



## **MANAGEMENT AND DEVELOPMENT PROCESSES IN THE ZAMBEZI WATERCOURSE**

**Integrating Fisheries within Zambezi Basin Strategic Plan**

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## ACRONYMS AND ABBREVIATIONS

AU	African Union
BCLME	Benguela Current Large Marine Ecosystem
BMU	Beach Management Unit
CAS	Catch Assessment Survey
CBD	Convention on Biological Diversity
CCLME	Canary Current Large Marine Ecosystem
CIFA	Committee for Inland Fisheries of Africa
CIFAA	Committee for Inland Fisheries and Aquaculture of Africa
CITES	Convention on International Trade in Endangered Species of Wild Fauna and flora
COFI	FAO Committee for Fisheries
CSO	Civil Society Organization
EAF:	Ecosystem Approach to Fisheries
EIFAC	European Inland Fisheries Advisory Council
ERA	Ecological Risk Assessment
FAO	Food and Agriculture Organization of the United Nations
FMP	Fisheries Management Plan
FS	Frame Survey
GDP	Gross National Product
GPS	Geographical Positioning Station
IBAR	Inter African Bureau for Animal Resources
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated (catches)
IWRM	International Water Resource Management
LVFO	Lake Victoria Fisheries Organization
MCS	Monitoring, Control and Surveillance
NGO	Non-Governmental Organization
PFRS	Policy Framework and Reform Strategy
RISDP	Regional Indicative Strategic Development Plan
SADC	Southern African Development Community
SADCC	Southern African Development Coordinating Conference
SIPO	Strategic Indicative Plan for the Organ
TDA	Transboundary Diagnostic Analysis
ZAMCOM	Zambezi Watercourse Commission
ZAMSEC	Zambezi Watercourse Secretariat
ZAMTEC	Zambezi Watercourse Technical Committee
ZSP	Zambezi Basin Strategic Plan

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## EXECUTIVE SUMMARY

Inland water bodies are natural capital assets which must be managed in a manner to not only maintain existing benefits (food security, livelihoods and income), but also seek to increase the sustainable contribution of the sub-sector to the blue economy growth of our member states. The current benefits are however under threat from a variety of sources, key amongst which include poor governance frameworks, open access nature, unsustainable fishing practices, weak capacity, threats by climate change, environmental and other natural disasters, lack of alternative livelihoods etc. The vast majority of these water bodies are shared ecosystems which in turn pose significant management challenges to fisheries management bodies.

The overall goal of the Policy Framework and Reform Strategy (PFRS) for fisheries and aquaculture in Africa is to create an enabling environment for food security, livelihoods and wealth. Therefore one of the PFRS key policy arenas is to promote sustainable development of small-scale fisheries on the continent that includes inland fisheries development. The formulation of realistic fisheries management plans informed by assessment of management and development issues could be a precursor to solving some of the challenges in the subsector. This study which was commissioned by the African Union with support from the European Union under the Fisheries Governance Project, assessed the issues which could ultimately contribute to realistic regional fisheries management plans in shared water bodies on the continent.

The Zambezi Watercourse is the largest in Southern Africa and one of the most important on the African continent. The watercourse embraces Angola, Namibia, Botswana, Zimbabwe, Zambia, Tanzania, Malawi, and Mozambique. By providing multiple benefits ranging from water for domestic, irrigation, and hydropower uses, to fisheries and a wide diversity of wildlife products, the river plays a central role in the lives of over 40 millions of people in its catchment area.

This paper assess the management of fisheries in the Zambezi Watercourse, identifies and analyzes the key transboundary issues that affect fisheries management and development and suggests strategies, processes and mechanisms to ensure that prominence is given to the fishery sector in the Zambezi Basin Strategic Plan (ZSP) being developed by the Zambezi Watercourse Commission (ZAMCOM)

There are three major ichthyologic regions in the Zambezi Watercourse which have been created by waterfalls. Victoria Falls on the Zambezi River, Avumba Menda Falls on the Kafue River, and Kalomo Falls—separate the Upper Zambezi and Kafue Rivers from the lower parts of the system. There are about 85 species of fish in the upper Zambezi River and 80 in the Kafue River. The middle and lower Zambezi River Basins have fewer fish—about 60 freshwater species, plus 15 marine species in the lower river.

Zambezi Watercourse Commission (ZAMCOM) an informational and consultative river basin organization set up through ZAMCOM agreement by the eight riparian states that share the Zambezi River Basin is the main institution charged to promote and coordinate the cooperative management and development of the Zambezi watercourse in a sustainable, climate resilient manner. The fisheries management and fisheries research institutes in the riparian states are directly responsible for the management of fisheries in the section of the Zambezi Watercourse within its jurisdiction. Coordination of fisheries activities is promoted or ensured by Southern African Development Community (SADC).

The Regulatory tools are the SADC Revised Protocol on Shared Watercourses and National Fisheries Legal Framework of the riparian countries. The Code of Conduct for Responsible Fisheries has been incorporated in the national fisheries legal frameworks either through legislation, regulations or administrative decisions, or policy in all the Zambezi River riparian countries

The fisheries on the Zambezi Watercourse are for the most part open access except for isolated cases as the industrial fishing in Lake Kariba using a mechanized vessel with a lift net exploiting the introduced Lake Tanganyika clupeid *Limnothrissa miodon* locally known as Kapenta. In many countries the fisheries policies, laws and regulations are outdated.

Management of the fisheries is often extremely difficult owing to the spatially dispersed nature of the fishery and the large number of persons involved. As a result, there is low compliance to the fisheries laws and regulations and the regulations are poorly enforced. Even where enforced, their success may also be questionable, because they are usually established by central authorities and do not cater for the needs of individual waterbodies and their fisher populations. Persistent reasons for low compliance and enforcement include lack of enforcement of existing regulations, weak institutional and legal structures, and inadequate economic, human, and technical capacity

The authorities have adopted traditional approaches to management including limitations on access, closed seasons, minimum sizes of landed fish and limitations on the type and mesh size of the gear to be used. Such centrally imposed limitations have been unsuccessful.

Participatory approaches including co-management systems are now being used in an effort to overcome the limitations imposed by central government agencies.

The key transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries in Zambezi Watercourse are related to inadequate fisheries governance. The main issues are: absence of up-to-date policies, laws and regulatory standards at national level; the non-harmonization of policies, laws, regulatory standards at regional level; low compliance to fisheries laws and regulations and inadequate enforcement and limited effective involvement of stakeholders in the fisheries management process.

These issues together with the prevalence of poverty and increase in population in the lakes basin contribute to excessive pressure being exerted on the fisheries resources and poor management practices as most artisanal fisheries are using small net and inappropriate gear and methods resulting in declining fish stocks, destruction of critical habitats and the environment, and conflicts among stakeholders.

The key challenges are to correct the imperfections in the fisheries governance and in addition reduce the pressure on the resources; generate appropriate scientific knowledge and incorporate the use of local knowledge to guide resource management; ensure the availability of reliable data and information to guide management; and develop the human and institutional capacity to manage the complexity of resource uses and pressures, and also to understand and develop mechanisms for adaptation to climate variability and climate change. There also a number of important environmental stresses.

