**STRATEGIC ACTION PROGRAMME (SAP)**

**FOR**

**THE SUSTAINABLE DEVELOPMENT AND MANAGEMENT OF THE OKAVANGO RIVER BASIN**

**Okavango River Basin Water Commission**

**Approved .......................**

**Disclaimer:**

A number of the studies, researches and preparatory works from which the Strategic Action Programme benefited were conducted with the support provided by International Partners to the Okavango River Basin Water Commission, the findings and the conclusions of the document however are those of the adopting parties and do not necessarily reflect the policies or opinions of the International Partners including UNDP and FAO .

**List of Abbreviations**

AIDS **A**cquired Immunodeficiency Syndrome

CCA: Causal Chain Analysis

EIA: Environment Impact Assessment

EQO: Environmental Quality Objective

DSS: Decision Support System

EA: Environmental Assessment

EIA: Environmental Impact Assessment

EPSMO Environmental Protection and Sustainable Management of the Okavango River Basin

FAO: Food and Agriculture Organisation (of the United Nations)

GIS Geographic Information System

QS Environment Quality Standard

ESI: Environment Status Indicator

Espoo: Convention on Environmental Impact Assessment in a Transboundary Context (Espoo)

GEF: Global Environment Facility

GIS: Geographical Information System

HIV: Human immune Deficiency Virus

HOORC: Harry Oppenheimer Okavango Research Centre

IBRD: International Bank for Reconstruction and Development

IDA: International Development Association

IFA: Integrated Flow Assessment

HDI: Human Development Index

IWRM: Integrated water resources management

MPPI: Major Perceived Problem and Issue

NAP: National Action Plan

NBSAP National Biodiversity Strategy and Action Plan

NCU(s) National Coordinating Unit(s)

NCS: National Coordination Structure

NGO: Non Governmental Organization

OBSC: Okavango Basin Steering Committee

ODMP: Okavango Delta Management Plan

OKACOM: Permanent Okavango River Basin Water Commission

ORB: Okavango River Basin

OWMC: Okavango Wetlands Management Committee

PI: Process Indicator

PIP: Priority Investment Project

RWP: Regional Water Policy

RWS: Regional Water Strategy

SADC: Southern Africa Development Community

SAP: Strategic Action Programme

SAP: Strategic Action Programme

SRI: Stress Reduction Indicator

TDA: Transboundary Diagnostic Analysis

UNCBD: United Nations Convention on Biological Diversity

UNCCD: United Nations Convention on Combating Desertification

UNDP: United Nations Development Programme

UNFCCC: United Nations Framework Convention on Climate Change

UNDP: United Nations Development Programme

**Strategic Action Programme for the Okavango Basin**

**Section 1: Introduction**

* 1. **The Okavango basin and its institutions**

The Okavango River Basin remains one of the watersheds least affected by human impacts on the African continent. In its present near-pristine status, the river provides significant ecosystem benefits and will continue to do so if managed appropriately. However, mounting socio-economic pressures on the basin in the riparian countries, Angola, Botswana and Namibia, could change its present character. Maintaining the river’s benefits requires agreement over the sharing of both the benefits and associated liabilities through joint management of the basin’s natural resources.

The river rises in the headwaters of the Cuito and Cubango Rivers in the highland plateau of Angola, where it derives its principal flow from the sub-humid and semi-arid rangeland in the Cuando-Cubango Province, before flowing boundaries of Namibia and Angola and finally spilling into the Okavango fan or ‘Delta’ in Botswana. Geological features at the margins of the fan direct the remaining flow into a set of evaporation pans in the Kalahari Desert. The Okavango Basin also includes a substantial area of fossil rivers which are hydrologically inactive, and other rivers that have headwater flows but it is unknown how they contribute to flows in the Okavango River. Figure 1 indicates the topographic system boundary for the basin. Contributing areas are indicated in Tables 1 and 2.

The water quality of the Okavango River is believed to be good; the waters are relatively clear with few dissolved chemicals, solutes or pollutants. The riparian landscapes along many of the waterways are largely unchanged with natural plant and aquatic life remaining healthy. The river supports people, their livestock and a myriad of livelihoods ranging from artisanal fisheries to small scale agriculture, as well as diverse wildlife. The Okavango Delta, a unique ecosystem, is a significant source of tourism income and cultural value to its people.

The generally low level of economic development associated with the Okavango is a by-product of history and geopolitics. The current situation offers the riparian countries of the Okavango an opportunity to choose a development pathway for the basin without compromising the set of environmental goods and services, including global benefits, distributed across the whole basin.

Established in 1994 by the “Agreement between the Governments of the Republic of Angola, the Republic of Botswana and the Republic of Namibia on the Establishment of a Permanent Okavango River Basin Water Commission” ( OKACOM) The Commission serves as technical advisor to the Parties on matters relating to the conservation, development and utilization of water resources of common interest. The OKACOM Agreement determines the issues for which OKACOM is mandated to advice the Parties on:

* Measures and arrangements to determine the long-term safe yield of the water available from all potential water resources in the Okavango River Basin;
* The reasonable demand for water from the consumers in the Okavango River Basin;
* The criteria to be adopted in the conservation, equitable allocation and sustainable utilization of water resources in the Okavango River Basin;
* The investigations, separately or jointly by the Contracting Parties, related to the development of any water resources in the Okavango River Basin, including the construction, operation and maintenance of any water works in connection therewith;
* The prevention of the pollution of water resources and the control over aquatic weeds in the Okavango River Basin;
* Measures that can be implemented by any one or all the Contracting Parties to alleviate short term difficulties resulting from water shortages in the Okavango River Basin during periods of drought, taking into consideration the availability of stored water and the water requirement within the territories of the respective Parties at that time;
* Such other matters as may be determined by the Commission.

**Figure 1: Okavango topographic basin limits, sub-basin areas and administrative units**

In April 2007 the three Parties concluded the “Agreement between the Governments of the Republic of Angola, the Republic of Botswana and the Republic of Namibia on the Organisational Structure of OKACOM” (hereafter OKACOM-Structure Agreement) which establishes the organs of OKACOM as

* The Commission,
* The Okavango Basin Steering Committee (OBSC); and
* The Secretariat,

The Commission is the principal organ responsible for defining and guiding policy and for the general supervision of the activities of OKACOM. The OBSC is the technical advisory body to the Commission whereas the Secretariat is responsible for providing administrative, financial and general secretarial services to OKACOM. In particular the OKACOM Secretariat has the mandate to ensure that:

1. OKACOM decisions are well informed, based on a well-prepared analysis of the alternatives and relative costs and benefits; and once taken, are implemented in a timely and effective manner.
2. All relevant actors are aware of the sources of information about the basin and that these sources of information match the present and future needs for information.
3. All relevant actors are aware of, respect and understand the operations of the other actors in the basin, thus minimising communicational barriers to cooperation.

Thus, at present the Secretariat fulfils an administration, communication and information management role. This role of the Secretariat could potentially be expanded in the future to a broader monitoring, coordination and possibly even project management and execution role.

The OKACOM Structures Agreement defines the functions of the three organs in significant detail, together with regulating other procedural matters relevant for the functioning of OKACOM such as financing, working language and communication. Article 7(n) permits the Commission to establish *ad hoc* working groups or specific temporary or permanent committees. This has been made use of by the Commission and at present three Task Forces have been established, namely a Biodiversity Task Force, a Hydrology Task Force and an Institutional Task Force. The OKACOM Agreement, the Southern African Development Community Revised Protocol on Shared Watercourses and the 1997 UN Convention on the Law of the Non-navigational Uses of International Watercourses provide a framework for cooperation between the three basin states. In the future, under the revised SADC protocol on shared water resources, there is the potential of developing a basin Framework Convention.

The OKACOM Agreement commits the three member states to promote coordinated and environmentally sustainable regional water resources development, while addressing the legitimate social and economic needs of each of the riparian states. Under the OKACOM Agreement, the riparian countries must work towards the implementation of an Integrated Management Plan (IMP) for the basin on the basis of an Environmental Assessment (EA); this requirement has been addressed through the development of a Transboundary Diagnostic Analysis (TDA) and the current Strategic Action Programme (SAP).

In addition to their commitments under the OKACOM Agreement the three states are committed to meeting the UN Millennium Development Goals and pursuing and implementing the concept of Integrated Water Resource Management, both arising from the Johannesburg World Summit of Sustainable Development. These commitments include the preparation of national Integrated Water Resource Management Plans.

* 1. **The EPSMO project**

Funded by the Global Environmental Facility, the Environmental Protection and Sustainable Management of the Okavango River Basin ESPMO project was designed to help OKACOM fulfill its mandate and to prepare ‘an Integrated Management Plan (IMP) on the basis of an Environmental Assessment (EA)’. Its origin lies with the formation of OKACOM in 1994.

The long-term objective of the EPSMO Project has been to achieve global environmental benefits through concerted management of the naturally integrated land and water resources of the Okavango River Basin. The specific objectives of the project are to:

* Enhance the depth, accuracy and accessibility of the existing knowledge base of basin characteristics and conditions and identify the principal threats to the transboundary water resources of the Okavango River Basin through a Transboundary Diagnostic Analysis (TDA)
* Develop and implement, through a structured process, a sustainable and cost-effective programme of policy, legal and institutional reforms and investments to mitigate the identified threats to the basin’s linked land and water systems through the Strategic Action Programme(SAP)
* Assist the three riparian states in their efforts to improve their capacity to collectively manage the basin.

The TDA identified five emerging areas of concern in the basin:

## Changing flow regimes

## Changes of land-use

## Water quality changes

## Changes in abundance and distribution of biota

## Changes to livelihood options

One of the principle challenges of the basin states will be to establish a management framework to address these issues as they emerge over the next ten to twenty years and ensure that development of the Okavango’s natural resources is undertaken in a sustainable manner.

**1.3 The need for and purpose of the SAP**

The SAP is a basin-wide policy framework document that lays down the principles of natural resource management and cooperation; notes the challenges to the sustainable integrated management of the Okavango basin; sets the regionally agreed Sustainable Management Objectives to address governance in the five areas of concern in a transboundary context and proceeds to define a set of targets,, interventions and indicators to meet these objectives. The SAP also highlights the financial resource for the implementation of the priority actions for the next 5+5 years (approximately 2011-2021).

The SAP is designed for voluntary adherence by the Okavango basin states and its contents are supported by and in accordance with their national development plans and NAPs, with appropriate support from the International Partners. Such voluntary adherence will promote cooperative and coherent action for safeguarding the environment of the Okavango basin and for advancing the sustainable and equitable use of its water resources.

Implementation of the SAP is the responsibility of the basin states independently as component of their NAP, and collectively as part of OKACOM. . Okavango Basin Steering Committee (OBSC) is the primary body for overseeing the implementation of the SAP and coordinating the activities under the different SAP programme areas, with the assistance of the OKACOM secretariat as well as maintaining adequate linkages with relevant organisations at the national level. The pivotal role of OBSC and the secretariat in SAP coordination is recognized and these bodies will require considerable capacity strengthening, something which has been addressed in the SAP itself.

