Republic of Mozambique

Republic of Zimbabwe

DEVELOPMENT OF THE BUZI RIVER BASIN JOINT INTEGRATED WATER RESOURCES MANAGEMENT STRATEGY

JOINT INTEGRATED WATER RESOURCES MANAGEMENT STRATEGY

DRAFT

Supported by:

Produced by:

in association with

Client:	Southern African Development Community on behalf of: Government of the Republic of Mozambique Government of the Republic of Zimbabwe
Project:	DEVELOPMENT OF THE BUZI RIVER BASIN MONOGRAPH AND JOINT IWRM STRATEGY
Title:	JOINT INTEGRATED WATER RESOURCES MANAGEMENT STRATEGY
Status of report:	**DRAFT**
SWECO Project No:	**1989801000**
Date:	May 2013
Project team:	SWECO International AB, Sweden (lead) CONSULTEC Lda, Mozambique AustralCOWI, Mozambique Interconsult Zimbabwe

Approved by:

Nils Kellgren, Team Leader
SWECO INTERNATIONAL AB

Tove Adolfo Lilja, Project Director
SWECO INTERNATIONAL AB

PREFACE

The Buzi River Basin is shared between the two countries of Mozambique and Zimbabwe. The Development of the Buzi River Basin Monograph and Joint IWRM Strategy constitutes a part of the Shared Watercourses Support Project (SWCSP) for the Ruvuma, Buzi and Save river basins. The SWCSP has been prepared by the Southern African Development Community (SADC) Secretariat and the African Development Bank (AfDB), in consultation with the Governments of Mozambique, Tanzania and Zimbabwe, within the framework of the SADC Revised Protocol on Shared Watercourses (2000), the Regional Water Policy (2005), and the Regional Strategic Action Plan on Integrated Water Resources Development and Management (2005). The SWCSP was approved by the AfDB for funding and implementation in May 2006.

The overall long term goal of the joint effort between Mozambique and Zimbabwe on the Buzi River Basin is to ensure development of integrated water resources management and related physical infrastructure development that contributes to regional integration and poverty reduction.

Project Implementing Agencies are the ARA-Centro in Beira, Mozambique and the ZINWA-Save in Mutare, Zimbabwe supported by the national Ministries responsible for water. As a transboundary project, the SWCSP including the Buzi component is managed by the SADC on behalf of the Governments of Mozambique and Zimbabwe.

Contributions

SADC Shared Water Course Support Project (SWCSP)
Mr. Phera Ramoeli - Head of Water Unit, SADC, Chairperson, SWCSP PSC
Mr. Jerome Dukuduku - Project Manager, SADC Secretariat, Botswana
Mr. Luis de Almeida – Former Project Manager, SADC Secretariat, Botswana
Mr. Pedro Simone - SWCSP Technical Assistant, ARA-Centro, Mozambique
Mr. Thomas Murinye - SWCSP Technical Assistant, ZINWA Save, Zimbabwe
Mrs. Magdeline Mathiba-Madibela - Head of Gender Unit, SADC, SWCSP PSC

Mozambique
Mrs. Suzana Saranga Loforte - Director of National Directorate of Water, SWCSP PSC
Mrs. Cacilda Machava, General Director of ARA Centro, SWCSP PSC
Mr. Manuel Fobra – Former General Director of ARA Centro
Mr. Marcos Gupo - User representative, SWCSP PSC
Staff of ARA-Centro

Zimbabwe
Mr. Vavarirai Choga - Director of Department of Water Resources, SWCSP PSC
Mr. Vengesai Mazambani - Catchment Manager, ZINWA Save, SWCSP PSC
Mr. Zvikomborero Manyangadze - User Representative, Zimbabwe, SWCSP PSC
Staff of ZINWA-Save

Key Consultant Experts
Dr. Nils Kellgren
Mrs. Tove Adolfo Lilja
Prof. Alvaro Carmo Vaz
Mr. Leonard Magara
Dr. Admasu Gebeyehu
Mr. Björn Almström
Mr. Jonathan Schroeder
Mrs. Nathalie Ritsch

Supporting Consultant Experts
Ms. Emelie Arnoldsson
Mrs. Isabel Vaz
Mr. Johan Rossouw
Dr. Makurira Hudson