The fisheries are among the most valuable wild resource, but they also play a crucial role in providing high quality nutrition for the people of the watercourse while also sustaining a diversity of livelihood strategies ranging from those who catch the fish to those who process and trade the catch. The paper makes a strong case for fisheries to be given greater prominence in the ZSP and that the countries are assisted to develop appropriate fisheries management plans premised on the Ecosystem Approach to Fisheries (EAF) management.

## SECTION ONE: INTRODUCTION

### 1.1. Purpose of the study

This study assesses the management of fisheries in the Zambezi Watercourse, identifies and analyzes the key transboundary issues that affect fisheries management and development and suggests strategies, processes and mechanisms to ensure prominence is given to the fishery sector in the Zambezi Basin Strategic Plan (ZSP) by the Zambezi Watercourse Commission (ZAMCOM) and that riparian countries develop appropriate fisheries management plans premised on the principles of Ecosystem Approach to Fisheries (EAF).

### 1.2. Context and rationale

Inland water bodies are natural capital assets which must be managed in a manner to not only maintain existing benefits (food security, livelihoods and income), but also seek to increase the sustainable contribution of the sub-sector to the blue economy growth of our member states. The current benefits are however under threat from a variety of sources, key amongst which include poor governance frameworks, open access nature, unsustainable fishing practices, weak capacity, threats by climate change, environmental and other natural disasters, lack of alternative livelihoods etc. The vast majority of these water bodies are shared ecosystems which in turn pose significant management challenges to fisheries management bodies.

The overall goal of the Policy Framework and Reform Strategy (PFRS) for fisheries and aquaculture in Africa is to create an enabling environment for food security, livelihoods and wealth. Therefore one of the PFRS key policy arenas is to promote sustainable development of small-scale fisheries on the continent that includes inland fisheries development. The formulation of realistic fisheries management plans informed by assessment of management and development issues could be a precursor to solving some of the challenges in the subsector. This study which was commissioned by the African Union with support from the European Union under the Fisheries Governance Project, assessed the issues which could ultimately contribute to realistic regional fisheries management plans in shared water bodies on the continent.

Africa has about 80<sup>1</sup> transboundary water basins that serve multiple functions. The transboundary water basins cover approximately 64% of the continent's land area, which contain 93% of the water resources and are inhabited by 77% of the population (UNEP, 2010). The water basins contain fisheries resources and a wealth of aquatic and other biodiversity. The Zambezi Watercourse (river Basin) with its extensive floodplains and wetlands is one of these transboundary water basins.

Inland fisheries make very significant contributions to nutrition and food security, employment, income generation and improvement of livelihoods to populations in African countries. In several countries, especially land-locked countries and riparian communities along major rivers and lakes of the continent, fish is probably the major protein source. Inland fisheries are the fourth (10.66%) most important source of animal protein after cattle (22.4%), marine fish (21.10%) and chicken (15.79%) (AUC-NEPAD, 2014). Although most of the catch of inland fisheries is consumed locally, products from inland fisheries are also important in regional, intra- and international trade. For example the value of the exports of catch from Lake Victoria in 2014 was over US300 million (LVFO, 2015).

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<sup>1</sup> Source: *Water and Sustainable Development in Africa: An African Position Paper African Water Task Force, August 2002*

The most recent estimate (2014) of the total fish production from Africa is 10.35 million tonnes. Of this, about 2.85 million tonnes or 33.1% is from inland capture fisheries. Total aquaculture production was 1.71 million tonnes and marine capture fisheries 5.78 million tonnes (FAO, 2016, Garibaldi, pers. com). The value added by the fisheries sector as a whole in 2011 was estimated at more than US\$24 billion, 1.26% of the GDP of all African countries. Of this, about US\$6.2 billion was inland fisheries (US\$4.7 billion from direct fishing and US\$1.5 billion from post-harvest). The fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1% of Africa's population of between 15 and 64 years old. The share of inland fisheries was about 5 million (3.3 million as fishers and 1.5 million processors). The estimated number of women in the inland fisheries sector was slightly over 1.3 million with the majority of them (about 1.1 million) in the post-harvest sub-sector (de Graff and Garibaldi, 2014)

Conventional wisdom holds that the contribution of inland fisheries is grossly under-estimated because of the difficulty of collecting data from highly dispersed landing sites (Welcomme et al. 2014); implying that with good management, inland fisheries can become a strong engine for development and economic growth.

Effective fisheries management of transboundary fishery resources is dependent on among other things the availability and implementation of appropriate fisheries and aquaculture policies; the conduct of fisheries management practices in a regulatory framework that is consistent, harmonized and applicable, and the development and implementation of an appropriate fisheries management plan which should be a negotiated instrument between the fisheries management authorities of the concerned countries and their stakeholders; an instrument that provides a clear vision for the fishery, realistic and measurable objectives and other parameters as a road-map for moving the fishery forward on an agreed schedule of shared responsibilities among the fisheries management authorities and the stakeholders.

While in the specific case of the Zambezi Watercourse a single management plan might not be appropriate, there is still need for policies, laws and regulatory standards to be harmonized and that the process for developing the management plans in the different countries are consistent and coherent. At the same time, experience has shown that in major water management projects which call for important capital investments the emphasis tend to be placed on hydroelectric power development and irrigation and fisheries tends to be marginalized.<sup>2</sup>

Efforts to promote the rational management of inland fisheries particularly in transboundary water bodies in Africa date back to 1970<sup>3</sup>. At the Fifty-four Session of the FAO Council, African countries, Members of FAO, conscious of the fact that several rivers and lakes are common to two or more countries, and that their fisheries resources constitute a field of international interest requested FAO to establish a body similar to the European Inland Fisheries Advisory Council (EIFAC) for the African Continent. In follow up to this request, an ad hoc Consultation on the Proposed Establishment of an Inland Fishery Body for Africa was held in Rome in April 1971. The Consultation among other things estimated that the presence of several shared rivers and lakes as well as extensive floodplains

<sup>2</sup> A Report on "Environmental Sustainability in Water Resource management" commissioned by SADC in collaboration with World Bank, Sida, IUCN and SARDC, and which Chapter 2 more specifically addressed issues on water and economy, totally by passed fishery which is not even identified as one economic use of water (Hirji, R., P. Johnson, P. Maro and T Matia-Chiuta (eds) 2002. Defining and mainstreaming environmental sustainability in water resource management in Southern Africa. SADC Technical Report, 318pp. Southern African Development Community, SADC

<sup>3</sup> The Author is aware that studies had begun in several water bodies as early as the late 1800s; but we refer to joint efforts at the international level.

and wetlands suitable for inland fisheries necessitated joint policy and the adoption of a uniform and standard methodology for resource appraisal and for collection of statistics and biological data in order to determine the consequences of fishing on stocks and strongly recommended the establishment of such body. Consequently, the FAO Council at its Fifty-six Session, in June 1971 established the Committee for Inland Fisheries of Africa (CIFA)<sup>4</sup>.

Since then several actions were taken by African countries with the assistance of development partners, including in particular FAO, to promote the sustainable development of inland fisheries particularly in transboundary inland water bodies. CIFA among other things established three sub-Committees, namely: the Sub-Committee for the Protection and Development of the Fisheries of the Sahelian Zone, (1974), the Sub-Committee for Development and Management of the Fisheries of Lake Tanganyika (1977), and the Sub-Committee for the Development and Management of Fisheries of Lake Victoria (1981) to coordinate fisheries research and development activities on these major inland water bodies, floodplains and wetlands.

