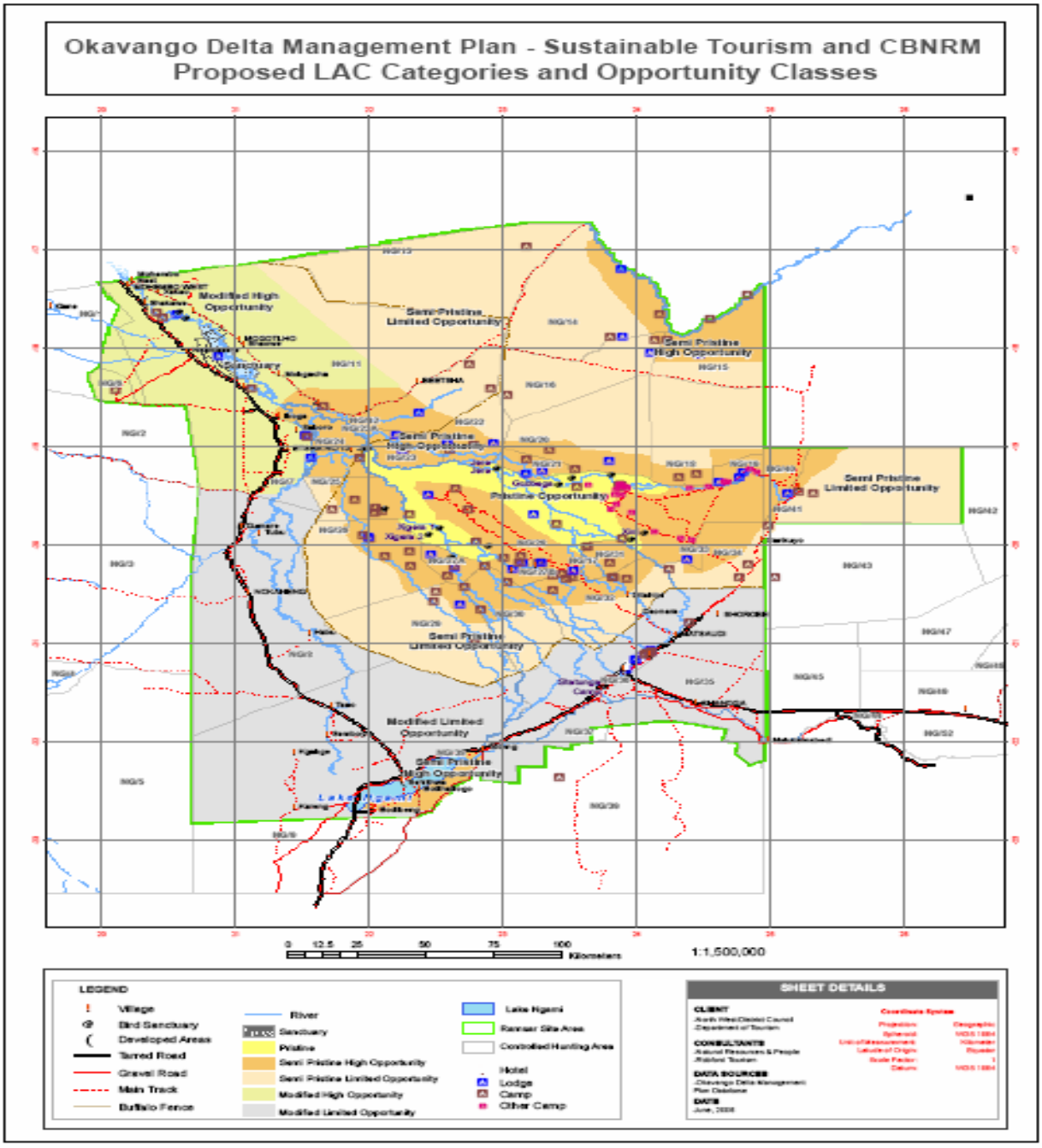

Figure 5-2: Proposed Limit of Acceptable and Opportunity Classes

Table 5-2: Characterization of conditions in the categories of status of the land

Category	Natural / Bio-physical	Tourism: Visitor activities and experience	Community / subsistence	Management
Pristine	Characteristics Extensive areas of wild or natural landscape that might include a number of different ecosystems or habitats No or minimal signs of lasting human presence, activities, impacts, structures ie. Buildings, roads or tracks, markings, signage etc. except significant historical or cultural items ie. graves, rock-art, ceremonial sites Relative absence of exotic species The natural character of the environment, biodiversity, associated natural and cultural resources, bio-physical systems and processes as well as the provision of environmental goods and services prevails. Biodiversity continues to be maintained. Contains sites of special importance ie. habitat or breeding areas for rare or endangered species. Absence of activities that can lead to degradation of the environment. Activities allow for easy recovery of environment, e.g. walking trails.	Visitor activities / operator support Professional armed guides accompany visitors Required to leave the site/area as it was in its natural condition i.e. “pack-it-in & pack-it-out” principle (condition) Access and roads Limited amount of motorised vehicles or traffic, some boats . No unaccompanied access Visitor experience Limits to the number of people using the area through limitations on number, type and capacity of lodges, camps and accommodation. No encounters with other users – except those with own group members. Numbers of groups and numbers per group of hikers controlled by market forces and self-imposed industry standards (max. 6 per group with 1 professional guide). Outstanding opportunities for solitude, isolation, quietness, communication with nature, exclusiveness. Significant exposure to risk from dangerous wild animals Facilities No permanent structures – only existing structures of cultural significance. No facilities except portable tents ie. Tents carried in, on foot, personally by the visitor or by a tour operator staff (pack-it-in, pack-it-out principle). No audible equipment and communication structures.	No permanent or temporary settlements, villages or camps. Limited access for use of natural resources. Very limited opportunities for the employment of neighbouring local communities.	Very low managerial presence Emphasis on off-site management Minimal use of signs Minimal invasive research Few public awareness campaigns

Category	Natural / Bio-physical	Tourism: Visitor activities and experience	Community / subsistence	Management
Semi Pristine	Characteristics Extensive area of wild or natural landscape that might include a number of different ecosystems or habitats The natural character of the environment, biodiversity, associated natural and cultural resources, bio-physical systems and processes as well as the provision of environmental goods and services prevails. Biodiversity continues to be maintained. Contains sites of special importance ie. habitat or breeding areas for rare or endangered species. Relative absence of exotic species – although some outbreaks exist in specific areas. Limited impacts of human activity or use may be visible or evident within the area ie. roads, tracks, buildings and infrastructure.	Visitor activities / operator support Accompanied walking trails, overnight camping in fly camps, game drives in tourism operator safari vehicles, night driving, limited sport licensed fishing (catch and release). Sustainable harvest of specified natural resources under controlled or permitted conditions, i.e. professional hunting of wild animals, cutting of thatching grass and reeds is taking place. Access and roads Limited motorised vehicles allowed ie. no. of vehicles per lodge/camp; y no. of boats per lodge/camp No self drive or unsupervised access except in Moremi Game Reserve or designated areas Visitor experience Provides a "wilderness-based" experience, but evidence of human activities or use from outside the zone may be visible or audible from certain vantage points. Minimal encounters with other users – except those with other parties in same camp or lodge. Numbers of groups and numbers per group to be set or controlled through limits on beds available in camps. Excellent opportunities for solitude, quietness, and communication with nature. Exposure to risk from dangerous wild animals Facilities Limited permanent and semi-permanent structures – ie. bricked lodges; tented camps with minimal permanent, supporting infrastructure, according to stipulated carrying capacity limits per site ie. number of beds per site (indicated in lease and management plans). Limited, temporary accommodation for camp or lodge support staff allowed under agreed, controlled conditions, laid out in facility management plans Facilities serve adjacent pristine areas. Stringent environmental and waste disposal regulations exist and	No permanent settlements. Extremely limited access for use of natural resources or area, based on permits and monitoring. Some use for religious purposes may be allowed, according to agreed conditions and circumstances. Limited opportunities for the employment of a moderate number of members of immediately local communities.	Emphasis on on-site management No signs or structures unless to protect resources Significant participation of local community in the tourism activities Implementation of the available policies, rules and regulations

Category	Natural / Bio-physical	Tourism: Visitor activities and experience	Community / subsistence	Management
		are enforced. Audible equipment and communication structures: Some exist under controlled conditions.		
Modified	Characteristics Areas of natural to semi-natural landscape that might include a number of different ecosystems or habitats, but where portions have been significantly modified through human activities ie. areas cleared for agriculture, or where cattle are kept. Sites of significant biodiversity, conservation, important ecological or bio-physical systems exist in specific areas. Developed, maintained trails and roads exist alongside tracks and paths. Recreational and livelihood impacts persist from year to year. Villages and settlements of varying sizes exist	Visitor activities / operator support Some uncontrolled recreational use is apparent, with associated impacts ie. camping, sport fishing, touring, hiking, boating, canoeing, riding in mokoros etc. Access and roads No controls or exclusions except those stated in lease agreements issued by the Tawana Land Board or in tourism licences. Visitor experience Limited, localised opportunity for solitude and isolation. Medium to high probability of contact with other visitors, residents or groups. Opportunity for moderate to high degree of interaction. Facilities Few limitations on types of tourism accommodation provided – except those stated in lease agreements. No limitations on carrying capacities unless stated in lease agreements issued by the Tawana Land Board Opportunity for community tourism projects. Stringent environmental and waste disposal regulations applied to tourism facilities.	Some permanent settlements or villages. No limitations on access for use of natural resources or area, except use of wildlife which is regulated and to a degree enforced. Opportunities for the employment of a moderate numbers of members of local communities. Minimal to no environmental and waste disposal regulations	Limited to local and traditional governance structures. Minimal signage and structures for resource protection Monitoring and controls limited except those linked to local government requirements, or individual national departmental Acts and Regulations ie, DWNP.