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of Abbreviations

AfDB	African Development Bank
ARA	Regional Water Authority (Mozambique)
BBC	Buzi Basin Committee
CBMP	Community Basin Management Project
CC	Catchment Council
CDM	Clean Development Mechanism
CSO	Central Statistical Office (Zimbabwe)
CPU	Central Protection Unit
DNA	National Directorate of Water
DNHA	National Directorate of Agricultural Hydraulics
DRM	Disaster Risk Management
DWR	Department of Water Resources
EdM	Mozambique Electric Utility Company
EFR	Environmental Flow Requirements
EKIS	Enhanced Knowledge Information System
EMA	Environmental Management Agency
EWS	Early Warning System
GDP	Gross Domestic Product
GOH	Office of Hydraulic Works
INAM	National Meteorological Institute
INE	National Institute of Statistics (Mozambique)
INGC	National Disaster Management Institute
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resources Management
JWC	Joint Water Commission
k	kilo
M	Million
m	meter
MAR	Mean Annual Runoff
MADER	Ministry of Agriculture and Rural Development
MDG	Millennium Development Goal
MICOA	Ministry of Coordination of Environmental Action
MIREM	Ministry of Mineral Resources and Mining
ML	Million Litres
MoPH	Ministry of Public Works and Housing
MoW	Ministry of Water
n/a	not applicable
NGO	Non-Governmental Organisation
PEDSA	Strategic Plan for Agricultural Development
PPP	Public Private Partnership
PROIRRI	Sustainable Irrigation Development Project

SADC	Southern Africa Development Community
SAP	Strategic Action Project
USD	United States Dollars
WDM	Water Demand Management
WQ	Water Quality
WRM	Water Resources Management
WRYM	Water Resources Yield Model
ZINWA	Zimbabwe National Water Authority

EXECUTIVE SUMMARY

The development and management of the transboundary Buzi River Basin requires cooperation, under a framework that promotes interdependence and joint management. The Monograph, the Development Scenario Report and the Joint Integrated Water Resources Management (IWRM) Strategy comprise background and detailed guiding documents for the responsible river basin authorities for further advancing the management of the joint water resources.

The purpose of the Buzi River Basin Monograph phase was to present the 2010 baseline data on the current state of the available water resources, socio-economic characteristics, environmental conditions, and current water demand.

The purpose of the scenario phase was to analyse development options and alternative strategic actions to meet future water demand and management requirements. Water has many uses and socio-economic development over time impacts on the water resource. In an era of climate change and uncertain global development dynamics, water planning is more complex than ever.

Water strategies and plans should be robust and lay the foundation for optimal, equitable and sustainable use of the water resource and hence they have to be tested against multi-discipline criteria and different development scenarios.

The national water law and policies of Mozambique and Zimbabwe together with international water agreements determine the overall governance framework within which the Buzi River Basin is to be managed and developed. It should be noted though, that there is no exact formula for IWRM decision making. The IWRM process is instead based on showing the impacts of each action so that informative decisions can be made. Some aspects are ruled by legislation (e.g. EIA, water allocation priorities); others are guided by policy objectives (e.g. access to water). The key steps involved in the strategy formulation analysis are review of sector plans and long term objectives, integrated analysis of development and management options, river systems analysis/water balance modelling and multi-criteria analysis.

The Strategy formulation process has provided substantial information about the range of institutional, social, economic, environmental and technical challenges and opportunities confronting both people and institutions within the Buzi Basin related to water.

For the JIWRM of the Buzi River Basin, four groups of water management challenges were identified:

- Sustainable use and assurance of water supply to key water users sectors.
- Water quality and aquatic ecosystem health.
- Water related vulnerability, notably floods and droughts.
- Water governance and IWRM implementation, with special focus on the Transboundary Water Management (TWM) dimension.

The review points to the numerous avenues through which such challenges are being and can be addressed. It also underscores the integrated dimension of IWRM and the need to view the activities proposed under the 'Buzi River Basin Joint IWRM Strategy' in relation to other complementary initiatives e.g. in the transport, agriculture and energy sectors. Specifically, a coordinated set of storage and regulating infrastructure to meet water demand have been studied – and priority investments have been identified as a result of the multi-criteria analysis. Additionally, the review indicates that a set of coordinated institutional actions are needed to enhance water

management and governance in the basin. Such supporting action projects are important to meet the future water challenges and to achieve the IWRM objectives, stated in international as well as national policies and legislation. As a result a number of priority strategies have been formulated to address challenges identified and to contribute to sustainable development.