### **1.3. Organization of the Paper**

The Paper systematically describes the Zambezi River Basin/watercourse and its fisheries resources; presents the institutional and regulatory frameworks for the management of the Zambezi Watercourse and in particular the fisheries resources; assess the fisheries governance and management approaches applied in the watercourse; identifies and analyzes the environmental stresses, and key transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries in the Zambezi watercourse; and suggests strategies, processes and mechanisms that could be considered to ensure fisheries and aquaculture sector are given due attention and are effectively integrated into the Zambezi Strategic Plan by ZAMCOM.

### **1.4. Methodology**

The assignment was essentially a Desk Study combined with two day mission to the headquarters of the Southern Africa Development Community (SADC) in Gaborone, Botswana. The approach for the study consisted of four distinct but interrelated phases of literature search/review and virtual search of websites; a field visit to Gaborone at which Semi-structured interviews were conducted.

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<sup>4</sup> The FAO Council at its Hundred and Thirty-third Session in 2007 changed the name to “The Committee for Inland Fisheries and aquaculture of Africa” (CIFAA) to reflect the importance of aquaculture in global fishery sector but also in Africa

## SECTION TWO: MAIN TEATURES OF THE ZAMBEZI WATERCOURSE AND ITS FISHERIES

### 2.1. Zambezi Watercourse

The Zambezi Basin is Africa's fourth-largest river basin after the Congo, Nile, and Niger Basins. Its total area represents about 4.5 per cent of the entire continent and embraces eight countries (Angola, Namibia, Botswana, Zimbabwe, Zambia, Tanzania, Malawi, and Mozambique). The headwaters of the Zambezi originate in Zambia from where the River flows northwards for about 30 km. It then turns west and south to run over about 280 km through Angola and re-enters Zambia. Upon re-entry into Zambia a major tributary Kabompo River flows into the Zambezi. It then flows southwards through marshy Barotse floodplains. In the southwest of Zambia the river becomes the border between Zambia and the eastern Caprivi region of Namibia for about 130 km. The Zambezi River then forms the border between Zambia and Zimbabwe and reaches its greatest width, over 1.3 km, before its waters plunge over the Victoria Falls. It continues to form the border between Zambia and Zimbabwe after the Victoria Falls with the 277 km stretch of the man-made Lake Kariba. Downstream of Lake Kariba the Kafue River, a major tributary originating in the north of Zambia, flows into Zambezi River with a discharge of about 10 km<sup>3</sup>/year. Still further downstream, at the border with Mozambique, the Luangwa River flows into the Zambezi River with an annual discharge of over 22 km<sup>3</sup>. Luangwa River originates in the northeast of Zambia. The Basin area is about 1,390,000 Km<sup>2</sup>. Figure 1 depicts the Zambezi Watercourse.



**Figure 1:** The Zambezi Watercourse

The hydrology of the Zambezi River Basin/Watercourse is not uniform, with generally high rainfall in the north and lower rainfall in the south. In some areas in the Upper Zambezi and around Lake Malawi/Nyassa, rainfall can be as much as 1,400 mm/year, while in the southern part of Zimbabwe it can be as little as 500 mm/year. Due to the rainfall distribution, northern tributaries contribute much more water than southern ones. For example, the northern highlands catchment of the Upper Zambezi sub basin contributes 25 percent, Kafue River nine percent, Luangwa River 13 percent, and Shire River 12 percent—for a total of 60 percent of the Zambezi River discharge. Together, Zambia, Zimbabwe, Angola, Malawi and Mozambique dominate the watershed, contributing 95 percent of the Zambezi watercourse area. The remaining three watercourse countries—Botswana, Namibia, and Tanzania—contribute the remaining 5 percent of the basin land area.

Several large dams have already been constructed on the Zambezi to generate much needed electrical power for watercourse states. The two largest dams are the Kariba Dam, located between Zimbabwe and Zambia, and the Cahora Bassa Dam in Mozambique (Wirkus and Boge, 2006). A number of other new dams are under discussion.

Of the approximately 40 million people living in the Zambezi River Basin, the majority (over 85%) live in Malawi, Zimbabwe, and Zambia (World Bank, 2010; Wirkus and Boge, 2006). This population living in the Basin represents about 20% of the total population in the Southern African Development Community (SADC), making the Zambezi an important river in the region (Chenje, 2003). Basin residents rely on the river for drinking water, fisheries, irrigation, hydropower production, mining and industry, etc. The Zambezi River also attracts tourists from around the globe, who visit several scenic sites and the wildlife that the river supports along its banks. Tourism supports local economies along the river and brings much needed foreign currency into the basin countries.

The Zambezi Watercourse contains four important areas of biodiversity and supports a vast amount of terrestrial and aquatic biodiversity and the richest and most diverse flora in Africa (Chenje, 2003). The four areas are:

- Lake Malawi/Niassa/Nyasa, a region of importance to global conservation because of the evolutionary radiation of fish groups and other aquatic species.
- The swamps, floodplains, and woodlands of the paleo-Upper Zambezi in Zambia and northern Botswana, including the areas of Barotseland, Busanga and Kafue, which along with the Bangweulu are thought to be areas of evolutionary radiation for groups as disparate as Reduncine antelope, suffrutices, and bulbous plants.
- The Middle Zambezi Valley in northern Zimbabwe and the Luangwa Valley in eastern Zambia, two of the last remaining protected areas extensive enough to support large populations of large mammals.
- The Gorongosa/Cheringoma/Zambezi Delta area of central Mozambique, which covers an area of enormous habitat diversity not found in such close proximity elsewhere on the continent.

## **2.2. The Fisheries of the Zambezi Watercourse**

The geology of the Basin determines the chemistry of the river, which affects the productivity of its fisheries. Much of the upper Zambezi River Basin consists of unconsolidated, wind-blown Kalahari Sands which are poor in nutrients. Kalahari sands are largely absent from the rest of the Basin, where the river and tributaries are richer in nutrients. Enriched by tributaries, the Zambezi River's nutrient levels rise along its course.

There are three major ichthyologic regions in the Zambezi River Basin which have been created by waterfalls. Victoria Falls on the Zambezi River, Avumba Menda Falls on the Kafue River, and Kalomo Falls—separate the Upper Zambezi and Kafue Rivers from the lower parts of the system. There are about 85 species of fish in the upper Zambezi River and 80 in the Kafue River. The middle and lower Zambezi River Basins have fewer fish—about 60 freshwater species, plus 15 marine species in the lower river.

Lake Malawi/Niassa/Nyasa is hydrologically a part of the Zambezi system, but a series of waterfalls separate its fish fauna from that of the Zambezi River System. The Lake has more endemic species than any other lake in the world. In particular, it has an extremely large and diverse fauna of cichlid fishes (more than 500 species). It has relatively few non-cichlids, which are more closely related to the Congo fauna than they are to fishes of the Zambezi River (Denconsult 1998).