Category	Natural / Bio-physical	Tourism: Visitor activities and experience	Community / subsistence	Management
Developed	Characteristics Urbanised areas with extensive evidence of man-made structures, infrastructure and modification to natural habitat – little natural area evident. Human activities such as development and construction, impacts persist from year to year	Visitor activities / operator support Some uncontrolled recreational use is apparent, with associated impacts ie. quad-biking, 4x4 trail driving, sport fishing etc. Access and roads No controls or exclusions except those stated in lease agreements issued by the Tawana Land Board or in tourism licence. Visitor experience Little or no opportunity for solitude and isolation Extremely high probability of contact with other visitors or residents Opportunity for extensive degree of interaction with other tourists or residents Facilities EIA necessary before any tourism development in this area Regulations to maintain the area, where development takes place No limitations on types of tourism accommodation provided No limitations on carrying capacities unless stated in lease agreements issued by the Tawana Land Board Opportunity for community tourism projects Stringent environmental and waste disposal regulations	Built up urban and peri-urban areas, with residential and commercial buildings and constructions. Limited access for use of natural resources, based on permits and monitoring. Significant access to use and development of area based upon permits and local government regulations. Opportunities for the employment of a very significant number of members of immediately local communities.	High managerial presence and on site regulation ie. by NWDC staff and monitoring Some strategies for visitor education and resource protection ie. Educational Game Reserve in Maun. Privatisation of some services (e.g. cleaning)

Category	Natural / Bio-physical	Tourism: Visitor activities and experience	Community / subsistence	Management
Sensitive areas ie. areas that deserve sanctuary status	Characteristics Primarily natural areas of varying sizes with specific characteristics attractive or necessary to species to complete phases of their life cycle ie. bird roosting sites, bird breeding sites, fish spawning sites, crocodile egg laying areas etc. Sites have species specific requirements relating to disturbance and human activity Sites designated by regulations and by laws.	Visitor activities / operator support Game viewing and observation related activities ie. bird-watching taking place with some level of regulation (in Moremi GR) and some self imposed 'regulations' set by the tourism industry ie. distances boats are permitted to be to heronries etc.. Sport fishing – predominantly in the Panhandle area, and based out of fishing camps. Access and roads Limited access allowed at this point in time. Access often linked to presence of professional guides, but exceptions exist in many cases where individuals use their own boats to approach heronries. Sport-fishermen at stages (during some fishing competitions) disturb crocodile and African skimmer breeding sites on sandbanks in the Panhandle area. Visitor experience Seeking for 'life-experience' feelings due to special nature of activity and privilege to be in a special area Inner-satisfaction of viewing vulnerable, rare and endangered species Some level of seeking solitude and isolation Little probability of contact with other visitors or residents.	No permanent settlements. No access for use of natural resources. Limited opportunities for the employment of a few members of immediately local communities ie. mukoro polers.	Little formal management or frequent management presence. Few if any signs and structures for resource protection, safety and visitor convenience

5.2.4 FISHING

The Fishing Regulations have been drafted and stakeholders have been consulted for their inputs. These Draft Fish Protection Regulations (2006) aim to discourage unacceptable fishing practices and recommend issuance of fishing licenses at a fee for commercial fishermen and no fee for subsistence fishermen, the use of proper fishing net sizes and the introduction of a closed fishing season. Some highlights include:

i. No person shall engage in commercial fishing without a commercial fishing licence.

ii. No person shall catch fish with gillnets exceeding a total of 150 metres.

iii. The period of time during which fish may be caught shall be the period beginning on 1st January and ending on the 31st October every year.

iv. No person may catch fish in Botswana for recreation without a recreational fishing licence

v. No person shall catch and keep more than ten fish in one day for recreational purpose

vi. No person shall enter upon any land for the purpose of catching fish without the written consent of the owner or occupier or duly appointed representative of such owner or occupier.

vii. No person shall catch fish at night except by the use of gill nets which have been set and left stationary in the water before or after the night.

viii. No person shall interfere or tamper with gillnets at night.

ix. No person shall catch fish by setting nets across a lagoon entrance or river channel, drive fishing, seining or using mosquito nets.

x. No person shall, without a permit from the Director, move fish from one water body to another water body.

5.2.5 VEGETATION RESOURCES USE

The following proposed guidelines for the management and utilisation of vegetation resources are strongly guided and informed by the Agricultural Resources Board Act of 1974, the Agricultural Resources Board Policy of 1975 and the Agricultural Resources Conservation Regulations of 2004 as the statutory tools. Therefore, these proposed guidelines and regulations are to be statutory if adopted, and their overall goal is to ensure sustainable utilisation of vegetation resources. The recommendations are as follows:

i. Where possible, access rights should be reserved, i.e. each settlement or a group of settlements should be allocated areas within which they will exclusively harvest;

ii. All veld products should only be harvested when they are fully matured;

iii. To harvest scarce vegetation resources and highly exploited vegetation resources such as river reed, thatching grasses, and in some cases fuel wood, permits must be obtained from the relevant authorities;

iv. Persons harvesting for commercial purposes should obtain a special license, for which a fee should be paid;

v. Sanctions and fines should be imposed on people who contravene regulations for harvesting vegetation resources, in line with provisions of Agricultural Resources Conservation Regulations, 2004;

vi. Where vegetation resources are scarce or getting scarce, a rotational system of harvesting should be practiced, i.e. the same areas should not be exploited continuously without a break;

vii. An assessment of the harvesting areas should be conducted every year before the harvesting season starts;

viii. All villages within the Ramsar Site should have a Village Natural Resource Management Committee (VNRMC) as per the provisions of the Agricultural Resources Board Policy of 1975;

5.2.6 QUARRYING AND SAND EXCAVATION

The Ramsar site has experienced rapid growth over the last 15 years. During this period, several facilities ranging from roads, schools, shopping centres, hospitals and residential houses were constructed, resulting in high demands for construction aggregates, gravel and sand. As a result, extensive excavations have taken place, resulting in a number of un-rehabilitated sites within the project area.

There are rules, regulations and procedures in place dealing with the excavation of construction aggregates from burrow pits, and the mining of sand from river beds. The procedures involve the Department of Mines, which issues the excavation permits, the Land Board, which allocates land for excavations and the Physical Planning Unit under the Council, which helps the Land Board to identify suitable excavation sites. An excavation permit is issued only after the applicant has conducted an EIA and submitted a rehabilitation plan. Despite the existence of these excavation regulations and procedures, illegal excavations and un-rehabilitated sites are common in the Ramsar Site. In order to address the situation, the following is recommended (ODMP – Land Use and Management Plan, 2005):

i. The Land Board should identify areas suitable for excavation in accordance with the guidelines of this plan and lease them off to excavating companies.

ii. The money generated from these lease agreements should be used by the Land Board to rehabilitate excavated sites.

iii. The Land Board, Department of Mines and the Physical Planning Unit should be more vigilant to ensure that excavators rehabilitate excavated sites as per the requirements of their permits.

5.2.7 FIRE MANAGEMENT

Fire has been used in the ODRS as a management tool. The reasons for burning, identified during the development of the ODRS Fire Management Plan, were that the vegetation was burnt for the removal of moribund and/or unacceptable grass or other plant material like reeds as a means of rejuvenating the plant community. Another purpose was to control the encroachment of undesirable plants e.g. controlling bush encroachment (ODMP – Fire Management Plan, 2006). The Plan has provided fire management guidelines which are given below.

5.2.7.1 Permissible fire regime for controlled burning

The following fire regime in terms of type and intensity of fire and the season and frequency of burning is recommended for the ODRS.

i. Fires burning with the wind either as surface head fires in grassland or a combination of surface head fires and crown fires in tree and shrub vegetation must be used in controlled burning. This is

because surface head fires cause least damage to the grass sward and crown fires can cause maximum damage to woody vegetation when fire is used to control bush encroachment;

ii. When burning to remove moribund and/or unacceptable grass material a cool fire of <1 000 kJ/s/m is recommended. This can be achieved by burning when the air temperature is <20°C and the relative humidity >50 %. When burning to control undesirable plants like encroaching bush, a hot fire of >2 000 kJ/s/m is necessary. This can be achieved when the grass fuel load is >4 000 kg/ha, the air temperature is >25°C and the relative humidity <30 %. This will cause a significant top kill of stems and branches of bush species up to a height of 3 m. In all cases the wind speed should not exceed 20 km/h.

iii. Controlled burning should only be applied when the grass sward is dormant. Relating this principle to the different vegetation units it is recommended that when burning to remove moribund, unpalatable grass material in either the Burkea, Acacia or Mopane Woodlands where plant growth is dependent only on rainfall, then these areas should be burnt at the end of the dormant winter season in approximately October after the first spring rains of ≥13 mm. When burning to control the encroachment of undesirable plants like bush encroachment, a high intensity fire is required and it is recommended that this be applied before the first spring rains in August/September when it is extremely hot and dry.

iv. In the case of burning in the Seasonal Swamps where the growth of the vegetation is generally influenced by the annual flood waters entering the Delta the ideal burning window for removing moribund and/or unpalatable grass material is during the period May to July, applying the fires when the grass sward is dormant before the flood waters start rising.

v. If it should be necessary to reduce the growth of trees and shrubs in the Seasonal Swamps then burning must be applied later in the winter during August/September when it is extremely hot and dry thereby ensuring high intensity fires necessary to control encroaching trees and shrubs.

vi. When burning to remove moribund and/or unacceptable grass material the frequency of burning will depend upon the accumulation rate of excess grass litter. Field experience indicates that burning is necessary for this reason when the grass fuel load exceeds 4 000 kg/ha and therefore the frequency of burning of areas in the Seasonal Swamps and the Acacia, Burkea and Mopane Woodlands can be determined using this criterion.

vii. In order to prevent overgrazing it is important to ensure that the burnt area exceeds the short term forage requirements of the grazing animals that are attracted to the highly palatable and nutritious re-growth that develops after a burn i.e. burn relatively large areas at any one time. Another effective strategy is to apply a series of patch burns at regular intervals throughout the duration of the burning window during the dormant season. This has the effect of attracting the grazing animals to the newly burnt areas after the different fires thereby spreading the impact of grazing over the entire burnt area and avoiding the detrimental effects of heavy continuous grazing after the burns.

5.2.7.2 Practical Application of Controlled Burning

In the practical application, a controlled burning program should be guided by the following factors (ODMP – Fire Management Plan, 2006):

a) The weather conditions as described and assessed using the recommended Fire Danger Rating System should be appropriate for burning.

b) Appropriate burning procedures for the application of the controlled burn should be used i.e. applying a block burn or a patch mosaic burn

c) Adequate and appropriate firebreaks for the area being burnt should be provided or be in place.

d) There should be adequate equipment for both initiating and controlling the fire

e) The field staff should be equipped with suitable protective clothing and footwear.

f) Appropriate forms of communication must be available to enable effective communication during the burning operation.

5.2.8 WATER QUALITY

The quality of the waters of the Delta play a very important role in the way the system functions. Deterioration in the quality of water has the potential to upset the functioning of the ecological processes that sustain the Delta. The water quality guidelines as set out by the Botswana Bureau of Standards need to be implemented effectively and met whereever practicable, and adjusted with good reason only. The capacity of the Water Apportioment Board needs to be improved in order for it to effectively deliver its mandate as defined by the Water Act with regard to the Delta. The Board issues permits with regard to amount and quality status of the effluent that can be discharged to river systems. What remains to be done in the future is to determine specific effluent levels taking cogniscence of the perculiar requirements for the environmental sustainability of the Delta.