The SAP is a med-term planning document which is designed to be reviewed and recast every 5 years alongside the TDA and the NAPs. The longer term over-arching vision for the Okavango which has not yet been agreed and will be formulated as part of the SAP process, is a clear representation of the characteristics desired for the future environment linked to an agreed ‘ Development Space’ for the Okavango basin.. The long term vision is a political objective to be achieved within a twenty year time-frame and is designed to inspire the peoples of the Okavango and their leaders.

**1.4 The Geographic Scope of the SAP**

This Strategic Action Programme applies to the priority areas of the Okavango River Basin as defined by OKACOM. Any interventions in areas outside the OKACOM defined priority area but inside the hydrologically defined basin area within the OKACOM Member States will be addressed in the countries’ respective National Action Plan (NAP).

[Map and description of priority area to be inserted – needs to be provided by OKASEC].

**1.5 Principles of environmental management and cooperation**

The three riparian states share a common desire for the sustainable management of the natural resources and biodiversity of the for the benefit of present and future generations, and recognize their role and responsibility in conserving the global value of the biodiversity resources. The riparian states have considered and taken into account, where appropriate, the following principles and values when developing this document.

1.5.1 The principle of **sustainable development** shall be applied in accordance with the UN Millennium Development Goals, such that there is a prudent and rational utilization of living resources and the preservation of the rights of future generations to a viable environment.

1.5.2 The concept of i**ntegrated water resource management** and the underlying Dublin Principles shall be recognized, which ‘is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems’.

1.5.2 The **precautionary principle** shall be applied, such that measures shall be taken when there are reasonable grounds for concern that any activity may increase the potential, harm to the ecosystems, amenities, or interfere with other legitimate uses of the Okavango basin , even when there is no conclusive evidence of a causal relationship between the activity and the effects; and by virtue of which, greater caution is required when information, including scientific information, is uncertain, unreliable or inadequate.

1.5.3 The **polluter pays principle** shall be applied, such that the cost of preventing and eliminating pollution, including clean-up costs, shall be paid by the polluter.

1.5.4 The principle of **anticipatory action** shall be applied, such that contingency planning, environmental impact assessment and strategic impact assessment (involving the assessment of the environmental and social consequences of governmental policies, programmes and plans) shall be undertaken in the future development in the region.

1.5.5 The principle of **preventative action** shall be applied, such that timely action shall be taken to alert the responsible and relevant authorities of likely impacts and to address the actual or potential causes of adverse impacts on the environment, before they occur. Many adverse impacts are irreversible or, if they can be reversed, the cost of remedial action is higher than the costs associated with prevention.

1.5.6 The principle of **accessibility of information** shall be applied, such that information on the use and pollution of the water resources and ecosystems of the Okavango Basin held by a riparian state shall be provided by that state to all riparian states, where relevant and in the maximum possible amount.

1.5.7 The principle of **public participation and transparency** shall be applied, such that all stakeholders, including communities, individuals and concerned organizations shall be given the opportunity to participate, at the appropriate level, in decision-making and management processes that affect the Okavango Basin. This includes providing access to information concerning the environment that is held by public authorities and effective access to judicial and administrative proceedings to enable all stakeholders to exercise their rights effectively.

**1.6 Millennium Development Goals, IWRM and Good Governance**

The Millennium Development Goals (MDGs) were agreed at the UN World Summit for Sustainable Development in Johannesburg and are the most broadly supported comprehensive and specific development goals ever agreed globally. There are eight time-bound goals which provide concrete, numerical benchmarks for tackling extreme poverty in its many dimensions. They include goals and targets on income poverty, hunger, maternal and child mortality, disease, inadequate shelter, gender inequality, environmental degradation and the Global Partnership for Development.

Adopted by world leaders in the year 2000 and set to be achieved by 2015, the MDGs are both global and local, tailored by each country to suit specific development needs. The principle goal relevant to SAP and its development is MDG 7, Ensure Sustainable Environment, broken down into 4 quantifiable targets, which are:

**Target 7a: Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources**

**Target 7b: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss**

**Target 7c: Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation**

**Target 7d: Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020**

**The MDGs provide guidance for the integration of the SAP into the basin states planning process and** a framework for the international community’s support efforts.

The three basin countries are all committed to the concept of Integrated Water Resources Management (IWRM) and it is at the heart workings of the SAP. It is a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems’ (GWP 2000).

IWRM is the term given to what is now considered best practice in water management. Specific definitions have evolved over the 13 years since the Dublin Principles were first put forward. At the Rio Conference later in the same year, six basic principles of IWRM were presented and they provide a good basis of what is meant by IWRM:

* The river basin is the correct administrative unit for managing water
* Water resources and the land which forms the river basin area must be integrated, in other words, planned and managed together
* Social, economic and environmental factors must be integrated within water resources planning and management
* Surface water and groundwater and the ecosystems through which they flow must be integrated within water resources planning and management
* Public participation is necessary for effective water resources decision making
* Transparency and accountability in water management decision making are necessary features of sound water resources planning and management

IWRM is not intended as a strict set of rules that would apply around the world, but rather a flexible approach based on the above principles which can be adapted to the needs of the individual country.

Water Governance is a broader concept than IWRM and is defined by Global Water Partnership (GWP) and later modified by the UN as being said to be:

‘made up of a range of political, social, economic and administrative systems that are in place, which directly or indirectly affect the use, development and management of water resources and the delivery of water services at different levels of society. Governance systems determine who gets what water, when and how and decide who has the right to water and related services and benefits.’ (UNESCO, 2006)

The components of a governance system are described in the generic policy cycle below and can be divided into three distinct processes: an analytical process (data and information, and analysis and advice) which determines the availability of water to users; a political process (decision making) which determines the ‘rights’ and needs of the various users at different levels (local, national regional and international); and a regulation process (implementation and review), ensuring delivery of agreed resources.

***A Generic Policy Cycle***

In defining good water governance four dimensions may be identified in terms of usage:

* Equitable (social)
* Sustainable (environmental)
* Efficient (economic)
* Democratic (political)

From this definition of good governance we can see the natural progression to the three E’s (economic efficiency, social equity and ecosystem sustainability) under-pinning IWRM. A major objective of the SAP will to be strengthen the governance framework and deliver a balanced transboundary development programme.

**Section 2: The challenge: Sustainable integrated management of the water resources of the Okavango River basin**

 **2.1 Priority areas of Concern**

At present the Okavango Basin, including its river ecosystem, is in exceptionally good condition, which, for a large international river is very unusual. However current trends in the basin are much the same as those facing most developing regions: growing population numbers and the need for food security, social upliftment, reliable supplies of good quality water and increasing energy generation to support social and industrial growth. However, the impact of the considerable benefits enjoyed from water-resource developments are increasingly becoming apparent and are well documented globally and in the form of environmental degradation and the loss of river resources. The Okavango countries are dependent in several different ways on a healthy river ecosystem: for food, for drinking and washing, flood attenuation, flood storage and reliable dry-season supplies, and for tourism. These attributes of the river, with a considerable inherent monetary worth, are vulnerable and will decline with water-resource development.

The potential increase in water demand over the next 10-20 years is considerable and therefore so is the vulnerability of the river and its dependent social structures. Demand for water is forecast to rise to meet the needs of a growing basin population, increased irrigation development, hydro-power development and inter-basin transfers. The level of increased sustainable demand for the Okavango river its tributaries and the delta is as yet unknown but initial studies show that the impact of any development proposal needs to carefully considered and evaluated both in the upper catchment and delta before being given basin-wide approval. It is not only the total volume of water to be abstracted which has to be considered but also when and where it is to be taken to determine how it impacts on the other riverine processes and services.

OKACOM has evaluated the ecological and social impacts that could emerge if the countries decide to follow individual and uncoordinated development pathways in the TDA. These impacts do not have to happen, but they could. The basin stands at a crucial point in its history, and the Okavango countries have a near-unique opportunity to forge a new approach to basin development that is truly sustainable in the long term and that could serve as a global model.

The extensive work carried out by OKACOM in formulation of the TDA has led to the identification of five areas of concern namely:

## Changing flow regimes

## Changes of land-use

## Water quality changes

## Changes in abundance and distribution of biota

## Changes to livelihood options

These are emerging transboundary problems and issues as yet unrealized and of undetermined scale and to help determine the impacts OKACOM undertook as part of the TDA an Integrated Flow Assessment (IFA) using a suite of hydrological models and drawing upon a comprehensive series of expert reports. The IFA investigated High, Medium and Low scenarios for water consumption over a planning horizon of twenty years and and compared them to present day levels. From these studies OKACOM was able to establish an early estimate of the scale of water resource development without compromising the sustainability of vital ecosystems of the lower basin and delta which they termed a ‘development space’. The challenge is to put in place a management framework to address these issues as they emerge over the next ten to twenty years and ensure that development of the Okavango’s natural resources is undertaken in a sustainable manner.

A brief description of each issue is given below with summaries of the related governance challenges. Also in the section is a brief review of the accentuated impacts predicted due to Climate Change.

## 2.1.1 Changing flow regimes

The major contribution to the overall flow of the river originates in Angola (94%), any changes in the flow will have implications for both Namibia and Botswana, with the Okavango Delta being most vulnerable. Increased water abstraction in order to satisfy the water demand for urban development, livestock production, and irrigation will cause changes in the volume of river flows and timing of both flood and low flows. These changes will have significant effects on river ecosystems, and downstream water users.

The Integrated Flow Assessment (IFA) looked at the impact on flow at eight locations within the basin, including the delta, of the High, Medium and Low demand scenarios. In the High scenario water demand in the basin is envisaged to rise from a current 100 Mm3/yr to over 6,600 Mm3/yr, which would have serious consequences on the flow volumes in the river in terms of annual average flows and drought flows.

The severe impacts on the flow regime are predicted with water development along the Cuebe River, at the top of the catchment, however these impacts could be mitigated and impacts are largely limited to the Angolan part of the basin. Further downstream impacts on flow are less easily mitigated since they would result from developments along the whole system. In general, the increasing number and nature of the envisaged water resource developments, as one moves from the Low to the High Scenario, would inevitably extend the impacts from a localised to a transboundary nature.

The Okavango River system has floodplains that store floodwaters and sustain the river in the dry season. If they were diminished, there would be increased flooding downstream and a significant drying out of the Delta and its outflow due to the weakening of dry-season flows. The Cuito River is key to the functioning of the whole lower river system, because of its strong year-round flow, its wet-season storage of floodwaters on vast floodplains and the gradual release of water back into the river in the dry season. The riverine ecosystems and associated social structures of people along the lower Okavango River, the Okavango Delta and the outflowing Thamalakane and Boteti Rivers are sustained mostly by the annual flow regime of the Cuito. These areas are of concern at the basin level and water resources development along the Cuito should therefore be undertaken with caution.