According to Jackson (1961), the upper Zambezi River is a “reservoir” river which favors the evolution of fish species. Relatively high rainfall means that water is abundant all year. Extensive swamps and floodplains act as buffers to regulate the flow of the rivers, which seldom exhibit large variations in height. The floodplains have water on them for long periods of time, while the low water flow periods are relatively short. Marginal vegetation is abundant and provides cover for small fish species and juveniles of larger species. The middle Zambezi River is a “sandbank” river (Jackson 1961) since its flow is much more variable, and it has little marginal vegetation. The lack of cover exposes small fish to severe predation. Floodplains appear again around the confluence of the Shire River and the Zambezi Delta. The number of species increases here, partly because of the appearance of marine elements but also because of the reappearance of some species typically found in the upper Zambezi

Many typically marine estuarine species—like gobies, mullets, and tarpon—can also tolerate freshwater and can be found far inland. The Bull Shark, for example, (*Carcharhinus leucas*) has penetrated the Zambezi River as far as Cahora Bassa (Skelton 1993). Temporary waters can be found throughout the Basin during the rainy season and include the “forest lakes” of the Upper Zambezi and the “pans” of the Middle and Lower Zambezi. Few have significant importance for fish production. The lungfish (*Protopterus annectens*) is an important inhabitant of many temporary waters in the lower Zambezi and are utilized by local people. Man-made habitats like sewage ponds, drainage ditches, and water storage dams can also be found throughout the Basin. Many of them support fish, but their potential as a resource has never been fully investigated.

## **SECTION THREE: Institutional and Regulatory Frameworks/Arrangements**

The important institutional arrangements for the management of the Zambezi Watercourse and by implication the fisheries include: the Southern African Development Community (SADC), the Zambezi Watercourse Commission and the national fisheries management authorities and fisheries research institutes in the eight countries that share the watercourse.

### **3.1. Institutional Frameworks**

#### **Southern African Development Community (SADC)**

The Southern African Development Community (SADC) was established as a development coordinating conference (SADCC) in 1980 and transformed into a development community in 1992<sup>5</sup>. It is an inter-governmental organization whose goal is to promote sustainable and equitable economic growth and socio-economic development through efficient productive systems, deeper co-operation and integration, good governance and durable peace and security among fifteen Southern African Member States.

The Member States of SADC are Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

The main objectives of Southern African Development Community (SADC) are to achieve economic development, peace and security, and growth, alleviate poverty, enhance the standard and quality of life of the peoples of Southern Africa, and support the socially disadvantaged through Regional Integration. These objectives are to be achieved through increased Regional Integration, built on democratic principles, and equitable and sustainable development.

The objectives of SADC, as stated in Article 5 of the SADC Treaty (1992) are to:

- Achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the people of Southern Africa and support the socially disadvantaged through Regional Integration;
- Evolve common political values, systems and institutions;
- Promote and defend peace and security;
- Promote self-sustaining development on the basis of collective self-reliance, and the inter-dependence of Member States;
- Achieve complementarity between national and regional strategies and programmes;
- Promote and maximize productive employment and utilization of resources of the region;
- Achieve sustainable utilization of natural resources and effective protection of the environment;
- Strengthen and consolidate the long-standing historical, social and cultural affinities and links among the people of the Region.

#### **SADC Common Agenda**

Linked directly to the SADC Objectives is the SADC Common Agenda, which originates in Article 5 of the SADC Treaty (1992) as amended. The Common Agenda summarizes the key strategies and

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<sup>5</sup> The Southern African Development Coordinating Conference (SADCC), established on 1 April 1980 was the precursor of the Southern African Development Community (SADC). The SADCC was transformed into SADC on 17 August 1992 in Windhoek, Namibia where the SADC Treaty was adopted, redefining the basis of cooperation among Member States from loose association into a legally binding arrangement.

policies of the institution. Subsequently, the SADC institutional structure is consistent with the SADC Common Agenda and Strategic Priorities that it encapsulates. The same values are echoed in the Regional Indicative Strategic Development Plan (RISDP) and Strategic Indicative Plan for the Organ (SIPO).

The SADC Common Agenda is underpinned by a series of principles and policies, including:

- Promotion of sustainable and equitable economic growth and socio-economic development that ensures poverty alleviation with the ultimate objective of its eradication;
- Promotion of common political values, systems, and other shared values, which are transmitted through institutions that are democratic, legitimate and effective; and
- Promotion, consolidation and maintenance of democracy, peace and security.

SADC has produced over 20 Protocols of which the SADC Revised Protocol on Shared Watercourses is of direct relevance to this study.

### **Zambezi Watercourse Commission (ZAMCOM)**

Zambezi Watercourse Commission (ZAMCOM) is a river basin organization set up through ZAMCOM agreement by the eight riparian states that share the Zambezi River Basin. ZAMCOM promotes and coordinates the cooperative management and development of the Zambezi watercourse in a sustainable, climate resilient manner. The Agreement was signed by the majority of the Riparian States on July 13, 2004 at Kasane in Botswana and it came into force on 19 June 2011.

ZAMCOM's main objective is "to promote the equitable and reasonable utilization of the water resources of the Zambezi Watercourse as well as the efficient management and sustainable development thereof". ZAMCOM's goal is to assist the Riparian States achieve regional cooperation and integration through sharing treasured benefits from the water resources cooperative development of the Zambezi river basin. This is in recognition of the contribution such cooperation could make towards the peace and prosperity of the basin and the Southern African region as a whole<sup>6</sup>.

In terms of governance, ZAMCOM has three main governing organs. These are the council of Ministers, which is the decision making; the Technical Committee (ZAMTEC), a technical advisory body; and the Secretariat (ZAMSEC) responsible for overall management and is supported by Project Implementation Units on one end and Working Groups on the other.

The current activities include the development of a Zambezi Basin Strategic Plan (ZSP) that will identify, categorize and prioritize investment projects and programmes for managing and developing the water and related resources of the basin. The plan will be used as a reliable and accepted basis for decision-making on investments.<sup>7</sup>

### **3.2. Regulatory Frameworks**

The Regulatory tools are the SADC Revised Protocol on Shared Watercourses and National Fisheries Legal Framework of the countries sharing the Watercourse.

<sup>6</sup> The nine principal functions, from the collection, evaluation and dissemination of data to promote the application and development of the ZAMCOM Agreement according to its objectives and principles, are spelt out in the ZAMCOM Agreement.

<sup>7</sup> From discussions with the Executive Secretary the principal national agencies with which ZAMCOM interact are those in charge of water management. In addition, the emphasis in its work is on hydrological information, studies on investments and Databases at Basin level. ZAMCOM is in the process of developing its SAP and this will be a good time to inject in the aspects of fisheries and aquaculture.