5.3 BUFFER ZONES

5.3.1 DEVELOPMENT WITHIN FLOOD PLAINS

The Department of Town and Planning has developed planning guidelines which prohibit any development within 200m from a flood plain for the whole country. The limit for the Panhandle part of the Delta was 500m.However the ODMP – Land Use and Land Management Plan (2005), has since reduced it to 200m in line with the rest of the whole of the Ramsar site.

5.3.2 BUFFER AROUND MOREMI GAME RESERVE

In so far as ecological considerations inform land use zoning decisions, it is noted that parts of zones NG 25 and 26 have the highest concentration of slaty egrets (ODMP – Land Use and Management, 2006). On this score, it is proposed that marginal parts of these NGs presently zoned for commercial wildlife utilisation, and bordering MGR be zoned as commercial photographic areas. This will further serve as a buffer for the MGR. In the same vein, the identified nesting areas for birds in the Panhandle have been zoned as no-wake areas for engine boats. The zonation of a strip merging NG 19 and NG 21, which cut into portions of NG 20 and 18 marginally as community and commercial photographic areas respectively is also proposed. This will also serve as buffer for Moremi Game Reserve, thus preventing hunting/poaching in the MGR.

6 MONITORING AND EVALUATION PLAN

A Monitoring and Evaluation (M&E) plan has been developed to track the implementation of the ODMP. The monitoring will be carried out at two levels. The first entails monitoring of implementation of outputs, and the second monitors changes at operational objective level. Within the context of government planning structure the M&E will equate to a performance measurement tool which usually accompanies strategic plans.

M&E is the regular collection and analysis of information to track the implementation and measure the performance of any project against its expected results. It provides important information about how the project is performing, which helps decision makers and other stakeholders. It is therefore a powerful management tool that provides project managers with information to track implementation and achievements, so that they can identify whatever obstacles are impeding the project's success as early as possible. M&E is a source of information for justifying changes in management strategy, budgets, etc., otherwise known as adaptive management.

Used well, M&E helps to identify successful interventions early which could be replicated. It provides information for evaluation and learning. It is also a tool for motivating the stakeholders, by generating a shared understanding of the project and its context. The information that it provides can promote accountability, credibility and public confidence in the project.

6.1 PLAN FOR TRACKING IMPLEMENTATION AND PRODUCTION OF OUTPUTS

A plan for tracking implementation and production of outputs has been developed for the three thematic areas, namely institutional, bio-physical and socio-economic subsystems. A set of criteria has also been developed to judge the quality of the outputs, time of delivery, target groups and an explanation for deviations. These plans are given in Appendix II

6.2 MONITORING FOR CHANGES

In addition to tracking project implementation and production of outputs, the M&E plan will monitor the changes in capacity and performance at operational level within the three subsystems. It will also monitor any improvements that occur in the state of resources. Ecosystem indicators have been formulated to monitor this level of results and an action plan for monitoring them has been outlined. This action plan details the information that will be collected on each indicator, identifies the party responsible for collecting the information, the frequency of collection, the baseline required and the tools of data collection. These plans are given in Appendix II

6.3 ASSESSMENT OF THE IMPACTS OF THE PLAN OR SECTORAL PROGRAMMES

The potential impacts resulting from the implementation of the plan and mitigation measures, sustainability criteria and any further action to be taken by

implementers are presented in Appendix III. It is important to identify the potential impacts of the plan upfront so that appropriate measures could be put in place to counteract the negative impacts and to enhance the positive ones, this has been achieved through subjecting the ODMP to SEA.

7 CONCLUSIONS

1. The Okavango Delta Management Plan (ODMP) project has reached its official completion target. Four milestones (inception, framework management plan, draft management plan and final management plan) were programmed for the delivery of the project through collaborative efforts of twelve sectoral components anchored within ten organizations both at central and local government levels as well as the University of Botswana.

2. The ODMP process was largely issue-driven. Stakeholder consultations were held at community, departmental, private sector, NGO/CBO and policy making level. Their diverse interests and expectations on the ODMP were recorded, analysed and, to the extent possible, incorporated into management options and action plans contained in the draft management plan.

3. The approach of the ODMP was also premised on the Ramsar Planning Guidelines as well as to a large extent informed by the policy framework in Government. A learning-by-doing course of action was pursued in order to adapt methods appropriate for the overall objective and principles of the ODMP as well as the sectoral functions of participating organizations. It was therefore not plausible for the process to follow to the letter, for example, the methodology outlined in the Ramsar Planning tool. Some of its elements can only be implied.

4. The focus of the ODMP was on integrated resource management. There is evidence of success attained through improved cross-sectoral planning even outside the ODMP programme itself. Sectors express themselves in a more focused way and can readily identify the synergies and complementary support which they can source from other sectors in a more cordial manner and without necessarily shifting burdens or pointing fingers. Integration is a process. ODMP has only demonstrated that it is possible to integrate and its maturity will be realised through change of mind-set as well as indicators for success in achieving plan objectives over time.

5. Technical objectives often take supremacy in planning and it is becoming evident that management issues that have recurred over time cannot only be solved by applying science and through academic methods. Through the ODMP participatory methods which advance the societal needs create room for improved understanding and ownership of the decisions which are ultimately made. A deliberate effort was made to engage all stakeholders through the services of a full-scale communications team and a participatory planner. Such arrangements will continue during implementation to keep the level of interest high and strengthen opportunities for stakeholder involvement in decision making.

6. The sustainability of the ODMP process in the long-term continues to be raised during all deliberations and ODMP platforms. The coordinating role which the DEA possesses is now visible within the district. The DEA's permanent location in Maun will enhance opportunities for more focused environmental planning. Through incorporation into the District Strategic Plan the ODMP has found its place in the

District and National Development Planning frameworks. From a more technical standpoint, the existence of the Harry Oppenheimer Okavango Research Centre in Maun creates an opportunity for direct links with the ODMP implementation in order to guide the sectoral activities within the agreed research strategy.

7. Data gathering, updating, storage and processing for more informed decisions is key to the implementation of the ODMP. As new information is acquired through focused research, which should benefit communities in the ODRS, action plans should be adjusted accordingly. The ODMP should remain adaptable and flexible. Annual sectoral reviews should be institutionalized to keep the plan relevant.

8. Capacity building at institutional and community levels is crucial to enhance understanding, dispel misconceptions and create opportunities for sustainable use and management of the Okavango Delta resources. The ODMP project had allocated funds for this but sectors should continue to budget annually for training and capacity building programmes, which are relevant for the advancement of their ODMP implementation programme.

9. Regional or basin-wide collaboration is inevitable. Persuasion and constructive negotiations should be pursued through set mechanisms such as the OKACOM. Botswana stands to strengthen its negotiation power if its positions are based on information that is empirical. Mechanisms for continued updating at the regional platforms such as the ODMP Communication Strategy are encouraged. Partnership building with and participation in regional programmes and projects should be encouraged to push the basin-wide interests of the ODMP forward and therefore solicit buy-in from basin-states.

10. Recommendations from key ODMP studies should be tabled for consideration at appropriate levels and implemented. Through the ODMP monitoring and evaluation tool the impact of the implemented results should be noted and negative ones avoided while positive ones should be enhanced and replicated in other similar parts of the Delta.

11. Implementation of pilot projects, identification of best practices, infusion of traditional knowledge and enhancement of livelihoods are key elements that can enrich the impact of the plan. These elements will constitute a substantial part of the workplan under the communication component. Lessons derived from this process will inform management options and practices and can be shared locally, regionally (within the basin) and internationally.

12. Commitments of resources for integrated wetlands management planning should consider the dynamism of the processes adopted to service the needs which may be adequately articulated in project documents but assume a highly varied form when actual implementation happens. The finances, institutional arrangements, ecosystem dynamics, socio-political contexts within an integrated planning framework present a complex situation where adjustments should happen as implementation evolves.

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APPENDIX I -ACTION PLAN

Appendix I. 1: Action Plan for Institutional Thematic Area

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.1 To establish viable management institutions for the sustainable management of the Okavango Delta								
ID	Key issues	Operational Objective	Critical Activities	Output / Outcome	Leading Institution	Supporting Institution	Delivery period	Resource needed (Manpower and budget)
I.1.1	There is need to establish a regional DEA office in ODRS and strengthen its capacity to coordinate and monitor the implementation of the ODMP.	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP.	DEA to complete the recruitment of the regional office staff.	Full staff compliment	DEA		March 2007	3 new positions required Recurrent/development
			DEA to prepare and sign a memorandum of agreement with HOORC for HOORC to provide technical support during ODMP implementation.	Operational Memorandum of Agreement	DEA	HOORC	April 2007	DEA to prepare annual budget for engagement of HOORC
I.1.2	There is need to build the capacity of communities for delivering management and sustainable use of natural resources	NWDC to strengthen the capacity of the communities in the management and sustainable use of the natural resources.	Assess the capacity of communities to manage CBNRM programmes	Capacity needs assessment report	NWDC	DoT, DFRR, DWNP, DEA, TLB, Tribal Admin	March 2007	Consultants Included in the P2 700 000 on going consultancy
			Develop and implement capacity building programmes	Capacity building programmes implemented			April 2008-March 2013	To be determined by March 2007
I.1.3	Manpower capacity of the fisheries division needs to be addressed	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources by 2012	Rationalization of DWNP positions to increase capacity of the Fisheries Division.	Additional personnel (2 at degree level (C1), 2 technical officers (C2), 6 technical assistants (B4))	DWNP		March 2007	Inhouse Recurrent(
			Train existing rationalized staff	Trained staff			March 2011	Budget (700 000)

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.1 To establish viable management institutions for the sustainable management of the Okavango Delta								
ID	Key issues	Operational Objective	Critical Activities	Output / Outcome	Leading Institution	Supporting Institution	Delivery period	Resource needed (Manpower and budget)
I.1.4	The solid and liquid waste collection services within the ODRS need to be improved.	NWDC to improve solid and liquid waste collection within the ODRS	Engage private sector to collect and dispose solid and liquid waste in settlements	Operational contracts / Compliance	NWDC	TLB, DoT, DWNP, Private Sector, Communities and associated structures.	March 2009	Private Sector engagement, existing NWDC staff. Recurrent Budget
			Ensure tour operators comply with provisions of waste management as contained in the lease agreement	Compliance				
I.1.5			Operationalise Maun landfill site through procurement and installation of outstanding equipment	Operational Sanitary landfill	NWDC	Tour operators	June 2007	P4 Million for equipment
			To construct a landfill site in Gumare	Operational sanitary landfill			March 2011	P20 million
			To increase temporary storage facilities in all settlements	Additional storage facilities			March 2007-March 2012	P135 000 for 2007/2008 P500 000 for March 2008-2013
I.1.6			Increase operational technician staff compliment from 6 to 8 by rationalising existing positions.	Additional technical staff	NWDC	DLGSM	March 2008	Recurrent budget