To meet the future water management challenges, an array of measures have been defined in the form of a Joint IWRM Strategy Framework comprising strategic action projects (SAPs) to be implemented at short, medium or long term time frames. The analysis of the water resource development scenarios and the macro-economy of the basin have guided the selection of strategic action projects. A major part of the strategic actions identified are not related to augmenting the water supply by investing in water infrastructure projects. Infrastructure investment projects are important but must be supported by strategic management related action projects such as water demand management, disaster management, inter-ministerial coordination and enhanced monitoring, studies and knowledge management. The measures and recommendations are built on the scientific studies and stakeholder feedback.

The priority management and institutional issues and actions that have been singled out are those important to fulfil the mandates under SADC shared Protocol and JWC Agreement. In planning the strategic framework, the aim has been to reach a balance of strengthening the basic framework for transboundary cooperation as well as working on national issues in water resource management. The rationale for a balanced approach is that it is important to focus on the national level IWRM as a way to strengthen TWM.

The strategic actions which have been defined and planned are deemed to contribute to a desirable state for the Buzi River Basin of socio-economic development, reduced vulnerability, sustainable use of water and regional integration.

Together, these measures form the Buzi Joint IWRM strategy and Implementation Plan up to 2030.

Table 0-1 summarises the **Buzi JIWRM Strategy Framework and Implementation Plan** with an indication of the time horizon for implementation (short, medium and long-term) and main implementing agencies. The implementation plan defines proposed lead organizations and key supporting stakeholders that should be actively engaged in these activities. This proposed plan is meant to guide and ensure implementation of the strategic directions and describe how, when, by whom, and at what cost the different components of the strategy can be implemented. However, the plan is subject to changes upon final negotiations among the involved actors.

The plan will be subject to comprehensive reviews on regular basis i.e. every five years, in order to take into account progress and experiences of each five year period. Development of shorter term “operational plans” is moreover recommended to be developed every five years period.

Table 0-1: Buzi Joint Integrated Water Resources Management Strategy

Challenge	Strategic Area	Action	Time Frame			Lead Institutions	Main Partner Institutions	Cost		
			Short Term (0-2 years)	Medium Term (3-10 years)	Long Term (10-20 years)			Total	Zw	Mz
								kUSD		
Meeting Water Demand	Coordinated Water Infrastructure Development	**Component 1.1: Major dam and hydro-power projects**								
		SAP 1.1.1: Mirror Dam	x			ZINWA-Save	Provincial ministries in Zm; Private sector	35 000	35 000	
		SAP 1.1.2: Tsate Hydropower Project	x	x		EdM in Mz	DNA /ARA-Centro in Mz	136 600		136 600
		SAP 1.1.3: Muenezi hydropower project	x	x		EdM in Mz	DNA/ARA-Centro, Provincial ministries	55 700		55 700
		SAP 1.1.4: Lucite/Cintura Multipurpose Project		x	x	DNA /ARA-Centro in Mz	EdM, DNHA, Provincial ministries and private sector in Mz	53 300		53 300
		SAP 1.1.5: Buzi/Miracuene Multipurpose Project		x	x	DNA /ARA-Centro in Mz	EdM, DNHA, Provincial ministries and private sector in Mz	47 700		47 700
		Component 1.2: Small and medium infrastructure projects								
		SAP 1.2.1: Small and medium dams and weirs		x	x	DNA /ARA-Centro, Mz; DWR/ZINWA-Save, Zm	Provincial ministries, private sector	50 400	20 200	30 200
		SAP 1.2.2: Assessment and development of the Dombe Alluvial aquifer		x		DNA /ARA-Centro, Mz		1 000		1 000
		Component 1.3: Mobilisation of investment funding								
		SAP 1.3.1: Development funding mechanisms and piloting		x		DNA /ARA-Centro in Mz; ZINWA-Save in Zm	Private sector	500	200	300