## **SADC Revised Protocol on Shared Watercourses**

The SADC region includes 15 major river basins which are transboundary or shared between two or more countries (accounting for approximately 70% of the water resources in the Region), requiring a complex system of water rights and leading to potential conflicts over water use. Therefore, in 2000, SADC member States signed the Revised Protocol on Shared Watercourses (Revised SADC Protocol) with the objective to foster closer cooperation for judicious, sustainable and coordinated management of shared watercourses, protection and utilization of shared watercourses and advancement of SADC's agenda of regional integration and alleviation of poverty. In order to achieve this objective, this Protocol seeks to:

- a. Promote and facilitate the establishment of shared watercourse agreements and Shared Watercourse Institutions for the management of shared watercourses;
- b. Advance the sustainable, equitable and reasonable utilization of the shared watercourses;
- c. Promote a coordinated and integrated environmentally sound development and management of shared watercourses;
- d. Promote the harmonization and monitoring of legislation and policies for planning, development, conservation, protection of shared watercourses, and allocation of the resources thereof; and
- e. Promote research and technology development, information exchange, capacity building and the application of appropriate technologies in shared watercourses management.

The Protocol is based on International Water Resource Management (IWRM) principles and upholds the rules for international waters management laid out in the UN Convention on the Law of Non-navigational Uses of International Watercourses. It provides for the establishment of bilateral and multilateral institutions for the management of shared watercourses and for the continued operation of watercourse agreements (without requiring existing agreements to be consistent with the spirit of the Protocol).

At the level of the countries all the countries have fisheries management authorities and the majority of them also have research institutes; and the National Fisheries Legal frameworks are the regulatory instruments. The National Fisheries Legal Frameworks embody the principal fisheries laws (Fisheries Acts/Codes/Laws) and subsidiary legislation; international fisheries legal framework reflected in national laws; and non-fisheries specific laws impacting on fisheries such as environmental laws, health/veterinary laws, and Customs laws. In this respect, the watercourse countries are Party to the Convention on Wetlands of international Importance especially as Waterfowl Habitat (RAMSAR Convention), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on Biological Diversity (CBD).

The eight countries sharing the Zambezi Watercourse also are implementing National Environmental Action Plans. These plans provide a framework for integrating environmental concerns when designing and implementing projects in order to maintain the health of the water bodies in which fish live by: taking measures to avoid excessive nutrient enrichment.

The Code of Conduct for Responsible Fisheries has been incorporated in the national fisheries legal frameworks either through legislation, regulations or administrative decisions, or policy in all the Zambezi River riparian countries.

## **SECTION FOUR: Governance of the Fisheries and Management Approaches Applied**

### **4.1. Governance of the fisheries**

In many countries the fisheries policies, laws and regulations are outdated. There is low compliance to the fisheries laws and regulations and the regulations are poorly enforced. Similarly, most of the basin countries have adopted environmental standards and regulations. However, persistent problems include lack of enforcement of existing regulations, weak institutional and legal structures, and inadequate economic, human, and technical capacity (Chenje, 2003).

### **4.2. Management Practices**

The fisheries on the Zambezi Watercourse are for the most part open access except for the industrial fishing in Lake Kariba using a mechanized vessel with a lift net exploiting the introduced Lake Tanganyika clupeid *Limnothrissa miodon* locally known as Kapenta. The governments of the riparian countries have sought to manage the fisheries using methods of direct command and control. There is the devolution of management to local level for example through co-management of the lakes in Malawi to enable participatory management at a local level. Co-management is also reported to be practised on Lake Kariba but the approach has not been formalized ((WorldFish/Government of Zambia/CGIAR, 2004).

A good example of the open-access nature of the fishery is the inshore fisheries on the Zimbabwean and Zambian side of Lake Kariba which have experienced fundamentally different management regimes since the beginning. The Zimbabwean side is highly regulated and enforced resulting in a fishing pressure and fishing pattern which has not changed much over time and where the fish stocks are only moderately exploited. In contrast, the Zambian inshore fishery, with open access and virtually no enforcement of regulations, has developed a much higher fishing intensity and a changed fishing pattern towards increasingly smaller mesh sizes resulting in a higher exploitation level and reduced stock sizes. While effort in both countries has been fluctuating over time, the general trend in Zimbabwe is a decrease with corresponding increase in catch rates. In Zambia effort generally has increased with a corresponding decreasing trend in CPUE. At present, the overall fishing effort, in terms of number of nets, is about seven times higher in Zambia than in Zimbabwe, while the average experimental catch rates are seven times lower.

**Zambezi Watercourse Floodplain fishery:** The Zambezi Watercourse is an excellent example of floodplain fisheries (Welcomme, 1985). The floodplains are widely distributed along the rivers in the upper Zambezi and Kafue river basins and, to a lesser extent, the Lower Shire and lower Zambezi rivers. They are highly productive systems, which are renewed each year during the flood season. Most fish species move onto the floodplain to breed at the time of the first floods in November and December. Spawning on the floodplain offers juvenile fish the advantages of abundant food, well-oxygenated conditions, and security from predation. Other species inhabit the system more or less permanently, living amongst the weeds in the marshes (Welcomme 1985). Economically, the most important family of the floodplains is the Cichlidae. These fish are generally sparse in the Sandbank Rivers of the lower and middle Zambezi.

**Natural Lakes of the Watercourse:** There are two significant natural lakes in the Basin. Lake Malawi/Niassa/Nyasa is located in the southernmost part of the Rift Valley and is very deep (with a maximum depth of 758 meters and an average depth of 426 meters) and anaerobic from about 250 meters down

(Patterson and Kachinjika 1995). The second lake, Lake Malombe, has an average depth of seven meters and is essentially a southern extension of Lake Malawi/Niassa/Nyasa. It did not exist 100 years ago when the level of Lake Malawi/Niassa/Nyasa was at the lowest level known in the historical record. Its fish fauna consists of some species similar to those found in Lake Malawi/Nyasa that have been able to pass down the Shire River. The Lake was once marshy with dense beds of aquatic vegetation and extensive reed beds around the shore. These plants have now been eliminated by the intensive use of seine nets.

**Catches and Potential Yields:** According to Denconsult, (1968 and World Fish Center (2007) the Upper Basin (from Kabompo to Cuando Chobe has very high potential and average catches of 7,500 tonnes a year with potential yield of 14,000t/yr have been reported. The Kafue River and floodplains of the Middle Basin (from Kafue to Luangwa) is one of the most important for Zambia. The average catches of 7,000 t/yr but with potential yield of 17,000t/yr. Lake Kariba with inshore fishery and Kapenta fishery has a potential of 40,000 t/yr; the Lukanga swamps on Kafue River has average catches of 1,400 t/yr but with potential yield of 8,000 t/yr. The Lower Basin (from Mupata to Zambezi Delta) in which is located the Lake Cahora Bassa is nutrient richer than Lake Kariba with inshore fishery and Kapenta fishery. Kapenta fishery is producing 16,000 t/yr (WorldFish Center, 2007) while inshore fishery produces 6,700 t/yr (WorldFish Center/Government of Zambia/CGIAR, 2004). In addition, Lake Malawi with diverse and complex fish fauna with average catches around 50,000 t/yr and potential estimated between 100,000 to 140,000 t/yr.

**Effects of Dam and Reservoir Construction:** Fisheries management and development in these wetlands has also been greatly impacted as a result of the construction of reservoirs both large and small. Two major reservoirs have been constructed on the Zambezi River: the first, filling of Lake Kariba (around 5,400 km<sup>2</sup>) was completed in 1968 and the second, Lake Cahora Bassa (around 2,700 km<sup>2</sup>), was completed in 1975. Other important reservoirs include Lake Itzhi Tezhi and Kafue Gorge Upper reservoir on the Kafue; Mulungushi and Mita Hills on tributaries of the Luangwa; Lakes Chivero and Manyame on the Manyame River; and the Sebakwe dam on the Sebakwe River. There are numerous smaller bodies of water throughout the basin. Most are reservoirs that have been constructed during the last hundred years. These large reservoirs have produced changes in fish production either an increase or decrease and also produced changes in the breeding habits of some species and in species composition. Overall, most of the major recorded catches are from these reservoirs.