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institutions	Delivery date	Resource needed
I.2.1	There is need to harmonize legislation and policies applicable to the ODRS.	DEA to facilitate the process of harmonizing legislation and policies applicable to ODRS	Carry out high level consultations with the affected government ministries on how to implement policy harmonisation recommendations	Implementation Strategy to achieve harmonised policies.	DEA	All government departments and ministries	July 2007	In-house, ESP Recurrent/development P100 000
			Facilitate implementation of policy harmonisation strategy	Harmonised policies			March 2013	
I.2.2	There is need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation	Fully integrate the vision during the implementation of the Okavango Delta Management plan and related planning and management processes	Vision integrated into the ODMP and other planning and management process	DEA	All govt. depts. and stakeholders	April 2007-March 2013	P100 000 In-house
I.2.3	There is need to facilitate the approval of Draft National Wetlands Policy and Strategy not by Parliament.	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy	Prepare a cabinet memo for Policy approval	Approved National Wetlands and Strategy Policy	DEA		March 2008	In-house P30 000

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome t	Leading Institution	Supporting Institutions	Delivery date	Resource needed
I.2.4	Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS need to be addressed.	HOORC to improve accessibility and updating of data and information for resources planning and management	Improve internet connectivity in all govt. depts.	Operational internet/e-mails	DEA	All govt depts. and, stakeholders	March 2007	Contractor P43 200 (SIDA Funds)
			Create information and data (ODIS/Library) accessibility through the web	Websites	HOORC		March 2009	Consultant required to develop website P200 000.
I.2.5	Research in the ODRS needs to be coordinated.	HOORC to implement the recommendations of the Research Strategy	To establish the Research Advisory Group	RAG	DEA	HOORC	March 2007	In-house P10 000
			To develop and implement research strategy action plan	Coordinated research	HOORC	DEA and All institutions	March 2007	Consultants P300 000 for Action plan
I.2.6	The long standing problem of fisheries conflicts need to be resolved.	DWNP to put in place fishery conflict resolution mechanisms	Finalise and operationalise fisheries regulations	Fisheries regulations	DWNP	Fishery sector, Tour operators, Communities, TLB, DoT, NWDC	March 2007	In-house P20 000
			Revive Ngamiland Fishermen Association	Functional Ngamiland Fishermen Association			June 2007	
I.2.7	Haphazard and delays in land allocations as well as poor record keeping need to be reduced.	TLB to allocate land in an orderly and timely manner through the use of a land management database.	Implement guidelines for land allocation as contained in the Integrated Land Use and Management Plan of 2005	Speedy and orderly allocations	TLB	Communities, private sector, NWDC, All Government Departments	Nov 2006-March 2013	In-house P200 000
			Develop land management database	Functional database			March 2009	P300 000

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Object 1.3: To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institutions	Delivery date	Resource needed
I.3.1	There is need to establish effective communication amongst ODMP stakeholders at all levels during plan implementation.	DEA to promote effective communication amongst stakeholders.	Finalise and operationalise Communication strategy	Operational Communication strategy	DEA	All government ministries and departments, private sector and communities	March 2007	Existing Staff and SIDA P1.5 million
I.3.2	Uncertainties about stakeholders continued meaningful participation in the implementation of the ODMP	HOORC to provide participatory services to the ODMP implementing institutions.	Engage stakeholders on a continuous basis through participatory methods	Stakeholders participation	HOORC	All government ministries and departments, private sector and communities	April 2007-March 2013	In-house P100 000
I.3.3	There is need to continue to engage Namibia and Angola in the sustainable use of the Okavango River Basin.	DEA to facilitate engagement of Angola and Namibia through the OKACOM process.	Engage Namibia and Angola on the sustainable use of the Okavango Delta through the OKACOM platform	Participation of Angola and Namibia in the joint management of the Okavango basin	DEA	DWA, International Waters Unit, Namibia, Angola	Nov 2006-March 2013	In-house P150 000
I.3.4	The limited awareness of the ecological impacts of tourism activities in the ODRS need to be addressed.	DWNP to mount awareness campaign to reduce the negative ecological impacts of tourism activities in the ODRS	Develop and disseminate tourist educational information and publicity materials	Educational programme and publicity materials	DWNP	DoT, TLB, NWDC	March 2009	In-house P100 000

Appendix I. 2: Action Plan for the Bio-physical Thematic Area

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.1 To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institution	Delivery date	Resources needed
B.1.1	Water quality and sedimentation monitoring needs to be improved	DWA to improve the water quality and sedimentation monitoring	Increase the frequency and monitoring sites.	Improved monitoring programme	DWA,	HOORC	March 2007	Existing staff P1.6 million
B.1.2	There is need to carry out baseline surveys on keystone species.	DWNP to carry out baseline surveys on keystone species	Improve baseline information on the Leopard, Cheetah and Slaty egret	Inventories	DWNP	HOORC, Birdlife Botswana, Researchers, Private sector	April 2007-March 2013	P2 million
			Carryout baseline surveys on the African Skimmer, Sitatunga, small mammals, amphibians, Hippos, reptiles and Invertebrates	Inventories				
B.1.3	Lake Ngami needs to be declared a bird sanctuary	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary	Engage with communities to build consensus to designate Lake Ngami as a non-hunting area Engage with policy makers to put in place the necessary legal instruments	Lake Ngami designated as a non-hunting area	DWNP	DEA, Birdlife, Communities	March 2009	In-house P50 000
B.1.4	The existing and potential breeding sites for slaty egret need to be protected.	DWNP to protect existing and potential breeding sites for the slaty egret	Protect existing breeding sites and those which will be identified during ODMP implementation	Protected breeding sites	DWNP	DoT, Birdlife Botswana, DFRR, Tourism sector, Communities	April 2007-March 2013	In-house P500 000
B.1.5	The inadequacy of base line data on fish stocks in the ODRS needs to be addressed.	DWNP to develop and implement fish stock monitoring programme	Undertake regular fish monitoring surveys and collect catch data from fishers	Base-line fish stock data on the Delta	DWNP	HOORC, Fishing communities, Ministry of Fisheries and Marine Resources, Namibia	Nov 2006-March 2013	In-house P500 000

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institution	Delivery date	Resource needed
B.2.1	There is need to reduce the impact and frequency of uncontrolled veld fires.	DFRR to reduce the impact and frequency of uncontrolled veld fires.	Implement the guidelines relevant on appropriate fire management practices as contained in the Fire Management Plan	Reduction in uncontrolled veld fires	DFRR	HOORC, DWNP, DoT, Tourism sector, NWDC	March 2009	In-house with Conservation Committees P300 000
B.2.2	Limited knowledge on the impact of large herbivores on sensitive habitats	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats	Assess the extent of the impact of large herbivores on sensitive habitats Develop limits of acceptable change for sensitive habitats in the Moremi Game Reserve Monitor defined parameters to ensure limits are not exceeded and institute corrective measures	Reduction in impacts	DWNP	HOORC, DFRR, Independent researchers	April 2007-March 2013	Part of the implementation of Moremi Management Plan
B.2.3	Overgrazing by livestock needs to be addressed	DAHP to reduce overgrazing in the ODRS	Carry out biomass assessment Develop and implement the range carrying capacities	Reduction in overgrazing	DFRR	TLB, NWDC, DEA, DWNP, DAHP	March 2007	In-house P500 000
B.2.4	The risk of Tsetse re-infestation needs to be reduced.	DAHP to reduce the risk of Tsetse re-infestation by promoting dialogue with Angola, Namibia and Zambia to create a tsetse free zone.	Undertake dialogue with Angola, Namibia and zambia to create tsetse free zone	Tsetse free zone	DFRR	DEA, Angola, Namibia, Zambia	March 2009	In-house P200 000

Appendix I. 3: Action Plan for the Socio-economic Thematic Subsystem

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.								
Strategic Objective 3.1: To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institutions	Delivery date	Resource needed
S.1.1	There is need to establish the non-use economic values for the ODRS	DEA to undertaken estimation of non-use economic values for the ODRS	Carryout assessment of non-use values Carryout further assessment on direct and indirect values	Revised Economic Valuation Report	DEA	DoT, DWNP, DAHP, DWA, DFRR, NWDC, DFCP,TLB	March 2009	Consultants P600,000
S.1.2	There is need to address the possible impacts of tourism activities on the ODRS ecosystem.	DoT to monitor and mitigate the impact of tourism in the ODRS	Determine the carrying capacity and limit of acceptable change for the tourism activities in the Delta	Information on ecological impacts of tourism activities	DoT	NWDC, DFRR, DWNP, DEA	March 2009	In-house
S.1.3	Sustainable use of vegetation resources need to be addressed	DFRR to develop regulations for sustainable use of vegetation resources	Carry out an assessment of vegetation use and users as well level of use. Determine levels of levies in consultation with the communities. Carry out a pilot project to test this management option	Vegetation resources levies	DFRR	DoT, NWDC, DWNP, TLB, Private sector, CBOs, communities	March 2008	In-house
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders								
S.2.1	Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation	Prepare mainstreaming tools	Mainstreaming tools	DEA	All Government departments	Feb 2007 Preparation	Covered under SIDA/ODMP contribution
			Hold stakeholder workshop for sectors on utilisation of the tools	Workshop proceedings			Feb 2007	
			Monitor the implementation of the guidelines	Cross cutting issues mainstreamed			Feb 2007-March 2013	In-house P100 000
S.2.2	The need to manage channel blockages to sustain communities access to livelihood activities	DWA to manage small channel blocks primarily for communities access to livelihood activities.	Undertake EIA on areas of channels blockages	EIA report on blocked channels	DWA	DEA, Government departments, Communities, private sector	April 2007	Consultancy P450 000

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.								
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.								
ID	Key Issues	Operational Objectives	Critical Activities	Output / Outcome	Leading Institution	Supporting Institutions	Delivery date	Resource needed
S.2.3	The human/wildlife conflicts continue to be a problem and need to be addressed.	DWNP to assess and mitigate the human/wildlife conflicts	Identify hotspots for human elephant conflicts Determine and implement mitigation measures	Report on reduction of conflicts	DWNP	DAHP, DFRR, TLB, DoT, NWDC, DEA, Communities, Private sector	April 2007-March 2013	To be implemented as part of the Elephant Management Plan P1 million
			Develop the comprehensive framework for monitoring of predators Undertake spoor survey Determine and implement mitigation measures				April 2007-March 2013	Predation to be dealt with under Predation Management Strategy P50 000 for predator monitoring P100 000 for spoor survey
			Develop problem animal control policy (National Wildlife Conflict and Strategy)				April 2007-March 2013	To be covered GEF funding P24 million
S.2.4	The level of citizen participation in the tourism sector needs to be improved.	DoT to develop and implement strategies to enhance citizen participation in the tourism sector	Determine strategies for citizen empowerment in the tourism sector Review CBNRM programme with the view of enhancing citizen participation	Strategies for citizen empowerment	DoT, NWDC	DFRR, TLB, DEA, DWNP, Private Sector, CBOs, Communities.	March 2007	Consultants (Included in the overall tourism consultancy budget of P2 700 000)
			Implement the citizen empowerment strategies and improved CBNRM programme.				April 2007 – March 2013	
S.2.5	The tourism products need to be diversified from being wildlife based to other areas.	DoT to develop and implement strategies for tourism product diversification	Determine strategies for tourism diversification	Diversified strategies for tourism sector	DoT, NWDC	DFRR, TLB, DEA, DWNP, Private Sector, CBOs, Communities.	March 2007	Consultants (Included in the overall tourism consultancy budget of P2 700 000)
			Implement strategies for tourism diversification				April 2007 – March 2013	To be advised in March 2007