Ultimately the change in flow patterns would manifest as changes in inundation patterns in the Delta, with a decrease in all major types of permanent swamp (open channels, lagoons and backswamps) and an increase in seasonal swamps (seasonal pools, sedgeland and grassland) as well as in dry-floodplain savannah. The extent and frequency of flooding drive the distribution of vegetation types and habitats.. For all vegetation types, the High Scenario would show a much greater change than the other scenarios, with the various types of permanent swamp decreasing to about 22% of present day average levels and seasonal swamp types increasing to 104– 178% of present day. Savannah ecosystems would show the largest change, increasing by more than four-fold in the High Scenario. These shifts would represent a progressive drying-out of the Delta.

## 2.1.2 Changing land-use patterns

The character of the Okavango River and the diversity of the river ecosystems, especially in the Delta, depend on sediment transport. Increased erosion in the Angolan highlands as a result of land clearance and cultivation could yield more sediment in the river, leading to loss of water quality, and threaten aquatic habitats. Bank erosion could increase, especially in Namibia and in the Panhandle, made worse by the removal of riparian vegetation, trees and reeds. In the reverse, any impoundment that traps sediment could have also negative impacts, changing flow and sediment dynamics within the floodplains and the Delta.

Despite the relatively low population densities in the Okavango River Basin in comparison to other major river basins, the pressure of human activities on land use and vegetation cover has been marked, particularly in the last twenty years. This has been noticeable in upper Cubango River Basin in the Angolan highlands, around the Rundu/Calai area in Namibia and around the Divundu/Shakawe area on the border between Namibia and Botswana.

The presence of significant numbers of livestock can degrade riparian vegetation and medium and high density livestock numbers are already present in Namibia and along the western side of the Okavango Delta. In Angola and Namibia livestock numbers are expected to increase substantially by 2025 – in Angola by up to 175%, and in Namibia, where numbers are already high, the increase may by up to 125%. In Botswana, the present high numbers of cattle are expected to decrease in the next fifteen years. In Botswana, overgrazing coupled with climatic variations such as periods of drought, has lead to bush encroachment resulting in changes of species composition of grasses – from more palatable perennial species to less palatable annuals. Wind erosion in the rangelands could also be increased by overgrazing. While overgrazing is more of an issue for the rangelands away from the Okavango River, the increasing numbers of livestock kept within the 10 km corridor of the river will have a significant localised impact upon the riverine and floodplain vegetation.

The use of fire for clearing land could become even more prevalent and have a greater effect on the composition, density and diversity of the vegetation. A recent study of the impact of deforestation in the Okavango River Basin found that it can have a significant effect on water availability and the flooding regime of the river. It was assumed that increased population pressure along the river banks would lead to deforestation of a 2km wide band along the main river courses. Analysis of the hydrological impacts of the deforestation scenario on the Delta, indicated that average inflow to the Delta would increase by around 7%, with an associated increase in average ground water levels in the Delta. Other hydrological impacts that can be attributed to deforestation include an increased occurrence of minor flood events, soil erosion, downstream sedimentation and associated water quality problems. Prolonged, severe soil degradation could also affect infiltration and groundwater recharge, thereby increasing surface runoff and lowering base flows in rivers.

## 2.1.3 Water quality changes

Data on water quality is sparse and limited to basic parameters, but it is generally agreed that the water quality of the river basin is high. The waters of the Okavango River Basin are well known for their clarity resulting largely from the geology and soils through which the river flows. The river basin is subject to small relatively isolated sources of pollution from urban and agricultural areas, however growth in population and municipal discharges as well as increased agro-chemicals present a potential threat.

Recent water quality measurements of sites in the upper tributaries show relatively alkaline pH levels and low nutrient levels. In general, human induced sources of pollution within the Angolan part of the basin is considered to be low. However there are localised areas where water quality has deteriorated, particularly around the population centre of Menonge due to municipal waste sources and new small irrigations schemes near Menonge and Chitembo. High water quality is important in Angola, since a large proportion of the people living in rely on river water for drinking.

The Okavango is classified has having excellent to good water quality according the Namibian water classification system at the limited number of sites sampled. However, with the concentration of human population located along the river, there is potential for decreasing water quality; recent measurements indicate that turbidity may be increasing, but data is limited and there is no permanent monitoring programme in operation. The pollution threats are similar to those in Angola although the sources tend to be more clustered.

In Botswana thereare some differences between the water quality in Panhandle leading to the Delta and the Delta itself, but they are not significant, there are also seasonal differences. Turbidity is lower in the Delta due to filtering effects as it passes through the Panhandle. Dissolved oxygen in the river tends to decrease with increasing flow in the Panhandle, attributed to the oxygen demand of increased organic matter washed into the river at higher flows. Conversely, in the Delta the dissolved oxygen tends to increase with increasing flow. The main sources of pollution are near the settlements along the panhandle and around the Delta such as Shakawe and Gumare, and along the Thamalakane River near Maun.

The knowledge of groundwater water quality is limited. In the Kavango district of Namibia the water quality of the Kalarhari aquifer is variable, with ‘stripes’ of saline water occurring and with areas of with high fluoride. In the water quality in Kalahari aquifer along the banks of the river Kavango is often poor due to high iron and manganese content – occasionally higher than safe limits for drinking. During flood events, the river recharges the aquifer and improves the groundwater quality. The shallow aquifers surrounding the Okavango Delta are generally saline, but interspersed with important freshwater lenses along the ephemeral streams that are recharged by the wetlands of the Okavango Delta. These aquifers are important for water supply and need to be protected

## 2.1.4 Changes in abundance and distribution of biota

A river ecosystem is much more than a wetted channel. Swamps, deltas, floodplains, marshes, river banks, complex secondary-channel networks and the associated groundwaters play their roles in adding to the river’s biodiversity and its ability to support the abundance of plants and animals so valued by humans. All parts of the river system are sculptured by the flow regime, which dictates its overall nature. The flow regime dictates the nature of the sediments, and the chemistry and temperature of the water, at any point along the system. There is a constant interchange of materials, energy and nutrients between the water in the river, its banks and its bed: sediments are continuously transported, sorted by size, re-sorted, eroded and deposited by the daily, yearly and decadal variations in flow, giving rise to permanent and semi-permanent river-channel features such as pools, rapids, ox-bow lakes, sandbars and floodplains. This dynamic, ever-changing environment creates the physical environment upon which the river’s plants and animals live their lives.

Several countries use a scoring system from A to F to signify the health of the system, where A is a natural, unmodified system and F is a critically modified system that has essentially lost all its natural attributes and has little value for people. A general aim among countries using such a system could be to not let any rivers fall below a D category and to keep those of conservation value at a B or high C. The Okavango River system was estimated in 2008 to be at a level B throughout, which translates as:‘Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged’.

The Integrated Flow Assessment predicted how the overall health of the system could change under the three scenarios. A progressive decline in condition of the river ecosystem is predicted to occur from the Low to High water development scenarios, with the High Scenario rendering large parts of the system unable to sustain present beneficial uses and causing significant drying out of the Delta. A severe impact in an upper-basin tributary would be localised around Capico (Low Scenario) until it, together with further downstream developments, triggered a widespread decline in the middle reaches to condition C (Medium Scenario). Transboundary impacts would be felt first and most severely in the Delta and its outflow.

Aquatic and semi-aquatic vegetation would be negatively affected at Capico, Mucundi, Popa Falls, the Panhandle and in the Boteti at Chanoga, where abstraction would seriously reduce low flows, particularly in the dry season. Riparian trees and shrubs would be less affected, but once impacted would take a long time to recover, if possible. In some parts of the system, floodplain grasses would increase in area because of general drying out of the system.

With the exception of Capico, the Low and Medium Scenarios are expected to have a low to negligible impact on aquatic invertebrates. The High Scenario could cause significant declines in some indicators, mostly at Popa Falls, the panhandle, and in the River Boteti, whilst inhabitants of woodland pools would increase several fold in the Delta as these increase

At Capico in the Cuebe, fish losses are expected to be high for all three scenarios because of run-of-river abstraction during the low-flow season. Elsewhere the fish assemblages are expected to cope fairly well with the Low Scenario, and slightly less well with the Medium Scenario. Under the High Scenario, fish in the lower part of the catchment, e.g., Kapako, Popa Falls, the Panhandle, Xakanaxa and in the Boteti at Chanoga would be severely and negatively impacted, and local extinctions would be highly likely, particularly from Popa Falls downstream to the Boteti.

The present abundance of wildlife would decline progressively through the scenarios, with the High Scenario having a severe impact. Some species at some sites could permanently decline to as low as 5% of present day values. The notable exception to this is the Delta, where one group of wildlife – the large herbivores – would benefit from the scenarios as permanent swamps give way to seasonal floodplains, but even they may show an eventual decline as wetlands give way to savannah.

Moderate declines in abundance of some bird groups could occur in the basin, especially under the High Scenario, with some local extinctions. However at Xakanaxa, conversely, there would moderate increases in several indicator species as open water and permanent swamp give way to seasonal grass and sedge lands. Birds are highly mobile and soon arrive when conditions become favourable or leave when they are unfavourable. The Okavango River is a vital part of the southern African mosaic of wetlands that supports both resident and migrant birds, and would need to maintain that status to ensure their long-term viability.

## 2.1.5 Changes to livelihood options

Developing the basin’s water resources will involve economic trade-offs. Economic benefits can be increased by manipulations of the river’s flow regime for municipal and individual water supplies, and for hydropower generation and irrigation. These manipulations will impact on the natural functioning of the river ecosystem, with a resulting change in the ecosystem services it presently provides. Something will be gained but something will also be lost. How much the basin is willing to lose for the benefits it aspires to is a value judgement to be made by their basin governments. OKACOM undertook in the TDA a macro-economic trade-off analysis to inform discussions and negotiations. In it, the existing natural resource and tourism benefits from the basin are grouped as ecosystem services, and the water supply and sanitation, irrigation and hydropower values are grouped as water resource developments. This is not a complete valuation of all ecosystem services but relates principally to the values of provisioning services and some cultural services. It thus underestimates the total value of such services and the potential losses that could occur with water resources development.

Many of the changes in the river ecosystem described above translate into impacts on the livelihoods and welfare of the basin’s people and on national economies. The TDA shows that poor households depend more on woodland and aquatic resources for home construction, craft making, and nutrition and changes in the availability of these resources will limit the livelihood options of these households, and increase their vulnerability to environmental changes, e.g. droughts, floods, climate change. The emerging picture is that the people in the Angolan basin currently derive relatively little income from the river system, while those in the countries downstream, and most notably Botswana, derive considerably more from it. By far the major part of this income is based on the natural status of the river/wetland ecosystem, with tourism making up the bulk of this income. Botswana has invested in this natural system through land allocation and protection, and relies on it for the bulk of its basin economy.

At the basin level, the livelihoods value would drop from the present day estimate of US$ 60 million per year, to less US$ 10 million per year for both the Medium and High water-use scenarios. These declines are illustrated in Figure 2.

**Figure 2. Projected decline in livelihood values under water use scenarios**

The significant declines are primarily linked to declines in tourism and the reduction of permanent Delta wetland. The TDA predicted that tourism turn-over in the Delta would drop in the short-term by about 15% as the flooding regime of the Delta changed. Flooding levels that are both higher and lower than natural would result in a marked reduction in tourist numbers. Relatively small, sustained reductions in tourism demand would severely reduce livelihood values and economic contributions to national incomes.