Reservoir construction has been most intense in Zimbabwe, Zambia and Malawi. These small bodies of water have significant potential as sources of fish that has not been fully realized. Most small reservoirs are not built specifically for fisheries, however, which may restrict their productivity. For example, they typically fluctuate much more than natural lakes do, especially when they are used for irrigation. Farmers use much of the water, and many small reservoirs are almost completely emptied each year (Satia, 1989). The effects of these fluctuations on fish production have not been studied. The potential catches of these small water bodies are estimated at no less than 10,000 t/yr, with average of 150 kg/ha.

The only estuaries in the Zambezi River Basin are found in the Zambezi Delta. Their salinity ranges from fresh water in their upper reaches to seawater at their outer reaches. Salinity can vary daily along this gradient according to the tides or seasonally according to the flow of the rivers. With reduced freshwater inflow, salinity can rise above that of seawater. Estuarine fish are able to tolerate a wide range of salinity. Some freshwater species, like the Mozambique tilapia (*Oreochromis mossambicus*) can also penetrate estuaries.

## **SECTION FIVE: Environmental Stresses, Strategic Transboundary Issues and Challenges**

### **5.1. Strategic Issues and Challenges:**

The key transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries in Zambezi Watercourse are related to inadequate fisheries governance. The main issues are: absence of up-to-date policies, laws and regulatory standards at national level; the non-harmonization of policies, laws, regulatory standards at regional level; low compliance to fisheries laws and regulations and inadequate enforcement and limited effective involvement of stakeholders in the fisheries management process.

These issues together with the prevalence of poverty and increase in population in the lakes basin contribute to exertion of excessive pressure on the fisheries resources, as is the case on the Zambian side of Lake Kariba and the basin ecosystems; and poor management practices as most artisanal fisheries are using small net and inappropriate gear and methods (Turpie et al. 1999), resulting in declining fish stocks, destruction of critical habitats and the environment, and conflicts among stakeholders.

The key challenges are to correct the imperfections in the fisheries governance and in addition reduce the pressure on the resources; generate appropriate scientific knowledge and incorporate the use of local knowledge to guide resource management; ensure the availability of reliable data and information to guide management; and develop the human and institutional capacity to manage the complexity of resource uses and pressures, and also to understand and develop mechanisms for adaptation to climate variability and climate change.

Absence of up-to-date policies, laws and regulations and the absence of harmonized policies, laws, regulations and standards: The starting point for good fisheries management is policy from which should be derived legislations, regulations etc. In many several countries there is no inland fisheries development policy, in certain countries the policy are outdated and generally lack integrated approach to river basin use. The same is true for legislation and regulations.

Low compliance to fisheries laws and regulations and inadequate enforcement: Major challenge in the management of the fisheries is the low compliance to fisheries laws and regulations by resource users. Compliance and enforcement levels of the various laws of relevance to areas of the Watercourse under national jurisdiction vary among the countries. In all cases where compliance and enforcement is poor, the causes are more or less the same namely: shortage of manpower, financial constraints, logistical constraints, lack of awareness by the fisheries communities, and inadequacy in the dissemination of relevant information, inadequate capacity and laxity on the part of the enforcement agencies and high poverty levels. These weaknesses could be addressed through awareness campaigns, improvement in information exchange, greater involvement of the community in management, such as the institution of participatory management approaches, co-management, Beach Management Units, etc. and capacity building through training and logistical support.

Additional problems of implementing regulations relate to non-deterrent penalties that do not discourage the offender, and would be offenders, from committing a similar offence and varied levels of penalties applied in the different or at least neighboring countries. Given the transboundary nature of the resources in the watercourse, it is important to reflect the gravity of each offence in respective

penalties in a uniform manner. The penalty for an offence should carry the same gravity no matter where it is committed. This would deter offenders from committing particular offences on the basis of the weakness in the penalty in one country as opposed to the other. The adoption of a consistent approach is even more important because many of the fishers are migrants. Furthermore, incentives must be adopted to support behaviour that fosters the conservation objectives and encourage resource users to go beyond mere compliance with the rules.

**Effective involvement of all stakeholders in the management process:** The many problems and challenges that the fishery faces, especially declining fish stocks and habitat loss, poor data and data management, low legitimacy of regulations and the consequent poor enforcement of regulations can be better solved by fisheries management authorities partnering with local communities, CSOs and the private sector, indeed involving all stakeholders in all the functions and responsibilities of fisheries management. Stakeholders should not merely be consulted to rubber-stamp decisions but should participate. The fisheries management authorities cannot and will never be able to achieve the ambitious object of the sustainable development of fisheries alone. It is believed that the reason effective involvement of stakeholders in the fisheries management process is limited is because such partnerships have to be carefully designed to be appropriate for the situation, as well as accountable and effective. However, knowledge and experiences accumulated over the past three decades allow the identification of the conditions and situations which are good predictors of successful partnerships.

Partnering would among other things permit the making of appropriate regulations that are consistent, harmonized and applicable; permit the monitoring of compliance to regulations by both the management authorities and local communities; permit common access to data and data analysis on the status of the resource; permit the effective enforcement of regulations; permit the resolution of conflicts in a timely manner through informal and formal means.

**Limited scientific and other knowledge to guide resource management-** The absence of scientific information and other knowledge such as local and traditional knowledge to guide management is a major issue and challenge for fisheries management in the watercourse. There is an apparent lack of information on the size of the fish stock, distribution and movement patterns, population structure, breeding habits, estimates of potential yield, characteristics of fishing gear and catch rates as most of the studies were conducted decades ago. In addition there is little long-term research, monitoring and evaluation of impacts to provide the basis for decision-making. Research institutions in the countries sharing the watercourse have no doubt studied some of the phenomena on the watercourse. However, the information is not easily shared or made available to the other country and is generally not in the public domain. It is important to emphasize that the management of transboundary fishery resources that are highly vulnerable to various factors requires the adoption of a systematic, inclusive and accelerated process/working style to better understand the abundance and distribution of fish stocks over time.

Scientists in charge of stock assessments, including economists and sociologists must work with managers and other users of fishery resources to develop appropriate methods to collect, manage and use biological, economic and social data and eventually produce information that is as accurate and precise as possible relying, as appropriate, on local and traditional knowledge to fulfill their responsibilities. In addition to undertaking stock assessment, research should also focus more on the definition of management measures. Emphasis should be placed to address gaps in knowledge about the

socio-economic aspects of the artisanal and industrial fisheries and to better assess the interactions between the categories of the fishery.

Fragmented data and information to guide management- The effective management of the natural resources in the Zambezi Watercourse will depend on the timely provision of key information to planners and decision makers. Presently the lack of reliable information makes it difficult to integrate the activities of the fisheries sector in the national economies of the riparian countries. Apparently Catch Assessment Surveys and Frame Surveys are rarely undertaken and basic information for the improvement of knowledge and understanding of fishery status and trends are lacking or inadequate.