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.								
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders								
S.2.6	Traditional access rights to natural resources in concession areas need to be upheld.	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected	Carry out inspections to ensure that traditional access rights contained in the lease agreements are respected	Traditional access rights respected	TLB	DoT, DWNP, DFRR, NWDC, Tourism sector, communities	April 2007 – March 2013	In-house P500 000
S.2.7	The livestock/wildlife interactions need to be reduced.	DAH to develop programmes for the reduction of livestock/wildlife conflicts.	Improve maintenance of veterinary fences	Maintenance programmes	DAHP	DWNP, Communities	April 2007 – March 2013	In-house To be advised
			Mount public awareness on livestock disease control strategies	Public awareness programmes			April 2007 – March 2013	In-house P500 000
			Assess feasibility of providing livestock watering points in sand veld areas.	Feasibility Report			May 2007	P300 000

APPENDIX II – MONITORING AND EVALUATION PLANS

Appendix II. 1: Plan for Monitoring Implementation and Outputs for the Institutional Thematic Area

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.1: To establish viable management institutions for the sustainable management of the Okavango Delta								
ID	Operational Objective	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
I.1.1	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP.	Full staff compliment	Well resourced office with personnel and equipment	Ngamiland District	March 2007			
		Operational Technical Support Memorandum of Agreement between DEA and HOORC	Implementable Agreement	All ODMP institutions	April 2007			
I.1.2	NWDC to strengthen the capacity of the communities in the management and sustainable use of the natural resources.	Capacity needs assessment report	Widely agreed, relevant, clear, implementable	Ngamiland District communities	March 2007			
		Capacity building programmes			April 2008 – March 2013			
I.1.3	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources by 2012	Additional personnel (2 at degree level (C1), 2 technical officers (C2), 6 technical assistants (B4)	Trained and qualified personnel	DWNP	March 2007			

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.1: To establish viable management institutions for the sustainable management of the Okavango Delta								
ID	Operational Objective	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
I.1.4	NWDC to improve solid and liquid waste collection within the ODRS	Operational contracts	Implementable contract	Ngamiland District stakeholders, waste management contractors	March 2009			
		Compliance with provisions of waste management in the lease agreement	Improved solid and liquid waste collection					
I.1.5	NWDC to improve the solid and liquid waste infrastructures in the ODRS	Operational Sanitary landfill in Maun	Disposal according to health standard	NWDC and all district stakeholders	June 2007			
		Operational Sanitary landfill in Maun			March 2011			
		Additional storage facilities provided			March 2012			
I.1.6	NWDC to improve the institutional capacity of the district waste management.	Additional technical staff	Trained and qualified personnel	NWDC, DoT, TLB and Tourism sector	March 2008			

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
I.2.1	DEA to facilitate the process of harmonizing legislation and policies applicable to ODRS	Strategy to achieve harmonised policies.	Implementable Approved by government SEA compliant	DEA and All government departments	March 2009			
		Harmonised policies			March 2013			
I.2.2	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation	Vision integrated into the ODMP and other planning and management process	Shared and agreed SEA compliant	Okavango Delta stakeholders	April 2007 –March 2013			
I.2.3	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy	Approved National Wetlands and Strategy Policy	SEA compliant Approved by government	All govt. institutions and district stakeholders	March 2008			
I.2.4	HOORC to improve accessibility and updating of data and information for resources planning and management	Operational website	User friendly and easily accessible	All planning stakeholders	March 2007			

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
I.2.5	Research in the ODRS needs to be coordinated.	To establish the Research Advisory Group	Well represented group made up of all experts in different fields.	Govt depts, Research stakeholders	March 2007			
		Research strategy action plan	Approved by Steering Committee		March 2007			
I.2.6	DWNP to put in place fishery conflict resolution mechanism	Fishery regulations	Agreed by fishery stakeholders and approved by Government	Fishery sector	March 2007			
		Ngamiland Fishermen's Association	Legally constituted and functional		June 2007			
I.2.7	TLB to allocate land in an orderly and timely manner through the use of a land management database.	Speedy and orderly allocations	No delays	Communities, private sector, NWDC, All Government Departments	Nov 2006-March 2013			
		Land Management Database	Functional, user friendly, accessible and updated		March 2009			

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Object 1.3: To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
I.3.1	DEA to promote effective communication amongst stakeholders.	Operational Communication strategy	Implementable, relevant, targeted, appropriate communication tools, widely agreed	DEA, national and international stakeholders	March 2008			
I.3.2	HOORC to provide participatory services to the ODMP implementing institutions.	Stakeholders participation in plan implementation and monitoring	Buy in by stakeholders	HOORC, District Stakeholders	April 2007 – March 2013			
I.3.3	DEA to facilitate engagement of Angola and Namibia through the OKACOM process.	Participation of Angola and Namibia in the joint management of the Okavango basin	Regional agreements minimum upstream developments	DEA, OKACOM, Okavango Basin-wide Forum	Nov 2006-March 2013			
I.3.4	DWNP to mount awareness campaign to reduce the negative ecological impacts of tourism activities in the ODRS	Educational programme and publicity materials	Easily understood campaigns in a native language, clear, concise, user-friendly	Tourism sector, national and district stakeholders	March 2009			

Appendix II. 2: Plan for Monitoring Implementation and Outputs for the Bio-physical Thematic Area

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.1: To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
B.1.1	DWA to improve the water quality and sedimentation monitoring	Flow monitoring reports Improved monitoring programme	Improved coverage (in terms of spatial, temporal and parameters)	DWA, Government departments, OKACOM, other ORB projects	Sept 2007			
B.1.2	DWNP to carry out baseline surveys on keystone species	Inventory and Survey Reports	Based on sound scientific survey and analysis methods	DWNP, HOORC, District stakeholders	April 2007 – March 2013			
B.1.3	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary	Lake Ngami designated as a non hunting area.	Reduced illegal hunting incidents	DWNP, Communities, Tourism sector	March 2009			
B.1.4	DWNP to protect existing and potential breeding sites for the slaty egret	Protected breeding sites	Protection enforced Sites less accessible	DoT, Birdlife Botswana, DFRR, Tourism sector, Communities	April 2007-March 2013			
B.1.5	DWNP to develop and implement fish stock monitoring programme	Base-line fish stock data on the Delta	Based on sound survey and analysis methods	DWNP, Fishers communities, Tour operators, HOORC	Nov 2006 – March 2013			

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
B.2.1	DFRR to reduce the impact and frequency of uncontrolled veld fires.	Reduction in uncontrolled veld fires	Accurate, reliable, Based on sound scientific survey and analysis methods	DFRR, Communities, Tourism sector	March 2009			
B.2.2	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats	Reduction in impacts	Based on sound scientific survey and analysis methods	DWNP, MoA, district stakeholders	April 2007 – March 2013			
B.2.3	DAHP to reduce overgrazing in the ODRS	Reduction in overgrazing	Based on sound survey and analysis methods	DWNP, DAHP, District Stakeholders	March 2007			
B.2.4	To reduce the risk of re-infestation by promoting tsetse free zones in neighbouring countries	Tsetse free zones and monitoring programme	Based on sound scientific survey and analysis methods	DAHP, Namibia, Angola, Zambia	March 2009			

Appendix II. 3: Plan for Monitoring Implementation and Outputs for the Socio-economic Thematic Area

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders								
Strategic Objective 3.1: To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
S.1.1	DEA to undertake estimation of non-use economic values for the ODRS	Revised Economic Valuation Report	Based on sound survey and analysis methods	DEA, DoT, DWNP, DAHP, DWA, DFRR, NWDC, DFCP,TLB	March 2009			
S.1.2	DoT to monitor and mitigate the impact of tourism in the ODRS	Information on ecological impacts of tourism activities	Accurate, reliable, based on sound survey and analysis methods	NWDC, DFRR, DWNP, DEA	March 2009			
S.1.3	DFRR to develop regulations for sustainable use of vegetation resources	Vegetation resources levies	Should include active involvement of the Okavango Delta stakeholders and agreed upon by the same	DFRR, Communities	March 2008			

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.								
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
S.2.1	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation	Mainstreaming tools Cross cutting issues mainstreamed	Targeted, user friendly, based on sound methods	All govt. institutions and district stakeholders	Feb 2007-March 2013			
S.2.2	DWA to manage small channel blocks primarily for communities access to livelihood activities.	Cleared and accessible channels	Accessibility to livelihood activities	DEA, Government departments, Communities, private sector	May 2007-March 2013			
S.2.3	DWNP to assess and mitigate the human/wildlife conflicts	Report on reduction of conflicts	Based on sound survey and analysis methods	DAHP, DFRR, TLB, DoT, NWDC, DEA, Communities, Private sector	April 2007-March 2013			
S.2.4	DoT to develop and implement strategies to enhance citizen participation in the tourism sector	Improved citizen empowerment	Be based on an inventory and gap analysis of the current range of tourism offerings and their seasonality	DoT, NWDC, DWNP, TLB, District stakeholders Tourism sector,	March 2012			

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.								
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.								
ID	Operational Objectives	Output	Criteria for quality	Main target group	Expected date of delivery	Is the output delivered in time within budget and set quality	Deviations from delivery time, budget and quality. Corrective measures	Comments by DEA
S.2.5	DoT to develop and implement strategies for tourism product diversification	Diversified tourism sector	Based on sound survey and analysis methods	DoT, NWDC	Jan 2007			
S.2.6	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected	Traditional access rights respected	Resources accessible	DoT, DWNP, DFRR, NWDC, Tourism sector, communities	April 2007 – March 2013			
S.2.7	DAH to develop programmes for the reduction of livestock/wildlife conflicts.	Veterinary fences Maintenance programmes	Should include active involvement of the Okavango Delta stakeholders and agreed upon by the same	DWNP, Tourism sector, District Stakeholders	March 2009			