From a basin perspective, the potential large ecosystem losses faced by the downstream riparian countries would be from US$700 million for the Low Scenario through US$ 1.4 billion for the Medium and High Scenarios.Under conservative assumptions regarding the profitability of irrigated agriculture, these losses could double in size with the large expansion of irrigated area expected under the Medium and High scenarios. Even under optimistic assumptions the net returns remain negative under the Low (-US$ 260 million) and Medium (-US$ 1 billion) Scenarios. Only with the full implementation of the irrigation schemes under the High scenario do net returns generate positive returns (US$ 215 million) under the optimistic projection. However, it should be noted that 60% of the positive returns under this alternative come from water supply and sanitation, and hydropower. This analysis does not take into account any willingness to pay for the continued existence of the Okavango Delta as a Ramsar Site, which would accentuate the losses of ecosystem services.

**2.1.6 Climate Change and Pacific Decadal Oscillation**

Three climate change scenarios are envisaged for the Okavango basin –’dry’, ‘moderate’ and ‘wetter’ than present day. In the Okavango basin, in the ‘dry’ scenario, the increase in evaporation and transpiration may exceed the increase in local rainfall and inflow from the catchment, resulting in drier conditions. This would result in a reduction of low flows in the rivers draining the system and a decrease in frequency and duration of flooding throughout the Delta. However, if the rainfall increases substantially (in the ‘wetter’ scenario) there will be an increase of high and low flows in the rivers draining the system and duration and frequency of inundation throughout the Delta. Under the ‘moderate’ and ‘wetter’ scenarios, expansion of the permanently inundated areas and areas subject to long inundation could be observed. There would also be a relative reduction in areas subject to short inundation.

There is long-term variability in the flow of the Okavango River and while it is not clear what causes this, it could simply result from normal inter-annual variability and randomness of rainfall. However, there is a very good relationship between the long-term rainfall in the Okavango and a long-term mode of variability in sea surface temperatures known as Pacific Decadal Oscillation (PDO). This could mean that the observed long-term variability in Okavango rainfall is caused in a similar way as El Niño affects rainfall all around the world. This hypothesis allows projections on the predictability of long-term variability of rainfall and runoff, because PDO is considered to result from natural processes.

# 2.2 Governance Challenges

The TDA has recognized the crucial need to strengthen the governance framework, nationally and regionally, in order to set the bounds and standards for water resource development, to police and monitor their implementation and to construct a mechanism for feed-back and review of the balance of development in terms of IWRM. The gaps in the components of the governance cycle have been analysed and are summarized below.

# 2.2.1 Policy and Legislation

The three countries share the overarching policy objective of alleviating poverty and improving the welfare and living conditions of their populations through increased economic growth. Incidence of poverty in the Okavango Basin is much higher than in other parts of each of the countries as a whole, partially due to the remoteness of the basin, and partially due to the unequal distribution of wealth in the three countries. Ambitious water resource development plans are aimed at aimed at alleviating this poverty, particularly in Angola and Namibia. In Angola the drive for economic growth is made more difficult by the need for post-conflict reconstruction and the gradual return and resettlement of previously displaced people.

While emphasising the need for economic growth and associated increasing water demands, all three countries recognise the importance of the environmentally sustainable use of natural resources and have made it an integral part of their national policy framework. Botswana in particular has identified the economic opportunities from ecosystem preservation and sustainable natural resource use (e.g. through tourism) as one of the main focus areas for the country’s future economic development. Among the most important social development objectives in the three countries is the extension of domestic water supply services with the ultimate goal of full coverage in line with the MDGs. This has particularly high priority in Angola where coverage rates are on average the lowest of the three countries in the basin. An increase in service coverage will require the construction of abstraction infrastructure and an increase in water abstraction volumes.

The analysis of the policy and legal landscape in the three basin countries shows a relatively strong framework of natural-resource management policies and legislation, although there is some variation between countries. The policy and legal framework is currently less developed in Angola due to the country’s relatively recent emergence from armed conflict. However, Angola is fast addressing policy and legislative gaps, with a Water Act and other environmental legislation already passed some time ago and a number of environmental policies and strategies being completed or under development (see overview of existing policies contained in the Governance Review accompanying this document)

The strength of the current policy landscape is the recognition of the economic and social development opportunities of sustainable natural resource management. Particularly in Botswana and Namibia, emphasis is placed on sustainable resource use as an economic driver, primarily through tourism and Community Based Natural Resource Management (CBNRM) activities and as such is reflected in policy and legislation. In Angola there is growing recognition of the need for sustainable management and it is expected that this aspect will be increasingly mainstreamed into sector policies under development. Yet there remains a number of existing or potential conflicts between sector policies that require resolution in order to determine the development pathway for the basin.

Of great importance for integrated basin management is that all countries have replaced old water legislation with IWRM-based water legislation that emphasises the need for integrated management and provides the legal mechanism for implementing integrated management in practice. Of particular relevance is the provision in law for the establishment of local-level basin management committees, the composition of which legally requires inter-sectoral representation.

On the other hand, there are some policy and legislative gaps at national level that currently hamper the optimal economic use of natural resources in a sustainable way – for example the inadequacies in the land tenure systems, e.g. insecurity of titles, making it difficult to obtain bank loans for tourism or CBNRM developments on communal land. Other examples include the exemption by law of communal land from meeting certain environmental protection requirements or the lack of strategic environmental assessment legislation/standards at national and basin level11. Whereas the type, scope and area of legislative gaps vary between the three countries, there are several common challenges that the countries face. Arguably the most important one in this respect is the shortcomings in the land-allocation and tenure system, which are of concern in all of the countries. Likewise, inadequate EIA and SEA regimes are common to the countries. The common gaps in the policy, legislative and planning framework are mirrored at transboundary level. The most relevant issue is the absence of a harmonised land-use planning framework between the three countries that allows integrated basin-wide planning. Similarly, harmonised basin-wide water quality standards and basin-wide climate change adaptation strategies are missing at present.

**2.2.2 Institutional strengthening**

Having noted the existence of gaps in the policy and legal framework at national and basin level, these problems are comparatively easy to identify and address (at policy and legislation level) in practice. More complex to solve, largely because of their structural nature, are the constraints resulting from a lack of institutional coordination and lack of effective implementation and enforcement of existing policies and legislation. The most significant constraints for the effective sustainable management of the basin lie in the institutional framework. These constraints are largely of a structural nature, namely the fragmentation of management responsibilities across different line function ministries, the lack of inter-sectoral planning, limited coordination between different spheres of government, weak institutional structures at the local level, a lack of skills, management capacity and resources for integrated planning and effective monitoring, implementation and enforcement.

The need for strong institutions at local level is at present the biggest governance challenge in the Okavango basin. All three countries have made provision in law or policy to strengthen and give greater autonomy to local government in local level development decision-making. Practical implementation is, however, lagging behind and local government continues to be under-resourced and with limited decision-making power resulting in central government remaining the dominant development decision-making power. Likewise, local basin-management committees established under the respective national water acts are either not yet established or have low levels of skills and financial capacity. They would require significant strengthening in order to fulfil their role in an effective manner.

Established as a cooperation, coordination and information-sharing platform for the three basin states with respect to water resources management, it is clear that OKACOM has a central role to play in the management of the basin, especially as there are no established basin-wide cooperation mechanisms in other natural-resource management fields, such as land-use or biodiversity. However, integrated water resources management cannot be undertaken effectively without considering issues of land management and other natural-resource use aspects. OKACOM itself has already recognised the integrated nature of water resources management institutionally by establishing the Biodiversity Task Force.

The member states must decide on the exact scope of activities of OKACOM in the overall management of the basin, choosing, for example, between a narrower focus on water resources management only and a broader economic development focus. Any choice cannot ignore the integrated nature of basin management and the need for inter-sectoral cooperation and coordination. At national level, inter-sectoral coordination is increasingly recognised and to some extent reflected in policy and legislation such as the proposed Water Resources Council of the Botswana draft Water Bill and the Grupo de Apoio Técnico Inter-Ministerial (GATECI) in Angola (the Inter-Ministerial Technical Support Group), which deals with matters related to international agreements on river basins. However, this need is not yet reflected in the composition of the national delegations of all the countries to the Commission and/or to OBSC. Given the importance of agriculture and energy issues, increasing the diversity of sectors represented in the different organs of OKACOM would allow greater consideration of and coordination between different sectors. The linkages between OKACOM and the member states could also be strengthened at local level, meaning closer ties between the respective local basin-management committees and OKACOM. This would not replace or undermine the decision-making power of the Commission made up of the national delegations, but could take the form of direct information exchange between OKACOM and the national basin-management committees. This would allow OKACOM to become more informed about local level planning, implementation and enforcement. Such direct information exchange mechanisms would improve the cooperation between the local committees in the three countries and bring implementation and enforcement challenges that require basinwide cooperation to the attention of OKACOM. Closer direct linkages are also desirable between OKACOM and the broad range of stakeholders in the basin and it is assumed that the stakeholder-participation strategy currently under development will adequately address this matter. The institutional linkages between local basin management committees and OKACOM could also be incorporated as an integral part of the stakeholder participation strategy.

Without pre-empting any decisions taken by member states on the exact role of OKACOM in the management of the basin it is foreseeable that its role and scope of activities will significantly grow, particularly once the Strategic Action Programme is endorsed and more detailed basin management plan is developed and implemented. This requires the further strengthening of its capacity, particularly at an operational management level. The OKACOM Structures Agreement gives OKACOM the necessary flexibility to structure its organs in a way that will accommodate its growing managerial role, with the establishment of Task Forces being one such option.

At operational level it is foreseeable that the Secretariat would have to play a stronger role, possibly over time taking on a key role in day-to-day monitoring and oversight of joint activities and also the implementation of joint projects and programmes between the three countries. A number of proposals for the further institutional evolution of OKACOM, and the Secretariat in particular, are already under consideration. It is critical for the effective, integrated management of the basin that OKACOM plays a central role and its institutional capacity is progressively strengthened in line with its evolving role and increased scope of activities.

**2.2.3 Planning process**

An overview of the responsibilities of different line function ministries in the respective natural resource management fields shows that numerous ministries and departments regularly need to be involved in most planning and decision-making processes and subsequent implementation. While the required coordination between national ministries does happen to some extent, it is still underdeveloped with sectoral rather than integrated planning being the norm. In some cases this is aggravated by conflicting sector policies that hinder integrated planning since line-function ministries have to pursue contradictory policy objectives.

Planning and decision-making across sectors and line function ministries or departments are arguably easier to achieve at local level where common local interests provide stronger incentives for cooperation and integrated planning. In Botswana, the Okavango Delta Management Plan (ODMP), a fully integrated management plan for the Okavango Delta developed with strong involvement of a vast diversity of stakeholders at all levels, might serve as a good example in this regard. However, even where integrated planning occurs and leads to the development of a fully integrated management plan, the challenge remains that implementation responsibilities reside in a diversity of agencies, again raising the issues of lack of coordination and cooperation at implementation level. This often leads to inefficient use of government resources if not failure to implement altogether.