A challenge to the effective collection of information and data is the lack of resources to data collectors and the manual entry of the data several days after collection. Consideration should be given to the introduction of electronic data collection mechanism using Tablets which permits the input of the data virtually instantly. This would require that resources are provided to a central information service, responsible for maintaining a GIS database, a literature reference system and other shared data sources. ZAMCOM is putting in place an extensive database for the Watercourse; consideration should be given to including fishery data and information in the system.

Inadequate human and institutional capacities: Managing transboundary fishery resources requires a portfolio of skills that cut across disciplines (fisheries, political, economic, social and environmental). Even in the strictly fisheries discipline capacity is limited in several areas (science/research, fisheries economics, development, statistics, organizational aspects, etc.). In many countries, fisheries offices have inadequate budgets, and are poorly staffed and equipped, which hinder the provision of technical services, build capacity at local community level and to monitor fisheries activities in the watercourse. In such a context the need for an on-going and targeted capacity enhancement and development is readily evident.

## **5.2. Major Environmental Stresses:**

The principal environmental stressors include:

- Threats to fish biodiversity within the Zambezi basin arises as human population growth and water demand for agriculture, industry and domestic uses within the basin increases thereby straining water resources and consequently impacting on fish biodiversity.
- Global warming due to climate changes is likely to result in long-term changes in water resources availability within the basin. Reduction in precipitation and increased evaporation will affect water availability and fish habitats.
- Further reservoir construction within the upper and lower Zambezi will alter the remaining riverine sections of the river. As experienced at Kariba this will result in changes in fish composition.
- Introduced fish species also present a threat to fish biodiversity. For example *Oreochromis niloticus* now present in Kafue River and Lake Kariba and in the Zambezi River below the dam is a major threat because it is aggressive and tend to competitively exclude other Tilapias and to hybridize with other *Oreochromis* species. The Revised SADC Protocol on Shared Watercourses prohibits the introduction of exotic species.
- Proliferation of aquatic weeds like water hyacinth also threatens fish especially in eutrophic water.
- Increased water demand usually results in water abstraction and drainage of wetlands. This results in reduction in flow and leads to restriction of fish habitats in streams and can alter fish breeding patterns when flooding regimes are changed.

- Pollution and siltation are also major threats to fish abundance and biodiversity within the basin. Excessive pollution leads to fish deaths and bioaccumulation of metals and pesticides in fish. Siltation of dams and rivers alters fish habitats and disrupts the breeding behaviour of cichlids.

## **SECTION SIX: Suggestions for Effective Integration of Fisheries and aquaculture in ZAMCOM**

The Zambezi Watercourse is the largest in Southern Africa and one of the most important on the African continent. By providing multiple benefits ranging from water for domestic, irrigation, and hydropower uses, to fisheries and a wide diversity of wildlife products, the river plays a central role in the lives of millions of people in the riparian states. As the countries of the watercourse place increasing attention on how best to harness these multiple benefits sustainably it is increasingly important that the potential and constraints of different resource uses are understood and factored into the decision-making process.

Amongst the many wild natural resources that the watercourse provides the fisheries are especially important. Not only are these generally the most valuable wild resource, but they also play a crucial role in providing high quality nutrition for the people of the watercourse while also sustaining a diversity of livelihood strategies ranging from those who catch the fish to those who process and trade the catch. Despite the important contribution that fisheries play in the livelihoods of local populations in the Zambezi watercourse, the fishers are often neglected or even excluded from the decision-making processes both at national and regional (watercourse) levels. Similarly the fishery sector is rarely included in the planning and management of the water sector; as was pointed out in Section One.

ZAMCOM is in the process of developing a Strategic Action Programme (ZSP) for the Watercourse; although emphasis will be placed on hydroelectric power development and irrigation, it is strongly suggested that the fishery sector (capture fisheries and aquaculture) be given prominence in the Zambezi Basin Strategic Plan (ZSP).

A number of areas where emphasis would need to be placed include:

- Analyze governance and policy processes in order to better understand those and improve the capacity of the sector to interact with the decision-makers, thereby increasing the chance of small-scale fisheries to be better integrated into the decision-making process.
- Develop more appropriate valuation methods which would in particular better reflect the socio-economic importance of fisheries for the livelihood of rural population of the Zambezi watercourse;
- A knowledge management system for the Zambezi Watercourse including: baseline information and managing data collection, quality control, harmonization, storage and dissemination
- Improved and increased fisheries research which contributes to sustainable rural livelihoods and food security including: research into the resource base, research on the socioeconomic context of the fishery (including HIV/AIDS); study of the effect of natural environmental variability on fishing stock versus fishing patterns and other human impacts (including upstream/downstream impacts of dams, pollution) on fisheries.
- Information for the management of fishery and the environment to favor fish are the habitats occupied by a species during its lifetime and the migratory pathway by which the species moves between them. This should include not only the pathways used by adult fish to arrive at spawning grounds, but also the conditions that favor the drift of the larvae and juveniles from spawning grounds to downstream nurseries.

In addition many of the countries do not have fisheries management plans and for those that do the plans are not adequate to address the situation in the country or the Watercourse. Although it might not be realistic at this stage to have one fisheries management plan for the watercourse to ensure that the plans of the different countries are consistent in terms of policy, process and mechanisms. In this context it is suggested that due consideration be given to assist the countries to develop fisheries management plan for the Zambezi Watercourse on the premise of the principles of the Ecosystem Approach to Fisheries (EAF) and ensure its effective implementation by Partner States and other stakeholders, donors, non-governmental organizations, etc.

**The following paragraphs outline the rationale and process for the elaboration of such a plan.**

First it is important to stress that a fishery management plan (FMP) for transboundary fishery resources should be seen as a negotiated instrument between the fisheries administrations of the concerned Member States and their stakeholders; it provides a clear vision for the fishery, realistic and measurable objectives and other parameters as a road-map for moving the fishery forward on an agreed schedule of shared responsibilities among the fisheries administration and stakeholders.

There are several reasons why it is advisable to work on the basis of a FMP: It provides a blue print for action based on current information; it provides realistic milestones with which to measure achievements and assess results, it fosters successful communication and team work among stakeholders of the international inland water body, it also permits bilateral partners and other donors and NGOs to realistically contribute to the sector on the basis of an agreed programme rather than each organization promoting its own agenda which may not be in line with endorsed programmes, etc.

**Why use the EAF process and tools.**

The Ecosystem Approach to Fisheries (EAF) has been adopted by the FAO Committee on Fisheries (COFI) as the appropriate and practical way to fully implement the Code of Conduct for Responsible Fisheries. EAF is a risk based management planning process that covers the principles of sustainable development including the human and social elements of sustainability, not just the ecological and environmental components. EAF is also an effective planning framework that facilitates the planning, coordination and prioritization of current and proposed activities, making them clearer by giving a “home” to the many strategies and monitoring programmes that are underway. In addition, EAF helps to develop comprehensive fishery management systems that seek the sustainability and equitable use of the whole system (ecological and human) to best meet the community’s needs and values.