Appendix II. 4: Plan for Monitoring Changes in the Institutional Thematic Area

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.1: To establish viable management institutions for the sustainable management of the Okavango Delta								
ID	Operational Objective	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
I.1.1	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP.	Fully operational and well supported DEA office	No. of personnel, equipment and transport and technical support programmes	DEA establishment register Annual Reports	DEA	Annual	Current manpower estimates	Review Manpower estimates Review annual reports
I.1.2	NWDC to strengthen the capacity of the communities in the management and sustainable use of the natural resources.	Improved capacity of the communities in sustainable use and management of the natural resources	No of successful CBNRM programmes No of training and capacity building programmes held No of trained personnel	NWDC, DWNP Annual reports	NWDC, DWNP, NGO facilitating CBNRM programmes	Annual	Current performance of CBNRM programmes	Review of the performance of the CBNRM programmes
I.1.3	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources	Increase in manpower capacity by 3 proffessional staff	No of additional personnel	DWNP establishment register	DWNP	Annual	Current manpower establishment	Review establishment register
I.1.4	NWDC to improve solid and liquid waste collection within the ODRS	Private sector involved in solid and liquid waste collection and disposal	Signed and contracts operational	NWDC Annual reports	NWDC	Annual	Current level of engagement of the private sector	Review of annual reports
I.1.5	NWDC to improve the solid and liquid waste infrastructures in the ODRS	Functional waste management infrastructure	No of functional waste management infrastructure	NWDC Annual reports	NWDC	Annual	Waste management records	Review of the records
I.1.6	NWDC to improve the institutional capacity of the district waste management.	Increase manpower capacity to effect quarterly audits with two professional staff	No of additional staff No of quarterly audit reports	NWDC establishment register Inspection reports	NWDC	Annual	Manpower estimates Current no of audit inspections	Review of manpower estimates Review of inspection report

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Operational Objectives	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
I.2.1	DEA to facilitate the process of harmonizing legislation and policies applicable to ODRS	Reduced policy conflicts and gaps	No of conflicting polocies	Policy documents	DEAs	Annual	Policies	Review of policy documents
I.2.2	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation	Vision incorporated in to the management of the Okavango Delta ecosystem	Vision statement appears in the management planning documents	Management and Project Implementation Plans	DEA	Annual	Documents containing vision statement	Review of the management and project implementation documents.
I.2.3	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy	Enacted National Wetlands Policy and Strategy	Approval by government Wetland Committees operational;	DEA Annual Report Hansard	DEA,	Annual	District committees	Review of annual reports
I.2.4	HOORC to improve accessibility and updating of data and information for resources planning and management	Operational internet/e-mails	Data records and amount of information in ODIS	ODIS	HOORC All govt. institutions	Annual	Records on data and information	Review of records in ODIS
I.2.5	Research in the ODRS needs to be coordinated.	Operational Research Advisory Group Operational research strategy action plan	No of researches done in partnership with HOORC with the approval of RAG	Bibliography of research in the Delta	HOORC	Annual	Research documents	Review of the bibliography on research

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level								
Strategic Objective 1.2: To improve the planning and regulatory framework for sustainable management of the Okavango Delta								
ID	Operational Objectives	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
I.2.6	DWNP to put in place fishery conflict resolution mechanisms	Reduced conflicts between commercial fishers and tour operators	Number of conflicts	Annual reports	DWNP	Annually	Conflicts incidents	Review of annual reports
I.2.7	TLB to allocate land in an orderly and timely manner through the use of a land management database.	Reduction in delays and increased allocations	No of allocations	Allocation records	TLB	Annually	Allocations	Review of records
Strategic Object 1.3: To raise public awareness, enhance knowledge and create a platform for information exchange and learning about the Okavango Delta.								
I.3.1	DEA to promote effective communication amongst stakeholders.	Level of awareness about the ODMP	No of Stakeholders aware of the ODMP	ODMP Progress reports	DEA	Annually	No of Stakeholders aware of the ODMP	Review progress reports
I.3.2	HOORC to provide participatory services to the ODMP implementing institutions.	Stakeholder participation in plan implementation and monitoring	No of stakeholders involved in the implementation of the ODMP.	ODMP Progress reports	DEA	Annually	No of stakeholders involved in the implementation of the ODMP.	Review progress reports
I.3.3	DEA to facilitate engagement of Angola and Namibia through the OKACOM process.	Regional agreements to minimize upstream developments	Participation of Angola and Namibia in the joint management of the Okavango basin	Monitoring reports compiled by DWA	DEA & DWA	Annual	Hydrological data	Review of annual reports
I.3.4	DWNP to mount awareness campaign to reduce the negative ecological impacts of tourism activities in the ODRS	Reduced negative ecological impacts	Baseline information on impacts	DWNP Annual Reports	DWNP	Annual	Impacts	Review of annual reports

Appendix II. 5: Plan for Monitoring for Changes in the Bio-physical Thematic Area

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.1 To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them.								
ID	Operational Objectives	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
B.1.1	DWA to improve the water quality and sedimentation monitoring	Increased coverage and frequency of water quality and sediment monitoring	Number of additional measuring sites Monitoring data	Hydrological Year Book Hydrological database Annual reports	DWA	Annual	Monitoring data	Review of records in the databsae
B.1.2	DWNP to carry out baseline surveys on keystone species	Improved baseline information on keystone species	Number of baseline studies	Research reports Journal articles Survey reports	DWNP and HOORC	Annual	Data on the species	Literature review and reports
B.1.3	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary	Gazzettement of Lake Ngami as a non-hunting area	Gazette document	Government gazette Annual reports	DWNP	One-off	Hunting incidents	Review of reports
B.1.4	DWNP to protect existing and potential breeding sites for the slaty egret	Protected sites	No of protected sites	DWNP Reports	DWNP	Annual	Protected sites	Review of reports
B.1.5	DWNP to develop and implement fish stock monitoring programme	Improved fish stock data	Fish stock data	Database on fish stocks DWNP Reports	DWNP	Annual	Protected sites	Review of reports

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it								
Strategic Objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta.								
ID	Operational Objectives	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
B.2.1	DFRR to reduce the impact and frequency of uncontrolled veld fires.	Reduction in impacts and frequency of un controlled veld fires	Level of impact of uncontrolled fires Frequency of uncontrolled veld fires	Annual reports	DFRR	Annual	Number of uncontrolled fires Area burned each year	Review of reports and remote sensing imagery
B.2.2	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats	Reduction in impacts caused by fire and large herbivores	Level of impact of uncontrolled fires	Monitoring reports	DWNP, DFRR	Annual	Impacts	Review of monitoring reports
B.2.3	DAHP to reduce overgrazing in the ODRS	Reduction in overgrazing	Range resources condition	DFRR Range Resources reports	DFRR	Annual	Range conditions	Review of reports
B.2.4	To reduce the risk of re-infestation by promoting tsetse free zones in neighbouring countries	Tsetse free zone	Area of tsetse eradication	Annual Tsetse Monitoring Reports	DAHP	Annual	Tsetse status	Review of reports

Appendix II. 6: Plan for Monitoring for Changes in the Socio-economic Thematic Area

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders								
Strategic Objective 3.1: To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders.								
ID	Operational Objectives	Indicator	Means of verification	Sources of information	Who will collect	Frequency	Baseline	Tools for collecting information
S.1.1	DEA to undertake estimation of non-use economic values for the ODRS	Improved Economic value of the Delta	Comprehensively reflects direct and indirect use values	Economic Valuation report	DEA	Periodic review of the ODMP	Economic values	Review of economic valuation reports
S.1.2	DoT to monitor and mitigate the impact of tourism in the ODRS	Reduction in negative impacts of tourism	Level of impacts	Annual reports Tourism monitoring information system	DoT	Annual	Level of impact Publicity materials	
S.1.3	DFRR to develop regulations for sustainable use of vegetation resources	Vegetation resources permits and levies developed and operational	Permits and levies	Annual reports	DFRR	Annually	Records of permits and levies	Review of annual reports
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders.								
S.2.1	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation	HIV/AIDS, Gender and Poverty issues incorporated	No of plans and programmes incorporating HIV/AIDS, Gender and Poverty	ODMP Departmental Reports	DEA	Annually	Status on HIV/AIDS, Gender and Poverty	Review of annual reports
S.2.2	DWA to manage small channel blocks primarily for communities access to livelihood activities.	Improved access to means of livelihoods	Extent of areas easily accessible	DWA annual reports	DWA and DEA	Annual	Blocked channels	Review of annual reports
S.2.3	DWNP to assess and mitigate the human/wildlife conflicts	Reduced incidents of human/wildlife conflicts by 30 percent	Number of incidents reported and verified by DWNP	Annual reports	DWNP	Annual	Conflict incidents	Review of annual reports
S.2.4	DoT to develop and implement strategies to enhance citizen participation in the tourism	Improved citizen participation in the tourism sector	Level of citizen participation in tourism enterprises	Licences, annual reports	DoT, NWDC	Annual	Citizens participation	Review of licences and reports

	sector							
S.2.5	DoT to develop and implement strategies for tourism product diversification	Diversified tourism products	Number of tourism product lines	Annual reports	DOT and NWDC	Annual	Product lines	Review of annual reports
S.2.6	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected	Traditional access to natural resources improved	Level of tradition access	Lease inspection reports	TLB	Quarterly	Traditional access rights	Review of lease inspection reports
S.2.7	DAH to develop programmes for the reduction of livestock/wildlife conflicts.	Reduction in conflicts	No of conflicts	Annual Reports	DAHP	Annually	conflicts	Review of annual reports

APPENDIX III: ASSESSING IMPACTS OF THE ACTION PLANS, MITIGATION MEASURES OF HOW TO ADDRESS THEM AND SUSTAINABILITY CRITERIA

Appendix III. 1: Assessing Impacts of the Action Plans, Mitigation Measures of how to address them and Sustainability Criteria for Institutional Thematic Area