It is in this context that the provision in the three countries’ water laws for the establishment of a basin-management committee is of great importance. Using the Okavango Basin Management Committee in Namibia as an example, the committee is comprised of representatives from a wide range of national ministries, local government and other relevant stakeholders, ensuring that a diversity of management responsibilities and sector interests can be considered in basin planning. The effectiveness of these basin management committees for integrated basin management requires strong institutions with adequate skills and capacity level, as well as effective coordination and cooperation between the local committees in the three countries, directly and/or through OKACOM.

**2.2.4 Monitoring and Evaluation**

The region suffers from severe limitations in the data and information that is available, both to decision makers and to informed members of the society. Sound IWRM planning is based on good data and information about the variation in space and time of available water and natural resources. Considerable research and monitoring has been carried out in the past, but the data is often not comparable across the region, it is often insufficient, inaccurate or non-harmonized and not freely exchanged and shared among the responsible institutions. The lack of data often promotes regulatory capture and self interest. Further, if and when national legislation requires open access to information, it is often constrained by poor dissemination, non-user friendly formats and insufficient media attention to the environmental issues or lack of information technology for information exchange. This sub-optimal availability of information can result in uncoordinated and unsubstantiated policies and measures at regional level.

The current hydrological monitoring network in the basin is inadequate and needs to be expanded, setting up new or rehabilitating existing stations to measure rainfall, temperature, and flows. In order to make the data collected available to water managers and water users, a data archival and information dissemination system has to be developed for the basin. The basin-wide hydrological information system integrated with other information systems needs to be developed and maintained by the respective basin states.

Groundwater makes a significant contribution to rural and urban water supply particularly for domestic use, agricultural production, and maintaining vital ecosystems. There is however inadequate information about the potential for groundwater development within the Okavango Basin due to limited assessment of groundwater resources. The contributions of groundwater to the various sectors within the basin have not been adequately evaluated and the transboundary implications of groundwater utilization are not known. There is lack of institutional framework for involvement of groundwater users at local, regional and basin levels in managing this resource. Current management approaches do not take into account existing linkages between surface water and groundwater. A basin-wide evaluation of groundwater resources that includes determining the locations of aquifers, establishing their reliable yields and the linkages with surface water is necessary to optimise their use. Routine regulatory monitoring of groundwater is required to ensure use is within abstraction licence limits and detect contamination of groundwater contamination is proposed. This monitoring system will also enable the effects of groundwater use on vital ecosystem and the transboundary effects to be managed.

Parts of the Okavango River basin are prone to flooding which adversely affects communities. The current approaches to flood management are reactive with very little prior warning to affected communities. Communication between upstream and downstream basin states about impending flooding is not systematic but rather ad hoc and based on personal contacts. There is very little integration of local communities, and different institutions in the management of floods. A basin-wide integrated flood management approach that aims to minimize adverse effects and enhancing benefits of flooding is proposed. Reducing the vulnerability of communities to flooding through incorporation of the flood hazard in land use planning, using early warning systems, and developing an institutional framework for timely responding to flooding at local, regional and basin levels is proposed.

Future growth of settlements and expansion of irrigation have the potential to adversely affect water quality along the Okavango River. There is very limited routine and systematic monitoring of water quality. Pollution control will not be effective without first an assessment of current and historical levels pollution and the establishment of a routine and systematic water quality monitoring programme across the basin. There also needs to be a basin-wide assessment of existing and potential sources of water pollution, including an assessment of transboundary implications. A network of water quality monitoring stations, measuring both physio-chemical and biological parameters needs to be established and water quality laboratories located in the basin. Water pollution occurs due to lack of policing and enforcement of existing water pollution regulations and therefore improving enforcement water quality management system is a vital step.

The dynamics of sediment transport and deposition are not fully understood because of the absence of routine monitoring of river sedimentation. Impacts of land use changes and river regulation cannot be predicted with acceptable levels of confidence. Therefore, monitoring of river sedimentation is proposed. Information collected will be used for improving planning of land use changes, design and operation of river regulation structures.

Strengthened biodiversity and land-use monitoring programmes are required to establish a clearer picture of existing status and to track long-term trends across the whole basin. Socio-economic data also needs to be systematically collected from the three basin states to fed into the existing and planned decision support systems

**2.2.5 International Partner Coordination**

The current coordination of international supported projects is weak. It is essential that the international partners work together with common objectives and targets and minimize overlap and maximize synergy between projects. There has been collaboration between the GEF international waters EPSMO project and the GEF Biovango project supporting the Okavango Delta Management Plan in Botswana in the implementation of the TDA and in Botswana development of the NAP. However, this collaboration could have been closer and it should be extended during SAP implementation to include combined monitoring programmes for land-use, water quality, fishing activity and biodiversity. There is also potential for knowledge transfer in the field of tourism development and investment and cost effective waste water treatment systems.

The USAID Southern African Regional Environmental Programme (SAREP), worth $23.3 million, was launched in 2010 and many of its targets correspond to the TDA areas of concern. The programme’s key result areas include:

* Cooperative management of shared resources
* Biodiversity and ecosystem services monitored and protected
* Increased access to safe water supply and sanitation
* Management of basin resources in the context of climate change by River Basin Organisations
* Regional, national and local development planning capacities in the river basin substantially improved.

The SAREP have been consulted closely during the development of the SAP and the initial NAP negotiations to ensure concurrence.

There any many smaller regional and national projects funded by both international partners and state governments which have not been so well incorporated into the SAP development process. All relevant projects sectors need to identified and overlaps and synergies mapped. It is proposed that OKACOM establish international partners coordination group to improve collaboration and cooperation.

**2.2.6 DPSIR Analysis**

As part of the TDA a Driver-Pressure-Status-Impact-Response analysis was undertaken in accordance with the accepted methodologies (European Environment Agency, Millenium Ecosystem Assessment) to investigate the potential future impacts of human activities. The analysis identifies:

* The **driving forces**, the socio-economic and socio-cultural, such as population growth, economic growth, urbanization and agricultural intensification, which increase or mitigate pressures on the environment.
* The resulting **pressures** which affect the state of the environment and, in turn, may impact on human health or ecosystems, such as reduction in flow, pollution and soil erosion.
* The **status** of the environment due to pressures imposed (or forecast to impose)
* The **impacts** of a degraded environment on human health, ecosystems and socio-economic/cultural conditions
* **Responses** which address the driving forces and seek to reduce the pressures on the environment and so improve the environmental status and reduce the impacts

The resulting framework will be presented in Annex 1 *(approach and structure to be discussed by OBSC September 2010).* The responses identified in the TDA were used as the basis for the development of the SAP. However it should be understood that within the SAP ten year planning horizon not all of the identified responses will be achievable.

**Section 3: SAP development and prioritization**

The Okavango SAP has been developed over three years (2008-2010) through a consultative process with a wide range of stakeholders from government departments, academic and scientific institutions, civil society, the private sector and community representatives. A series of national consultation workshops was held in each country, complemented by basin-wide consultation meetings under the umbrella of the Okavango Basin Steering Committee (OBSC).

The overarching objective of the SAP during the ten year period from 2011 to 2021 is:

**To promote and strengthen the integrated, sustainable management and development of the Okavango River Basin at national and transboundary levels according to internationally recognised best practices to protect biodiversity, improve the livelihoods of basin communities and the development of basin states.**

This objective balances the shared commitments of the basin states under MDG countries for environmental sustainability, alleviating poverty and improving the welfare and living conditions of the population through increased economic growth through the mechanism of IWRM. It recognizes that increasing future water demands will need to be met but that the ecosystem integrity of the Okavango must be preserved and the value of the ecological services it provides maintained.

All three basin states are pursuing aggressive economic and social development policies, in various sectors, including agriculture, hydropower and tourism which in the long term could have significant impact on the water resource availability and management. The SAP will establish a long-term planning framework, entitled the Basin Development and Management Framework (BDMF), which will include a long-term vision and agreement development space for the Okavango. The BDMF will provide flexible management approaches informed by scientific and economic analysis to be applied and will respond to changing socio-economic and environmental conditions in the basin over time.

The five areas of concern and governance challenges have resulted in a set of responses which these have been refined into six sustainable management objectives, addressing the main components of the governance cycle. Each sustainable management objective consists of a number of targets that are comprised of sets of responses or interventions to address the forecast impacts. The sustainable development objectives and the targets are listed below and a full listing of interventions is given in Annex 2. The timings of the interventions in order to meet their targets are also listed in Annex2. Interventions have only been included in the first five year period if they are supported by a majority of the NAPs, that is if the national level supporting projects are included within the NAP, and they have been identified as priority interventions. In addition in Annex 2 for each intervention and set of indicators is listed by which to track implementation and effectiveness.

The six sustainable management objectives are:

Objective 1: **Establish a shared vision and decision framework for sustainable management of the water resources of the Okavango basin**

Target 1: Develop a basin-wide decision framework (BDMF) and strengthen existing regional management bodies to coordinate and implement the SAP

Target 2: Strengthen national decision frameworks and management bodies and fully integrate NAPs into the planning process

Target 3: Strengthen coordination of basin-wide and national projects and activities.

**Objective 2: Sustainable development decisions based on by strong scientific analysis of available data and information and improved basin knowledge.**

Target 1: Design and construct a decision support system (Basin Development management Framework) which presents to decision makers at basin-wide and national levels, the options in a clear, understandable fashion

Target 2: Make assessable water and natural resource data and information to decision makers, regulators, scientific community, basin stakeholders and the general public.

Target 3: Expand baseline data, information and knowledge of the Okavango basin system.

Objective 3: **Establish and strengthen environmental and socio-economic monitoring programmes to support management decisions and track long-term trends.**

Target 1: Strengthen existing hydrological and meteorological monitoring to determine surfacewater resource yields, predict drought and flood events and determine sedimentation transport.

Target 2: Establish cost effective water quality monitoring to measure ambient water quality, indentify pollution problems and regulate pollution discharges

Target 3: Establish groundwater monitoring to determine the sustainable yields of the major aquifers, linkage with surfacewaters, potential for conjunctive use and regulation of use.

Target 4: Establish impact of changes both, anthropogenic and natural, on the Okavango basin ecosystem

Objective 4: **Establish** **common integrated planning criteria and objectives for sustainable development of water resources of the Okavango basin**

Target 1: Common guidelines, methodologies and understanding of IWRM

Target 2: Effective implementation of water resource management regulations

Target 3: Common guidelines and methodologies for Water Quality management and planning.