However, the effectiveness of the EAF process and the contribution of EAF to long-term sustainable development of the resources are greatly enhanced by the conduct of an Ecological Risk Assessment (ERA) as an integral and essential part of the process. Ecological Risk Assessment is a means of identifying the ecological risks associated with the management of the major fisheries in a given region, and to prioritize appropriate management responses. As a tool, it is helpful in ensuring cost-effective decisions and actions are taken because it ensures that time, effort and resources are not wasted on pursuing issues, which may appear important but which are generally insignificant in the context of the broader fishery.

As a process, the conduct of the ERA is fundamentally participatory and seeks to build consensus among diverse stakeholders about identifying and prioritizing ecosystem issues and a programme of action.

Secondly the ERA process sees the “ecosystem” in its broadest definition, including the biological, social, and economic as well as governance systems. This latter principle is of particular importance given the fact that in fisheries management, many biological recommendations are undermined by the lack of consideration of the social and economic implications or governance systems required to implement these recommendations. The conduct of an ERA also makes it clear that contrary to the concerns of those skeptical of the intentions of EAF, humans are seen as an integral component of the ecosystem in the approach<sup>8</sup>.

A four step process is used to develop FMP using EAF principles:

- i. Develop a clear description of the fishery, identify high policy goals and the relevant societal values attached to the fisheries;
- ii. Identify issues, assets, and challenges; and assess the risks associated with each issue and prioritize these issues and consider the key elements that will deliver successful outcomes. The process is facilitated by using an EAF Log-Frame<sup>9</sup> to provide a snapshot version of all the important elements of the management system (plan). The elements are besides an identification of the issue number and its risk value:
  - a. **Management objectives that provide a link between the principles**, policy goals, major issues and what participants agreed the fishery should try to achieve.
  - b. **Operational objective(s)** that is/are clear, measurable and directly linked to one or more of management objectives; noting that an operational objective could be applicable to more than one issue.
  - c. **Management measures**, specific controls applied in the fishery to contribute to achieving the objectives<sup>10</sup>.
  - d. **Indicators**, variables that can be monitored to give a measure of the state of the fishery at a given time. Each indicator should be linked to one or more reference points and used to track the state of the fishery in relation to those reference points.
  - e. **Reference points**, benchmark against which to assess the performance of management in achieving an operational objective, corresponding to a state considered to be desirable (target reference point) or undesirable and requiring immediate action (limit reference point).
  - f. **Performance measure**, a function that relates the value of an indicator to its reference point, and that guides the evaluation of fisheries management performance in relation to its stated operational objective.
  - g. **Means of verification**, the sources of information used to indicate accomplishments, in other words sources of information on the indicators. They are usually recorded details such as publications, reports, databases, statistics, surveys, etc.
  - h. **Data requirements**: the type of data/information that would need to be collected to ensure suggested measures could be implemented within the time-frame and in a cost-effective manner.
  - i. **Responsibility**: who or what institution would be responsible for specific management actions or arrangements that will achieve the desired level of performance.
3. Identify and select key elements for the management systems and summarize the elements by component (ecological wellbeing, human wellbeing and governance) to fit into the management plan

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<sup>8</sup> It is important to emphasize that we manage fish mainly through managing people. Indeed, our failure to manage people effectively has turned out to be the main limiting factor in fisheries management today.

<sup>9</sup> The Logical Framework Approach (LFA) was developed in 1969 by the United States Agency for International Development (USAID) as a planning and management tool for designing, tracking and evaluating projects. An important output of the LFA was a Log-Frame (Document) which has since been adopted and modified by several bilateral and multi-donor organizations and NGOs. The Log-Frame used by the participants is that modified by FAO for EAF management plans.

<sup>10</sup> In some cases such as in the US and in Canada the column « Management Measures » is represented by “Strategies”. Strategies here refer to the full set of management measures applied to reach the operational objectives in a given fishery.

4. Elaborate the Log-frame for the Management Plan
5. The framework (EAF Log-Frame) which is a major product of the process can be considered an asset. It provides countries elements on which they can establish coherence between national plans and the regional initiative. Table below provides an extract of the log-frame for the management plan of a transboundary fishery.

The development of fisheries management plan implies implementation. It is the successful delivery of the elements at local or fisheries community level that the future of Zambezi Watercourse fisheries will be decided. Creating an enabling environment for this to occur is a goal worth pursuing because fishing is a successful enterprise that already contributes substantially to development in Zambezi Watercourse and has the potential to contribute even more.

Issue #	OPERATIONAL OBJECTIVE	MANAGEMENT MEASURES	INDICATORS	REFERENCE POINTS	PERFORMANCE MEASURES	MEANS OF VERIFICATION	DATA REQUIREMENTS	RESPONSIBILITY
<b>ECOLOGICAL WELLBEING</b>								
<b>Management Objective No.1: Rebuild over-exploited stocks and protect those stocks that are threatened</b>								
EW 1, 9 & 17	1. Reduce fishing mortality and adopt regional cooperative management approach for Sardinella aurita, Trachurus species, and Ethmalosa fimbriata in the Gambia and Senegal	1. Limits on catches, 2. Protection of spawning areas, 3. Zoning by fleet type, 4. Biological Rest 5. Harmonize size at first capture	Level of catch and spatial distribution	Catch level compared to those recommended by scientists	Reported level of actual catches in relation to recommended level of catches	Stock Assessment reports	1. Catch statistics, 2. Scientific reports 3. Scientific survey data	Scientists, Fisheries Administrations, Fisheries Operators
EW 18	2. Reduce fishing mortality of Sardinella pilchardus in Morocco Zone A+B	1. Limit catches, 2. Protection of spawning areas, 3. Zoning by fleet type, 4. biological Rest	1. Catch level 2. Spatial distribution	Catch level compared to those recommended by scientists	Reported level of actual catches in relation to recommended level of catches	Stock evaluation reports	1. Catch Statistics 2. Scientific reports 3. Scientific survey data	Scientists, Fisheries Administrations, Fisheries Operators
EW 4, 8, 12 & 19	3. Reduce catches of juveniles of Sardinella aurita, Sardinella maderensis, Trachurus sp. And Sardinella pilchardus in Morocco Zone A + B	1. Concerted monitoring system, 2. Mesh size regulation 3. Revision of size at first capture 4. Use of VMS 5. Better control of landings	Level or quantity of juveniles caught	1. Size at first capture 2. Limits of juveniles authorized in the catches	1. Significant reduction of juveniles caught 2. Recommended sizes of fish are caught	Scientific reports with emphasis on demographic structure	1. Trade statistics of catches, 2. Sampling data at landing sites	Scientists, Fisheries Administrations, Fisheries Operators
EW 3, 7 & 11	4. Reduce impacts of illegal fishing on Sardinella aurita, Sardinella maderensis & Trachurus sp.	1. Sensitize operators 2. Strengthen control systems	1. Number of observed infractions 2. Number of complaints by fishers 3. Number of illegal (pirate) vessels	1. Recommended mesh sizes; 2. Authorized fishing zones; 3. Total allowable catch, by-catch and rejects	Significant reduction in the number of infractions	Reports on violations of regulations	1. Statistics on surveillance missions, 2. Observations	Fisheries Administration (Surveillance Unit) and Operators

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