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level						
Strategic Objective 1.1 To establish viable management institutions for sustainable management of the Okavango Delta ecosystem						
ID	Key issues	Operational Objective	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
I.1.1	There is need to establish a regional DEA office in ODRS and strengthen its capacity to coordinate and monitor the implementation of the ODMP.	DEA to strengthen the capacity of the ODRS DEA office to coordinate and monitor implementation of the ODMP.	DEA to complete the recruitment of the regional office staff.	• Improved coodination by DEA in the implementation of ODMP • Influence of DEA may not be felt in outlying areas of ODRS and Ngamiland District • Staff turn-over will hamper implementation of the plan	• DEA presence to be expanded to sub-district level • Plan to address staff turn-over needs to be put inplace	• DEA staff to be trained in critical relevant skills to the management of the ODMP such as ecosystem approach, economic valuation and strategic environmental assessment • Staff conditions should be guided by strategic goals and objecives set out by the repective department with regard to retaining staff
			DEA to prepare and sign a memorandum of agreement with HOORC for HOORC to provide technical support during ODMP implementation.	Technical sound implementation of the ODMP	Financila resources needs to be availed by MEWT to ensure the agreement is implemented	Use of the best available expertise and knowledge required for the management of the ODRS
I.1.2	There is need to build the capacity of communities for delivering management and sustainable use of natural resources	NWDC to strengthen the capacity of the communities in the management and sustainable use of the natural resources.	Assess the capacity of communities to manage CBNRM programmes	Improvement and understanding of sustainable management practices in the Delta	• Clear strategy for identifying beneficiaries and clear programme for implementation has to be developed • The programme has to be clearly communicated to the communities • Mobilisation strategies have to be developed and tested before implemetation	• Communities trained are well represented in terms of gender, age, ethnic diversity and social responsibilities • Aspects for capacity building should be focused on critical areas such as basic environmental management systems and financial accounting • The capacity building programmes should have a provsion of r long-term mentoring
			Develop and implement capacity building programmes	• Differential implementation of capacity building programme may make some communities to feel left out, • Poor turn out in programmes may hamper implementation • Programme may conflict with existing commuinities activities to sustain		

				livelihoods		
I.1.3	Manpower capacity of the fisheries division needs to be addressed	DWNP to improve the manpower capacity in the Fisheries Division to sustainably manage the fish resources by 2012	Rationalization of DWNP positions to increase capacity of the Fisheries Division. Train existing rationalized staff	Improved management of the fisheries resources Staff turn-over may hamper implementation of the programmes	Plan for reainig staff should be put in place	Staffing conditions should be guided by strategic goals and objectives set out by respective department with regard to retaining staff Guidelines developed for the management should be used at all times
I.1.4	The solid waste collection services within the ODRS need to be improved.	NWDC to improve solid and liquid waste collection within the ODRS	Engage private sector to collect and dispose solid and liquid waste in settlements Ensure tour operators comply with provisions of waste management as contained in the lease agreement	• Improved waste management system • Poor supervision and payment of contractors may result accumulation of waste Lack of monitoring may not significantly improve status	• Adequate financial resources should be made available for waste management • Before outsourcing NWDC should assess those waste management aspects they are able to adequately provide to reduce the financial burden	Waste management practices should be in accordance with waste management and sanitation master plan A clear timetable for monitoring should be developed to ensure tour comply with provisions
I.1.5	The solid and liquid waste infrastructure in the ODRS needs to be improved.	NWDC to improve the solid and liquid waste infrastructures in the ODRS	Operationalise Maun landfill site through procurement and installation of outstanding equipment To construct a landfill site in Gumare To increase temporary storage facilities in all settlements	Impacts related to operation of landfill such as leachate, gas emmissions, smell and air polllution Impacts related to construction and operation of land fill Additional storage facilities	EIA to be used to manage impacts	Landfill to operate in accordance with the EIA Act, Waste Management Act and Waste and Sanitation Master Plan.
I.1.6	The institutional capacity of the district waste management needs to be improved	NWDC to improve the institutional capacity of the district waste management.	Increase operational technician staff compliment from 6 to 8 by rationalising existing positions.	• Improved waste management • Increased financial obligations	• Qualified and skilled personnel to be recuited in to those posts • Proper incentives to retain staff	Well trained and equiped staff

ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
I.2.1	There is need to harmonize legislation and policies applicable to the ODRS.	DEA to facilitate the process of harmonizing legislation and policies applicable to ODRS	Carry out high level consultations with the affected government ministries on how to implement policy harmonisation recommendations Facilitate implementation of policy harmonisation strategy	Efficient management of the ODRS Lack of political will to undertake harmonisation	Relavant politicians have to be lobbied to enable speedy review of existing legislation	Policy and legislation review should achieve the following: • Reducing adverse effects on natural resource base • Upholding the pricipless of wise use • Upliftment of livelihoods • Develeopment of management responsibiliites at all critical levels • Promotes a balance amongst social, economical and ecological aspects of development • Appreciation of local values/knowledge • Sound legislative backing
I.2.2	There is need to ensure that plans, programmes and development activities in the ODRS are guided by a common and shared vision for the ODRS.	DEA to ensure that the common and shared vision of the ODRS guides the planning and programmes in the ODRS during the ODMP implementation	Fully integrate the vision during the implementation of the Okavango Delta Management plan and related planning and management processes	Sustainable management of the ODRS resources Lack of clarity on how to integrate vision, goal into plans and programmes	All plans and programmes being implemented in the ODRS should be guided by the ODMP vision and goals	Vsion and SEA should be used to guide plans and programmes implemented in the Delta
I.2.3	There is need to facilitate the approval of Draft National Wetlands Policy and Strategy not by Parliament.	DEA to facilitate approval of the Draft National Wetlands Policy and Strategy	Prepare a cabinet memo for Policy approval	Sustainable management of the ODRS system		

Strategic Goal 1: To establish viable institutional arrangements to support integrated resource management in the Okavango Delta at local, district level, national level and international (River Basin) level						
Strategic Objective 1.2: To improve the planning and regulatory frame work for sustainable management of the Okavango Delta ecosystem						
ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
I.2.4	Difficulties in obtaining, updating and accessing existing information for resource planning and management in the ODRS need to be addressed.	HOORC to improve accessibility and updating of data and information for resources planning and management	Improve internet connectivity in all govt. depts.	Improved information availability on the ODRS Lack of financial resources might delay implementation of the programme	Financila resources need to be made available to allow implementation of the programme	An easily accessible, affordable and internet based system A standardised data and information system
			Create information and data (ODIS/Library) accessibility through the web	Gaps in data reduces effectiveness of availbale data	Data gaps need to be highlighted and incentives offered to collect missing data	
I.2.5	Research in the ODRS needs to be coordinated.	HOORC to implement the recommendations of the Research Strategy	To establish the Research Advisory Group	Improved coordination in research Bias in research can marginalise some issues	Research Advisory Group needs to be multi-sectoral and multi-disciplinary	A representative Advisory Reasrch Group capable of advising on different research needs
			To develop and implement research strategy action plan	An implementable ODMP research strategy	Action plan needs to be widely communicated	Reliable information generated through research made available to managers
I.2.6	The long standing problem of fisheries conflicts need to be resolved.	DWNP to put in place fishery conflict resolution mechanisms	Finalise and operationalise fisheries regulations	Aspects of fisheries management might not be addressed by the regulations Lack of information amongst stakeholderson the guidelines	Ensure wide consultations on the regulations	Regulations should incorporate sustainable fisheries management practices
			Revive Ngamiland Fishermen Association			
I.2.7	Haphazard and delays in land allocations as well as poor record keeping need to be reduced.	TLB to allocate land in an orderly and timely manner through the use of a land management database.	Implement guidelines for land allocation as contained in the Integrated Land Use and Management Plan of 2005	Lack of information among stakeholders on the guidelines	Ensure uidelines are communicated adequately to stakeholders	Sustainable land use management guidelines which are adequately communicated to stakeholders
			Develop land management database	Lsck of standard format result in different data sets being collected	Standardise data collection and storage format	Standardised data sets for land managment

ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
I.3.1	There is need to establish effective communication amongst ODMP stakeholders at all levels during plan implementation.	DEA to promote effective communication amongst stakeholders.	Finalise and operationalise Communication strategy	Existence of communication strategy will improve awareness of the ODRS issues	The strategy should be well resourced for it to be implemented	Communication strategy should be comprehensive The strategy should stakeholders and all media for communicating to different stakeholders and adequate consultations should be carried on the same
I.3.2	Uncertainties about stakeholders continued meaningful participation in the implementation of the ODMP	HOORC to provide participatory services to the ODMP implementing institutions.	Engage stakeholders on a continuous basis through participatory methods	Possible emergence of lobby groups and special interest groups who might delay implementation of ODMP Possible ommission of peripheral groups during consultations	Adequate consultations need to be carried out to address ermerging issues	Stakeholders meetings have to be inclusive and representative
I.3.3	There is need to continue to engage Namibia and Angola in the sustainable use of the Okavango River Basin.	DEA to facilitate engagement of Angola and Namibia through the OKACOM process.	Engage Namibia and Angola on the sustainable use of the Okavango Delta through the OKACOM platform	Improved regional cooorperation on ODRS issues Raising country specific issues might derail implementation of ODMP	Engaging regional neighbours has to be undertaken as early as possible in the implementation of ODMP	Communication strategy should identify need to consult regional players and levels of consultation to be carried out.
I.3.4	The limited awareness of the ecological impacts of tourism activities in the ODRS need to be addressed.	DWNP to mount awareness campaign to reduce the negative ecological impacts of tourism activities in the ODRS	Develop and disseminate tourist educational information and publicity materials	Improved knowledge of tourism impacts Possible emergence of lobby groups and special interest groups who might delay implementation of ODMP	Adequate consultations need to be carried out to address emerging issues	Stakeholders meetings have to be inclusive and representative

Appendix III. 2: Assessing Impacts of the Action Plans, Mitigation Measures of how to address them and Sustainability Criteria for the Bio-Physical Thematic Area

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it						
Strategic Objective 2.1 To conserve the biotic and abiotic functions of the Okavango Delta, and the interactions between them.						
ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
B.1.1	Water quality and sedimentation monitoring needs to be improved	DWA to improve the water quality and sedimentation monitoring	Increase the frequency and monitoring sites.	Improved monitoring improves knowledge on the trends on water quality	Develop partnerships to overcome deficiencies in resources	In addition to monitoring presented in the ODMP, consideration should be given to monitoring criteria proposed in the Draft Environmental Guidelines, especially developing a reporting structure and feedback mechanism to enhance implementation of mitigation measures
B.1.2	There is need to carry out baseline surveys on keystone species.	DWNP to carry out baseline surveys on keystone species	Improve baseline information on the Leopard, Cheetah and Slaty egret	• Improved knowledge on the said species • The baseline survey might require mobilisation of huge resources	• Develop partnerships to overcome deficiencies in resources • Proactive engagement of independent researchers • Implementation of the Research Strategy and Monitoring Action Plan	Sound scientific criteria for survey to be developed to ensure representative results/samples
			Carryout baseline surveys on the African Skimmer, Sitatunga, small mammals, amphibians, Hippos, reptiles and Invertebrates	• Improved knowledge on the said species • The baseline survey might require mobilisation of huge resources		
B.1.3	Lake Ngami needs to be declared a bird sanctuary	DWNP to facilitate the designation of Lake Ngami as a bird sanctuary	Engage with communities to build consensus to designate Lake Ngami as a non-hunting area Engage with policy makers to put in place the necessary legal instruments	Increased touris arrivals to watch birds Improved conservation of species at the lake Impacts related to increased tourists	Emphasis should continue to be put on high value low volume tourism	The lake should be managed in accordance with natioanal parks requirements and BirdLife International's Important Bird Area guidelines Follow regioanl and international guidelines for development of a sanctuary
B.1.4	The existing and potential breeding sites for slaty egret need to	DWNP to protect existing and potential breeding sites for the slaty egret	Protect existing breeding sites and those which will be identified during ODMP	Increased numbers and performance of the Slaty egret	Adequate consultation and communication regarding this activitiy	The sites need to be incorporated into the Integrated Land Use Plan for the ODRS

	be protected.		implementation	Enhancement of ecological status of the ODRS Impacts related to increased number of tourists	should be developed	
B.1.5	The inadequacy of base line data on fish stocks in the ODRS needs to be addressed.	DWNP to develop and implement fish stock monitoring programme	Undertake regular fish monitoring surveys and collect catch data from fishers	Improved knowledge on the fish stocks opf the ODRS	Data collected should be periodically made available to natural resource managers to improve knowledge and initiate review of management systems	