Target 4: Common guidelines and methodologies for land-use and natural resource management and planning

Target 5: Development of basin-wide water resource planning

Objective 5: **Improvement and enhancement of the livelihoods of the basin’s peoples**

Target 1: Livelihood alternatives to reduce pressures on the basin system demonstrated and replicated

Target 2: Environment improved and livelihoods enriched

Objective 6: **Enhanced technical capacity in the basin and involvement of stakeholders in SAP and NAP implementation**

Target 1: Increased stakeholder knowledge of the basin and its management

Target 2: Improved communication and involvement of basin stakeholders

**Section 4: SAP Implementation**

**4.1 National Action Plans (NAPs)**

Preparation of the NAPs by the basin states was started at the same time as SAP preparation, based on an assessment of the priority national concern areas, which included, where they were in concordance, the basin –wide concerns as identified in the TDA. However, the NAP development process was delayed and endorsement could not be concluded during the implementation of the ESPMO project. It has been agreed that NAPs will be completed as soon as possible, as part of the next phase of development with each state developing objectives, targets, proposed interventions, and drawing up a resource mobilization strategy to address their objectives. The states will also enter into a thorough inter-sectoral dialogue as an integral part of a national endorsement process.

The National Action Plans (NAPs) represent an awareness of and commitment to enhanced sustainable management of water resources by the basin states. It is critical that all states continue to make further steps towards improved stewardship of all natural resources at the national level, with the confidence that even the smallest action can lead to large improvements when taken collectively. Without this commitment to implement the national supporting interventions the SAP’s basin-wide interventions have no foundation and their implementation is undermined. Whilst the NAPs feed into the SAP, they are also cohesive, independent documents which detail national objectives, targets and interventions to be achieved. They have common guidelines and like the SAP will be implemented in two separate 5-year periods and will be reviewed every five years. Implementation of the NAPs moves forward independently of the SAP process but their updating shall be undertaken concurrently with the SAP.

**4.2 Policy Coordination**

The basin states have ensured and will continue to ensure that the NAP and SAP content, policy and measures, are coordinated and consistent with those developed across the sectoral ministries. The NAP consultation process leading to endorsement is designed to ensure all key government stakeholders are consulted fully and timely to ensure integration. In preparing the NAPs the littoral states are required to refer to existing development and environment plans, including the National Environmental Action Plan (NEAP) and National Biodiversity Strategic Action Plan (if available), and it has been stressed that each littoral state should ensure that its body of laws and regulations is fully coordinated and supportive of environmental policies developed through the SAP.

**4.3 Resource mobilization**

It has been estimated that implementation of the SAP in the first five year period (approximately 2011 – 2015) will require some $30 million, to be provided from national budget with potential assistance from the international donor community and the private sector estimated at $25 million. Implementation of the SAP in the second five year period is estimated at $27 million. International grant sources could be further raised; however, any success will undoubtedly be tied to the Okavango states demonstrating their continued commitment to OKACOM towards implementation of the SAP and establishing strong governance frameworks. International financial institutions should be approached for loans with the full involvement of both technical institutions and financial, economic and planning authorities to ensure that the requests meet the relevant financial and guarantee criteria. Even given the above initiatives there may remain however a significant funding gap, which will principally need to be filled by the riparian states. This may be done through further integration of development and environment planning processes; assigning higher value to environmental considerations in the region, and allocation of substantially enhanced national financial resources to water resource and environmental management issues in general and to the Okavango in particular.  Consideration of environmental costs and benefits should be fully taken into account in economic measures and budget making, and private sector partnerships for environmental protection should be promoted throughout the region.

**4.4 Institutional Arrangements**

Once adopted and endorsed by OKACOM implementation of the SAP will become the responsibility of OKACOM and the governments of the riparian states. At the national level the OKACOM National Coordination Structures will be responsible for coordination of NAP and SAP implementation. At the regional level SAP implementation will be coordinated by OBSC assisted by the secretariat. The OBSC will also be responsible for coordination of the International Partner projects and work to attract further SAP implementation support from the both public and private sectors at the regional and national levels.

**Section 5: The Future of the Strategic Action Programme**

The SAP is officially launched with its adoption by the OBSC Steering Committee and endorsement by members of OKACOM. Active promotion of the SAP by the riparian states and OKACOM at national, regional and international fora is critical in gaining the broad support it needs for successful implementation. Key stakeholders are to be targeted through public meetings, media campaigns and briefings and consultations. Ultimately, the riparian states responsibility is to create and maintain the necessary momentum for SAP implementation. The riparian states and OKACOM will maintain their close dialogue on how best to support implementation of the SAP and strenuous efforts will be made to attract new international donors and donors from the private sector. The OBSC and secretariat will maintain close communication with the national bodies to ensure concordance between the SAP and the three NAPs and shall report annually to OKACOM on the implementation status of the SAP and the NAPs in accordance with the M&E framework. Every five years OBSC and the national bodies, facilitated by the secretariat, shall review and recast the SAP and NAPs for the next 5+5 year period and, if necessary, reset the regional priorities. This review shall take place concurrently with an updating of the TDA, which will indentify new areas of concern and new potential interventions.

**ANNEX 1: DPSIR ANALSIS**

To be conformable with TDA: Approach and format to be discussed at OBSC Meeting, Gaborone September 2010

|  |  |
| --- | --- |
| **OBJECTIVE 1:** | **Establish a shared vision and decision framework (BDMF) for sustainable Management of the water resources of the okavango basin**  |

| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| --- | --- | --- | --- | --- |
| 1. Develop a basin-wide decision framework (Basin Development management Framework) and strengthen existing regional management bodies to coordinate and implement SAP  | 1.1 Development of shared Vision for the development and protection of the Okavango basin and delta. | Statement by the basin states with Vision and component objectives for development of the Okavango over twenty year period  | PI | 1-5 years |
| The promotion of the Vision throughout the basin and production of information materials.  | PI | 1-5 years  |
| 1.2 Support for initial negotiations for a framework Convention for the Protection of Okavango basin environment and its peoples. | Draft Framework document prepared and listing of protocols agreed | PI | 1-5  |
| Five meetings held between parties with representatives of involved Ministries  | PI | 1-5years |
| 1.3 Development of an adaptive decision framework (Basin Development Management Framework) based on IWRM concepts and linkage with ODMP | Listing of decision makers and decisions made basin and national and local level, currently and in future.  | PI | 1-5 years |
| Analysis of horizontal (across sectors) and vertical decision paths and proposals for integration and subsiduarity (administrative and political procedures)  | PII | 1-5 years |
|  Decision points and thresholds identified and agreed | PI | 1-5years  |
| Support data and information identified | PI | 1-5years |
|  | 1.4 The role of OKACOM in the long-term coordination and implementation of the SAP and its component national plans, including the widening of inter-sectoral involvement, strengthened.  | Clarification of OKACOM’s role in water and natural resource management and amendment of mandate.  | PI | 1-5 years |
| Proposals for strengthening OBSC and secretariat to coordinate and implement regional component of SAP, including hosting BDMF DSS. | PI | 1-5 years |
| Agreement on long-term financial support of OKACOM | PI |  5-10 years |
| OKACOM representation widened to include major water resource stakeholders |  PI | 1-5 years |
| Reporting and M&E framework established for SAP projects | PI | 1-5years |
| OKACOM national basin committees affirmed linked to RBA. | PI | 5-10 years |
| 2. Strengthen national decision frameworks and management bodies and fully integrate NAPs in the planning process  | 2.1 Review of national governance/regulatory frameworks and make recommendations for strengthening through national IWRM plans and linkage with the BDMF. |  Creation of Water Councils and evidence of their workings | PI | 1-5 years |
| Separation of water resource operation and management functions | PI | 1-5years |
| Integration of water quantity and water quality management and decision making in the three states | PI | 1-5years |
| Integrated groundwater and surface management in the three basin states | PI | 5-10Years |
| Clear reference to SAP and the basin-wide decision framework in national planning process | PI | 1-5years  |
| 2.2 Establishment of national River Basin Authorities and, where appropriate, associated River Basin Councils in each of the participating states.  | Fully funded and staffed River Basin Authorities operating in the three states as management and planning bodies.  | PI | 1-5years  |
| Evidence of active communication and collaboration between the River Basin Authorities | PI | 1-5years  |
| River Basin Councils composed of representatives from a wide range of stakeholders acting as consultative bodies to RBA | PI | 1-5years |
| 2.3 Review of coordination and implementation of NAPs in the basin states as an integral part of the national planning process (see Objective 4, intervention 5.1) | Reference to NAP in national IWRM and natural resource plans  | PI | 1-5years |
| Evidence of consultative process in development of NAPs and inclusion of related sectoral projects | PI | 1-5years |
| 3: Strengthen coordination of basin-wide and national projects and activities. | 3.1 Strengthening of existing OKACOM data sharing protocol, signed by the key data providers and water resource regulatory and management organizations in each state. |  Revised OKACOM document signed and operational agreements signed by data-providers | PI | 1-5years  |
| Documented evidence of joint surveys performed | PI | 1-5years |
| Common data formats and reporting procedures in place | PI | 1-5years |
| 3.2 Development and agreement on EIA/SEA procedures in a transboundary context  | Transboundary EIA procedures agreed by the basin states based on the ESPOO Convention guidelines . | PI | 1-5years |
| Mandatory application of EIA in transbounday development project decisions making process and increased number of public meetings. | PI | 1-5Years |
| 3.3 Establishment of donor coordination mechanism for SAP implementation | Meeting minutes of donor coordination group chaired by OKACOM | PI | 1-5Years |
| Map of donor projects and linkage with SAP  | PI | 1-5Years |
| Evidence of collaboration between donors in supporting implementation of SAP. | PI | 1-5Years |

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| **OBJECTIVE 2:** | **SUSTAINABLE DEVELOPMENT DECISIONS, BASED BY STRONG SCIENTIFIC ANALYSIS OF AVAILABLE DATA AND INFORMATION AND IMPROVED BASIN KNOWLEDGE**  |

| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******Frame*** |
| --- | --- | --- | --- | --- |
| 1.Design and construct a decision support system which presents to the decision makers, at the basin-wide and national levels, the options in a clear and understandable fashion | 1.1 Review of existing decision support system and re-design (inputs, outputs and interfaces) to meet the needs of the BDMF and national decision frameworks. | Report on the outputs of existing DSS and its ability to support the BDMF decision framework and inputs required to meet existing and future threats | PI | 1-5 years |
| New system interface component to designed for decision makers at different levels  | PI | 1-5 years |
| Training on DSS operation for decision makers at different levels | PI | 1-5 years |
| Installation of full DSS in OKACOM secretariat and abbreviated version in OKACOM national coordinating units | PI | 1-5 years |
| 1.2 Refinement and up-grading of the water resource/hydrological models, including increased coverage of upper basin, delta and outflow of River Boteti. | Refined model covering the whole of basin developed and operating. | PI | 1-5 years |
| Estimates of surface water yield for various drought scenarios and environmental flow constraints.  | PI | 5-10 years |
| Potential surface water storage options tested and evaluated | PI | 5-10 years |
| 1.3 Upgrading of water resource/hydrological models to take account the surfacewater-groundwater interflows | Report on of conjunctive use potential in the basin | PI | 1-5 years  |
| Estimates of contributions of ‘inactive’ part of the basin and impact on the long-term yield of the system | PI | 1-5 years |
|  1.4 Refinement of economic model, including more detailed assessment of indirect benefits and the existence value of the Okavango system and comparative study of the value of water for different economic uses. |  Analysis of the indirect benefits and existence value of the Okavango using latest techniques and incorporation of results into the macro- economic study | PI | 1-5 years |
| Assessment of the potential development of various sectors in the basin, including tourism, irrigation in the upper basin and power production and comparison of their economic value in terms of water use.  | PI | 1-5 years |
| 1.5 Revised expert-opinion based assessment of impacts of increased water abstraction and climate change on water quality, and basin ecosystems. | Determination of minimum ecological flows at key locations in the basin | PI | 1- 5 years |
| Long-term Impact on wetlands and fisheries determined, consistent with ODMP findings.  | PI | 1- 5 years |
| Identification of at risk sites and proposed mitigation measures  | PI | 1- 5 years |
| 1.6 Status of Environment report produced every two years. | First report prepared in 2012 and reports subsequently every two years  | PI | 1-5 years |
|  1.7 Development of basin wide flood forecasting model and early warning system designed and implemented. | 1. Basin –wide flood risk maps and preparedness and response plan endorsed.
 | PI | 5-10 years |
| 1. Flood warning centre and national units established
 | PI | 5-10 years |
| 1. Hydrological gauging stations constructed at key locations and communication system installed.
 | SRI | 5-10 years |
| 1. Field trials to test early warning system operation
 | SRI | 5-10 years |
| 2. Make assessable water and natural resource data and information to decision makers, regulators, scientific community, basin stakeholders and the general public.  | 2.1 Design of information management system combining existing systems of OKACOM and ODMP with a common platform, data format, access protocols and QA protocols. The system should work on a number of levels providing a basin archive, serving the BDMF DSS and providing easy accessible data to stakeholders and the general public.  |  Agreement on common structure and format for national water resource and water quality databases and agreed  | PI | 1-5 years |
| Up-grading of GIS database and expansion of layers for land-use, water resource, conservation and other planners | PI | 1-5 years |
| Development of remote sensing monitoring database to determine land use and vegetation change for land-use and conservation managers | PI | 1-5 years |
| Creation of basin-wide biodiversity databases and listing of indicator species.  | PI | 1-5 years |
| Creation of basin-wide socio-economic database, to include all major areas of economic activity (tourism, agriculture, fishing, mining, etc.)  | PI | 1-5 years |
| Development of web-based information management system linked to DSS and accessible at different levels by a range of stakeholders  | PI | 1-5 years |
| Number of hits recorded on web-site. | PI | 1-5 years |
| 3.Expand baseline data, information and knowledge of the Okavango basin  | 3.1 Determine the long-term contribution of the inactive part of the basin.  | Survey of key sites in the ‘inactive’ parts of the basin and establishment of groundwater monitoring programme  | PI | 1-5 years |
| Report on inter-connectivity of basins and historical contributions based on historical meterological and hydrological records. | PI | 1-5 years |
| Review of climate change on future contributions | PI | 1-5 years |
| 3.2 Survey of contamination of sediments in the basin to provide historical baseline, a wide range of contaminants to be measured including, where appropriate, complex organic compounds and biological monitoring.. | Establishment of basin signature and identification of pollution hot spots and correspondence with known pollution sources. Linkage with work undertaken by GEF Biokavango project and ODMP.  | PI | 1-5 years |
| Assessment of PoPs contamination in the basin and linkage with national action programmes including GEF PoPs enabling activities. | PI | 1-5 years |
| Assessment of pollution loadings of lower basin | PI | 1-5 years |
| 3.3 Determine sediment contributions of all tributaries to the lower basin and ascertain composition of sediments by grain size | Report on historical sediment transport prepared, and review of impact on sediment fluxes of water abstraction, impoundment and climate change.  | PI | 1-5 years |
| Monitoring programme established at existing sites of composition and size of transported sediments and assessment of importance to the lower Okavango basin. | PI | 5-10 years |
| 3.4 Investigate the rates of change of river topography and physiology.  | Historical report on the river topography and physiology and assessment on potential impact of water abstraction, impoundment and climate change  | PI | 1-5-years |
| 3.5 Mapping of land use potential (sensitivity map) of the basin and detailed assessment of land use policies, legislation and regulations in the basin countries. | National reviews of policy, legislation and regulations and classification of potential land use in the Okavango basin  | PI | 1-5 years |
| Sensitivity map of the Okavango basin on new GIS template | PI | 1-5 years |
| 3.6 Determination of the relationship between composition of the various vegetation communities and depth, frequency and timing of inundation. | Ten field monitoring stations established in example wetland locations and long-term monitoring programme implemented  | SRI | 5-10 years |
| Report prepared on the relationship between vegetation composition and inundation and environmental and social significance | PI | 5-10 years |
| 3.7 Mapping and assessment of impact of invasive species in the basin | Report on current and potential invasive animal and plant species in the Okavango, establishing a baseline for control programmes and potential impact  | SRI | 1-5 years |
| Monitoring programmes established and implemented for critical species  | PI | 1-5 years |

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| **OBJECTIVE 3:**  | **ESTABLISH AND STRENGTHEN ENVIRONMENTAL AND SOCIO-ECONOMIC MONITORING PROGRAMMES TO SUPPORT MANAGEMENT DECISIONS AND TRACK LONG-TERM TRENDS**  |

| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******Frame*** |
| --- | --- | --- | --- | --- |
| 1. Strengthen hydrological and meteorological monitoring to determine surfacewater resource yields, predict drought and flood events and determine sedimentation transport.  | 1.1 Review of meteorological and hydrological monitoring networks and programmes in the basin and make recommendations for strengthening in support of the BDMF | Review of national meteorological and hydrological programmes to determine compatibility to BDMF  | PI  | 1-5 years |
| Basin wide regional monitoring programme to monitor ecological flows and abstractions as well as track long-term trends, standardized data protocols, agreed data exchange between relevant bodies and real-time reporting.  | PI | 1-5 years |
| 1.2 Development of strategic, phased investment programme for the improvement of meteorological and hydrological networks, including institutional strengthening and capacity building components. | Basin- wide monitoring programme implemented and 10 new monitoring stations established in each basin state | SRI | 5-10years |
| Automated monitoring stations established at critical locations providing real time data to national centres for water resource and flood management | SRI | 5-10 years |
|  Increased technical capacity within the basin measured by implementation of extensive training and knowledge programmes.  | SRI | 5-10 years |
| A significant increase in available water resources and decrease in flood damage through improved management  | SRI | 1-5 |
| 2. Establish cost effective water quality monitoring to measure ambient water quality, identify pollution problems and regulate pollution discharges. | 2.1 Review of water quality monitoring network including laboratory facilities and make recommendations for strengthening in support of BDMF. | Review of national basin surface water quality monitoring programmes, ambient and discharge, to determine compatibility to BDMF. | PI | 5-10 years |
| Basin wide monitoring programme to focus on certain contaminants and hotspots, with information exchange among relevant bodies, standardized monitoring protocols, including baseline contaminant levels. | PI |
| 2.2 Development of strategic phased investment programme for the improvement of the water quality monitoring network, including institutional strengthening and capacity building components. | Basin- wide monitoring programme implemented and 10 new monitoring stations established in each basin state  | PI | 1-5 years |
| Basin laboratories equipped and mobile laboratories deployed.  | SRI | 5-10 Years |
| Intercalibration procedures established for transboundary locations and laboratories accredited | SRI | 5-10 Years |
| Increased technical capacity within the basin measured by implementation of extensive training and knowledge programmes. | SRI | 5-10 Years |
| Data available quarterly and annual report produced on the basin surfacewater quality.  | PI | 5-10 years |
| 2.3 Introduction and development of biological based water quality monitoring programme.  | Endorsed basin-wide biological monitoring plan based on Southern African methodology. | PI | 5-10 years |
| Personnel trained in species identification and identification keys and specimen collections established | SRI  | 1-5 years |
|  3. Establish groundwater monitoring to determine the sustainable yields of the major aquifers, linkage with surfacewaters, potential for conjunctive use and regulate pollution discharges.  | 3.1 Design and implementation of groundwater monitoring programme in major aquifers and at key locations (water quality/water quantity) including transboundary locations.. | Review of national groundwater monitoring programme, water quantity and quality to establish compatability with BDMF | PI | 1-5 years |
| Design of basin-wide monitoring programme included agreed monitoring protocols and data exchange | PI | 1-5Years |
| 20 new nonitoring boreholes installed in major aquifers at critical locations | SRI | 5-10Years |
| Data available quarterly and annual report produced on the basin water quality.  | SRI | 5-10 years |
|  4. Establish impact of changes both, anthropogenic and natural, on the Okavango basin ecosystem  | 4.1 Design and implementation of f biodiversity monitoring programme linked to existing ODMP programme, including a review of indicator species. | Design of biodiversity monitoring programme, including agreement of indicator species (dragonflies, etc), monitoring locations, monitoring intervals and data formatting and analysis. | PI | 1- 5 years |
| Training programmes for basin experts delivered and laboratories equipped | SRI | 1-5 Years |
| Regional specimen collection established and electronic identification keys developed  | SRI | 5-10Years |
| Annual biodiversity report prepared and threats identified | SRI | 5-10years |
| 4.2 Vegetative mapping of basin wetlands and classification based on conservation status (see Objective 2, intervention 2.4) | Vegetative maps prepared using remote sensing data. | PI | 1-5 years  |
| Ground-truthing surveys performed and classification zones described and demarcated.  | PI | 1-5 years  |

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| **OBJECTIVE 4:**  | **establish common InTEGRATED PLANNING CRITERIA AND OBJECTIVES for sustainable development of the water resources of the okavango basin** |
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| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
|  1. Common guidelines, methodologies and understanding of IWRM  | 1.1 Development of common methodology assessment of long-term ground and surface water resource yields.   | Agreed methodology for assessment of available water resources for given drought return periods and environmental constraints.  | PI | 1-5 years |
| Cadastra of water resource surface yields in Okavango basin and its tributaries | PI | 1-5 years |
|  1.2 Development of common methodology for assessment of existing and forecast demand, including assessment of return flows.  | Determination on existing demand based on licensed amounts and supply based on measured volumes in the basin | PI | 1-5 years |
| Development of component demand forecasts over a twenty year planning horizon taking into account the MDGs.  | PI | 1-5 years |
| Calculation of return flows from all use sectors, including groundwater recharge  | PI | 1-5years |
| Determination of water resource surpluses and deficits in the basin based on interventions 1.1 and 1.2 |
| 1.3 Review climate change scenarios for the Okavango basin and determine impact on water resource yield and demand of most the likely scenarios.  | Report the potential impact of the most likely for climate change scenario for the South African region on water resources, demand and surpluses/deficits in the Okavango basin  | PI | 1-5 years |
| 1.4 Establish of minimum environmental flows in key locations in the catchment using BDMF DSS and field surveys (see objective 2, intervention 1.5) | Agreement of key locations and base-line surveys undertaken. |  PI | 1-5 years |
| Agreement of ecological flows to be protected established based on best international practice. | PI | 1-5 years |
| Ecosystem integrity and health monitored and shown to be maintained or improved | ESI | 5-10 years |
| 1.5 Assessment of utilizable groundwater resources yields of major aquifers.  | Cadastra of groundwater resource yields and abreactions in Okavango basin  | PI | 1-5 years |
| 1.6 Review water resource options in the basin, including conjunctive use, in-basin storage and demand management. | Report reviewing all possible options for meeting existing and future deficits predicted in 1.2 | PI | 1-5years |
| Feasibility studies of priority options overtaken | SRI | 1-5years |
| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| 2. Effective implementation of water resource management regulations  | 2.1 Review of national permitting and licensing procedures in the basin for water abstractions and discharges and recommendations for their improvement.  | National reports on permitting and licensing and recommendations for harmonization. | PI | 1-5years |
| Revised water abstraction licenses to make reference to drought restrictions and environmental flows | SRI/PI | 1-5years |
| Revised discharge permits to make reference to Water Quality Objectives and treatment targets  | SRI/PI | 1-5years |
| 2.2 Review of national of policing and enforcement measures for water quantity abstractions and quality discharges and recommendations for their improvement.  | National reports on policing and enforcement effectiveness and recommendations for improvement | PI | 1-5years |
| Number of inspections and analyzed samples increased by 100%  | SRI | 1-5years |
| Number of legal cases for over abstraction and discharge violation increased by 50% | SRI | 1-5years |
| 2.3 Review of the use of economic instruments in water resource and land-use management and recommendations for possible new basin-wide instruments. | National reviews of use of economic instruments in the water sector to moderate demand and protect the environment, including recommended change | PI | 1-5 years |
| National recommendations acted upon and new economic instruments introduced  | SRI | 1-5 years |
| Basin-wide economic instruments proposed and introduced - e.g tourism levy- to fund environment protection measures  | SRI | 1-5 years |