Strategic Goal 2: To ensure the long-term conservation of the Okavango Delta and the provision of existing ecosystem services for the benefit of all the organisms depending on it						
Strategic Objective 2.2: To maintain or restore the wetland habitats and ecosystems of the Okavango Delta						
ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
B.2.1	There is need to reduce the impact and frequency of uncontrolled veld fires.	DFRR to reduce the impact and frequency of uncontrolled veld fires.	Implement the guidelines relevant on appropriate fire management practices as contained in the Fire Management Plan	Reduction in the negative impacts of uncontrolled fires in the ecosystem Some sections of the society may not be aware of the existing guidelines of use of fire	Implement the ODRS Fire Management Strategy Wide consultation and communication of the strategy	Develop feedback mechanisms to improve guidelines/fire management strategy
B.2.2	Limited knowledge on the impact of large herbivores on sensitive habitats	DWNP to assess and mitigate the impact of large herbivores on sensitive habitats	Assess the extent of the impact of large herbivores on sensitive habitats Develop limits of acceptable change for sensitive habitats in the Moremi Game Reserve Monitor defined parameters to ensure limits are not exceeded and institute corrective measures	Improved knowledge on the impacts of herbivores on sensitive environments	Implementation of elements of the Research Strategy and Monitoring Action Plan	Sound scientific methods for conducting research to have reliable results
B.2.3	Overgrazing by livestock needs to be addressed	DAHP to reduce overgrazing in the ODRS	Carry out biomass assessment Develop and implement the range carrying capacities	Improved rangeland management Resistance from farmers on proposed strategies	Adequate communication with farmers before implementing rangeland carrying capacities Develop alternative livelihoods systems Mechanisms which	Implementation of carrying capacities should be guided by the provision of alternative livelihood systems which are sustainable The programme should be guided by the objective of reducing poverty levels

					enable farmers to easily dispose off their livestock at the market rates should be put in place	
B.2.4	The risk of Tsetse re-infestation needs to be reduced.	DAHP to reduce the risk of Tsetse re-infestation by promoting dialogue with Angola, Namibia and Zambia to create a tsetse free zone.	Undertake dialogue with Angola, Namibia and zambia to create tsetse free zone	Reduced re-infestation by Tsetse fly Reduced impact of tsetse fly on livestock sector and human health	Continuos monitoring of the areas where tsetse fly has been eradicated Expansion of the tsetse fly free zones into the neighbouring countries	Any eradication programmes should be preceded by an EIA study and recovery monitoring programme should be budgeted as part of the operation

Appendix III. 3: Action Assessing Impacts of the Action Plans, Mitigation Measures of how to address them and Sustainability Criteriafor Socio-Economic Subsystem

Strategic Goal 3: To sustainably use the natural resources of the Okavango Delta in an equitable way and support the livelihoods of all stakeholders.						
Strategic Objective 3.1: To sustainably use the wetland resources of the Okavango Delta for the long-term benefit of all stakeholders						
ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
S.1.1	There is need to establish the non-use economic values for the ODRS	DEA to undertaken estimation of non-use economic values for the ODRS	Carryout assessment of non-use values Carryout further assessment on direct and indirect values	Improved knowledge on economic value of natural resources	Valuation should include comparison of different possible scenarios which might affect the management of natural resources in the Delta	Methodology should allow for ranking of resources including possible scenarios
S.1.2	There is need to address the possible impacts of tourism activities on the ODRS ecosystem.	DoT to monitor and mitigate the impact of tourism in the ODRS	Determine the carrying capacity and limit of acceptable change for the tourism activities in the Delta	Knowledge on thresholds on carrying capacity enhanced Possible information on carrying capacities might dissuade investors in the tourism sector	Information on thresholds should be complemented by relevant policies and legislation Stakeholders should be adequately consulted on any policy formulated in this regard	Policies for sustainable tourism management should be guided by survival of the Delta, as well as mantaining sustainable livelihoods in the Delta
S.1.3	Sustainable use of vegetation resources need to be addressed	DFRR to develop regulations for sustainable use of vegetation resources	Carry out an assessment of vegetation use and users as well level of use. Determine levels of levies in consultation with the communities. Carry out a pilot project to test this management option	Encourage sustainable management of vegetation resources	Develop alternative to vegetation resources	Sustainable monitoring mechanisms should be followed as outlined and also develop feedback mechanisms

Strategic Objective 3.2: To improve livelihoods of the Delta stakeholders through improved socio-economic opportunities						
S.2.1	Cross-cutting issues such as HIV/AIDS, Gender and Poverty need to be mainstreamed into the ODMP process	DEA to prepare and implement guidelines for sectors to streamline HIV/AIDS, Gender and Poverty during ODMP implementation	Prepare mainstreaming tools	Potential impact	Mitigation measure	Sustainable criteria
			Hold stakeholder workshop for sectors on utilisation of the tools	Improved awareness on cross-cutting issues of gender, poverty, HIV and AIDS Programmes initiated could reduce poverty, HIV and AIDS and address gender issues Some sections of the communities might be left out	Implement economic projects to address issues Implement gender, poverty and HIV and AIDS mainstreaming tools	Programmes should aim at providing sustainable livelihoods to affected and infected groups
			Monitor the implementation of the guidelines			Develop sustainable indicators
S.2.2	The need to manage channel blockages to sustain communities access to livelihood activities	DWA to manage small channel blocks primarily for communities access to livelihood activities.	Undertake EIA on areas of channels blockages	Sustainable management of blockages Restoration of threatened livelihoods		EIA Act

Strategic Goal 3: To sustainably use the Delta resources for improvement of livelihoods of all stakeholders that are directly and indirectly dependent on the ecosystem products and services of the Okavango Delta (and associated dry lands) in an equitable way.						
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders						
ID	Key Issues	Operational Objectives	Critical Activities	Potential impact	Mitigation measure	Sustainable criteria
S.2.3	The human/wildlife conflicts continue to be a problem and need to be addressed.	DWNP to assess and mitigate the human/wildlife conflicts	Identify hotspots for human elephant conflicts Determine and implement mitigation measures Develop the comprehensive framework for monitoring of predators Undertake spoor survey Determine and implement mitigation measures Develop problem animal control policy (National Wildlife Conflict and Strategy)	• Human/elephant conflict phenomena better understood • Loss of livelihood sources through buffering of some areas to separate wildlife and human activities • Problem animal control can upset can upset family structure of animals which is not well understood • PAC could be done at unsustainable levels	• Develop alternative livelihood sources for communities in the Delta seriously affected by wildlife incursions • Compensation mechanism need to be developed for any loss of access to natural resources • PAC should only be used as a last resort. Other mechanisms for chasing animals need to be explored	• Trade-offs to be developed on long-term survial of the Delta against sustainable livelihoods of Delta communities • Monitoring should have • PAC should be informed by population data on other predators and other wildlife
S.2.4	The level of citizen participation in the tourism sector needs to be improved.	DoT to develop and implement strategies to enhance citizen participation in the tourism sector	Determine strategies for citizen empowerment in the tourism sector Review CBNRM programme with the view of enhancing citizen participation Implement the citizen empowerment strategies and improved CBNRM programme.	• Citezens benefit more from utilisation of natural resources • Possible disinvestment from tourism industry by international players who feel threatened • Increased need for training of citizen entrepeneurs	• International investors need to be assured of the security of their investment • Responsive programmes for ciotezen entrepeneurs need to be developed and implemented	• Citezen empowerment should be guided by transparency and fairness and the need for equitable distribution of resources • Programmes developed should equip entrepeneur with relevant skills that emphasisze sustainable programmes in the Delta
S.2.5	The tourism products need to be diversified from being wildlife based to other areas.	DoT to develop and implement strategies for tourism product diversification	Determine strategies for tourism diversification Implement strategies for tourism diversification	• Proliferation of impacts from different activities being implemented in the Delta • People might be forced to engage in peripheral activities in the name of diversification	• SEA needs to be undertaken for those programmes and activities identified for implementation followed by project specific EIAs • Techniques such as cost benefit analysis should be used to evaluate potential projects for implementation	Projects to be implemented need to be evaluated aginst environmental, technical and financial feasibility and should be critical in addressing gender concerns, HIV and AIDS and reduce poverty

Strategic Goal 3: To sustainably use the Delta resources for improvement of livelihoods of all stakeholders that are directly and indirectly dependent on the ecosystem products and services of the Okavango Delta (and associated dry lands) in an equitable way.						
Strategic Objective 3.2: To develop socio-economic opportunities to improve livelihoods of the Okavango Delta stakeholders						
				Potential impact	Mitigation measure	Sustainable criteria
S.2.6	Traditional access rights to natural resources in concession areas need to be upheld.	TLB to ensure that traditional access rights to natural resources for subsistence in concession areas are respected	Carry out inspections to ensure that traditional access rights contained in the lease agreements are respected	• Improved access by communites to natural resource utilisation • Lack of awareness by some communities of their traditional access rights • Poor communities can be bought out by rich individuals forfeiting their rights	• Community awareness programmes should be implemented to ensure communities are not denied their access rights • Review relevant sections of the lease agreement to address loopholes	Traditional rights should maintain fair and equitable access by all those conerned
S.2.7	The livestock/wildlife interactions need to be reduced.	DAH to develop programmes for the reduction of livestock/wildlife conflicts.	Improve maintenance of veterinary fences Mount public awareness on livestock disease control strategies Assess feasibility of providing livestock watering points in sand veld areas.	• Fragmentation of ecological habitiats • Cutting animals to traditional watering places and migratory routes	• Large areas or buffers should be mainained where possible and new fences should be only be preceded by a full EIA study • Promote the undertaking of appropriate activities in such areas such as CBNRM	Fencing and other livestock production programmes should respect the integrity of ecosystems