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| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| 3. Common guidelines and methodologies for Water Quality management and planning.  |  3.1 Proposals for the adoption of basin-wide water quality standards and monitoring protocols  | Development of WQS system which is measurable and cost effective, including biological parameters - based on existing systems.  | PI | 1-5 years |
| 3.2 Establishment of a water classification system and agreement on priority parameters to be measured.   | Classification of Okavango basin based on WQS established in 3.1 above and water quality survey objective 2, intervention 3.2  | PI | 1-5 years |
| Establishment of medium and long-term water quality objectives for the Okavango basin.  | PI | 1-5 years |
| 3.3 Development of a basin-wide water quality improvement plan to be established over a 10 year planning horizon. | Land-based source assessment (point and diffuse sources) leading to prioritized listing of areas of pollution concern. | PI | 1-5 years |
| Development of strategic, phased investment programme for the improvement of municipal water treatment in the Okavango basin. | SRI | 5-10 years |
| Reduction in contaminate loadings by 30% by 2020  | ESI | 5-10 years |
| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| Target 4: Establish common guidelines and methodologies for land-use and natural resource management and planning | 4.1 Harmonisation of land use planning guidelines developed through a consultative process. | Recommendations for wetland management adopted and management plans developed | PI | 1-5 years  |
| 4.2 Development of guidelines for management of different categories of wetlands.  | Plans implemented and financed by basin states | SRI | 5-10years |
| 4.3 Harmonisation of fishing regulations | Recommendations to harmonise fishing regulations adopted and implemented in the basin  | PI | 1-5 years |
| 4.4 Establish game corridors in critical areas | Critical game corridors identified and established | SRI | 5-10 years |
| 4.5 Develop best practice guidelines for community-based use of natural resources | Recommendations for common guidelines adopted and implemented in the basin | SRI | 5-10 years |
| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
|  5. Development of basin-wide water resource planning | 5.1 Development of OKACOM national actions plans consistent with the SAP and based on the concept of IWRM and in line with the SADAC water protocol. | Development of consistent NAPs incorporating SAP interventions and supporting national actions | PI | 1-5years |
| Clearly identified NAP ownership and implementation mechanisms | PI | 1-5years |
| Inclusion of SAP and NAP in national planning procedures and reference in sectoral plans | PI | 1-5years |
| Financial support to NAP secured | PI | 1-5years |
| 5.2 Applying the BDMF establish of a water resource development space for the Okavango basin and delta. | Revised report prepared on water development options, the social, economic and environmental impacts using enhanced DSS, with results presented in an easy assessable form to decision makers  | PI | 1-5years |
| Meetings of basin states chaired by OKACOM to negotiate development space and procedures for its establishment, monitoring and review |
| Signed agreement on Okavango development space | PI | 1-5years |
| 5.3 Development of water resource management plan for the Okavango basin, aligned with Okavango Delta Management Plan. | Water resource development plan over a planning horizon based on agreed development space and environmental constraints.  | PI | 1-5years |

**OBJECTIVE 5: Improvement and enhancement of the livelihoods of the basin’s peoples**

| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| --- | --- | --- | --- | --- |
| 1. Alternative livelihoods demonstrated and replicated (addressing MDG 7, Environmental sustainability, Target 1 : Integrating the principles of sustainable development into country policies and programmes)
 | 1.1 Community based, transboundary climate change adaptation projects identified and implemented, especially in the agricultural sector.  |  3 climate change adaption projects identified and implemented in each basin state | SRI | 1-5years |
| Lessons learnt disseminated and projects replicated | SRI | 1-5 years |
| 1.2 Demonstration of sustainable rangeland management practices at priority sites. |  3 sustainable rangeland projects identified and implemented in each basin state | PI | 1-5 years |
| Lessons learnt disseminated and projects replicated | SRI | 1-5years |
| 1.3 Establishment and demarcation of transboundary fishing reserves  | Report on potential transboundary sites and feasibility studies on priority sites | PI | 1-5 years |
| Agreement demarcation of fisheries, regulations, policing and monitoring and public education campaign | PI | 1-5 years |
| Staffing and equipping of reserve wardens | SRI | 1-5 years |
| Measureable increase in fishery productivity | ESI | 5-10 years |
| 1.4 Identification of potential indigenous aquatic species for aqua-culture and feasibility studies implemented  | Report on potential aquatic species and identification of sites  | PI | 1-5 years |
| Implementation of 2 aqua-culture projects per basin state | SRI | 5-10years  |
| 1.5 Agricultural market creation/extension feasibility studies undertaken in selected basin locations..  | Report on potential agriculture market support in basin and selection of pilot studies | PI | 1-5 years1-5years |
| Feasibility studies taken and projects implemented in the basin states | PI |
| 2. Environment improved and livelihoods enriched (addressing MDG 7, Environmental Sustainability, Target 3: Halve, by 2015, the population without sustainable access to drinking water and basic sanitation; and Target 2: Reduce biodiversity loss)  | 2.1 Improved provision of water supply to the basin | Sustainable water supply provided to 10 communities of more than 5,000 in each basin state | SRI | 5-10 years |
| 2.2 Improved provision of sewerage to the basin population | Sewerage system installed in 10 communities of more than 5,000 in each basin state | SRI | 5-10 years |
| 2.3 Degraded river banks and riverine forests restored and vegetation buffers established | 200 km of river banks restored in each basin state | SRI | 5-10 years |
| 5000 Hectares of riverine forest protected and restored | SRI | 5-10 years |
| 5 vegetation buffer schemes established in each basin state | SRI | 5-10 years |
| 2.4 Transboundary programmes for control and spread of alien plant species established. | Eradication measures agreed and control teams established and equipped.  | SRI | 1-5 Years |
| Halting or reduction of spread of target species | ESI | 5-10years |
| 2.5 Strategies for mitigation of human/wildlife conflicts developed and mitigated in selected sites.  | Three sites selected in each basin state and strategies developed | PI | 1-5 years |
|  Strategies implemented and lessons learnt disseminated  | PI | 1-5 years |

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|  | **OBJECTIVE 6: ENHANCED TECHNICAL CAPACITY IN THE BASIN AND INVOLVEMENT OF STAKEHOLDERS IN SAP AND NAP IMPLEMENTATION** |

| ***Target*** | ***Intervention*** | ***Indicator*** | ***Indicator type*** | ***Time-******frame*** |
| --- | --- | --- | --- | --- |
|  1. Increased stakeholder knowledge of the basin and its management | 1.1 Technical and management training programmes designed and implemented for a range of stakeholders.  | Needs assessment undertaken and training programmes designed for * OKACOM Secretariat
* basin authorities and councils
* national regulatory bodies including hydrometerological services and environmental protection agencies
* Local government
* NGOs,
* Community organisations,
* and other stakeholder groups,

to improve stakeholder involvement in basin management. | PI | 1- 5 years |
| Number of staff trained and courses delivered  | PI  | 1-5years |
| M&E framework designed to measure training effectiveness in improving efficiency of regulatory authorities and involvement of stakeholders in basin management  | PI | 1-5years |
| 1.2 Knowledge exchange programmes between basin states developed for tourism, CBNRM/conservation management. | Number of staff secondments, bilateral training activities and  | PI | 1-5 years |
| Academic exchange program and conferences focusing on Okavango ecology held throughout the basin. | PI | 1-5 years |
| New curriculum included in primary, secondary and tertiary schools in the region and an increase in the number of academic partnerships recorded by OKACOM | PI | 1-5 years |
| 1.3 Training coordination body to be established under OKACOM secretariat with the participation of the major donors | Review of training programmes being undertaken by governments and international partners | PI | 1-5years |
| Establishment of training board under OKACOM including representatives of international partners and agreement on joint training programmes  | PI | 1-5years |
| Target 2: Improved communication and involvement of basin stakeholders | 2.1 Stakeholder analysis and questionnaire to establish stakeholder priorities.  | Review of stakeholder analysis and extensive questionnaires to establish stakeholders priority issues/problems and conflict areas | PI | 1-5 years |
| Review of SAP/NAPs taking account of stakeholder analysis | PI | 1-5years |
| 2.2 Development and implementation of OKACOM public participation and communication strategy | An agreed strategy for communication and stakeholder involvement with clear guidance on roles, tasks, responsibilities and funding sources. | PI | 1-5 years |
| Functioning press bureau and an increased number of articles published on the Okavango environment in all national languages | PI | 1-5 years |
| Easy access mechanisms to Okavango environmental information held by public authorities in all riparian states.  | PI | 1-5 years |
| 2.3 Development and implementation of marketing/promotion strategy produced for the Okavango basin  | Strategy document prepared and agreed by OKACOM  | PI | 1-5 years |
| Five documentaries selected from competition and aired on television stations every year in local languages | PI | 1-5 years |
| Functioning Okavango Environment Centers in each riparian state.  | PI | 1-5 years |
| 2.4 Re-establishment of Okavango NGO forum  | Coordinated Okavango NGO Forum with participation of national and international NGOs throughout the Okavango basin | PI | 1-5 years |
| NGO forum mandate, rules and procedures and strategy agreed | PI | 1-5years |
| Meetings of NGO forum held every six months and funding of activities increased three fold.  | PI | 1-5 years |
| 2.5 Promotion of small-grants programme established for improvement of and CBNRM and local tourism. | Project criteria established and agreed by OKACOM and NGO forum | PI | 1-5 years |
| Ten projects funded in each basin states and the results presented in a basin wide competition. | PI | 1-5years |