Maintain WQ and Environmental Health	Cross-sectoral Environmental Actions	**Component 2.1: River Protection**							
		SAP 2.1.1: Pollution control structures		x		DNA /ARA-Centro in Mz; ZINWA-Save in Zm	Ministry of mines and MICOA in Mz; Ministry of mines and EMA in Zm, Mining associations	10 000	3 000	7 000
		SAP 2.1.2: River Protection		x		DNA /ARA-Centro, Mz; DWR/ZINWA-Save, Zm	Provincial ministries	400	100	300
		Component 2.2: Water Quality Management							
		SAP 2.2.1: Environmental flow study	x			JWC; DNA /ARA-Centro, Mz; DWR/ ZINWA-Save, Zm	MICOA in Mz; EMA in Zm	300	150	150
		SAP 2.2.2: Water quality management plans	x	x		JWC; DNA /ARA-Centro, Mz; DWR/ ZINWA-Save, Zm	MICOA in Mz; EMA in Zm	300	150	150
Reduce Vulnerability	Climate Change and Disaster Management	**Component 3.1: Disaster Management**							
		SAP 3.1.1: Disaster Management Plan	x	x		JWC; DNA /ARA-Centro in Mz; ZINWA-Save in Zm	INGC in Mz; CPU in Zm	500	250	250
		SAP 3.1.2: Flood control structures		x	x	DNA /ARA-Centro, Mz; DWR/ZINWA-Save, Zm	Provincial ministries, private sector	5 000		5 000
		Component3.2: Climate Change Management							
		SAP 3.2.1: Climate change adaptation strategy	x			JWC; DNA /ARA-Centro, Mz; DWR/ZINWA-Save, Zm	Provincial ministries in Mz and Zm	400	200	200
Efficient Water Governance	Institutional Consolidation and Strengthening	**Component 4.1 Institutional Management Framework**							
		SAP 4.1.1: Establishment of JWC Secretariat	x	x		JWC, MOPH/DNA /GRI in Mz; MoW/DWR in Zm		1 200	600	600
		SAP 4.1.2: Institutional consolidation, Zimbabwe	x	x		MoW/DWR/ZINWA/ ZINWA-Save in Zm		800	800	
		SAP 4.1.3: Institutional consolidation, Mozambique	x	x		MOPH/DNA /ARA-Centro in Mz		800		800

		SAP 4.1.4: Legal review and enforcement	x			MOPH/DNA in Mz; MoW/DWR in Zm	Ministries of Environment, Energy, Mines, Agriculture in Mz and Zm	100	50	50
		Component 4.2: Water Resources Management								
		SAP 4.2.1: Water use management system	x			DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	Ministries of irrigation and mining	300	150	150
		SAP 4.2.2: Pollution management system		x		DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	MICOA in Mz; EMA in Zm	300	150	150
		SAP 4.2.3: Enhanced Knowledge and Information Management Phase II	x	x		MOPH/DNA in Mz; MoW/DWR in Zm	DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	1 500	600	900
		SAP 4.2.4: Sub-basin plans		x		DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	Provincial ministries	300	150	150
		SAP 4.2.5: Groundwater management strategy		x		DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm		500	250	250
		Component 4.3: Stakeholder Participation and Cross-Sectoral Coordination								
		SAP 4.3.1: Technical support to stakeholder organisations	x	x		DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	BBC in Mz; Save CC and Budzi (and Odzi) Sub-CCs	400	200	200
		SAP 4.3.2: Community Basin Management Projects		x		DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	BBC in Mz; Save CC and Budzi (and Odzi) Sub-CCs	10000	5000	5000
		SAP 4.3.3: River awareness kit	x	x		JWC	DNA /ARA-Centro in Mz; DWR/ZINWA-Save in Zm	100	50	50
							Total Buzi JIWRM Strategy	**413 400**	**67 250**	**346 150**

1 BUZI STRATEGY FORMULATION – PURPOSE AND PROCESS

1.1 Introduction

The Buzi River Basin is shared between the two countries of Mozambique and Zimbabwe. This document presents the Joint Integrated Water Resources Management (JIWRM) Strategy and Implementation Plan for the basin. The JIWRM Strategy presents the future water management issues and needs in the Buzi River Basin and the strategies and actions to address them, both in terms of infrastructure development, environmental protection, and institutional efficiency. It builds on the insights of stakeholders and scientific sector studies of current and future water availability, utilization and water quality issues as well as multi-criteria analysis of strategic options to address future water demands and management needs. Moreover it prioritises Strategic Action Projects (SAPs) in short, medium and long-term actions and defines the roles and responsibilities for the implementation.

The Buzi JIWRM Strategy report structure is presented in Figure 1-1.

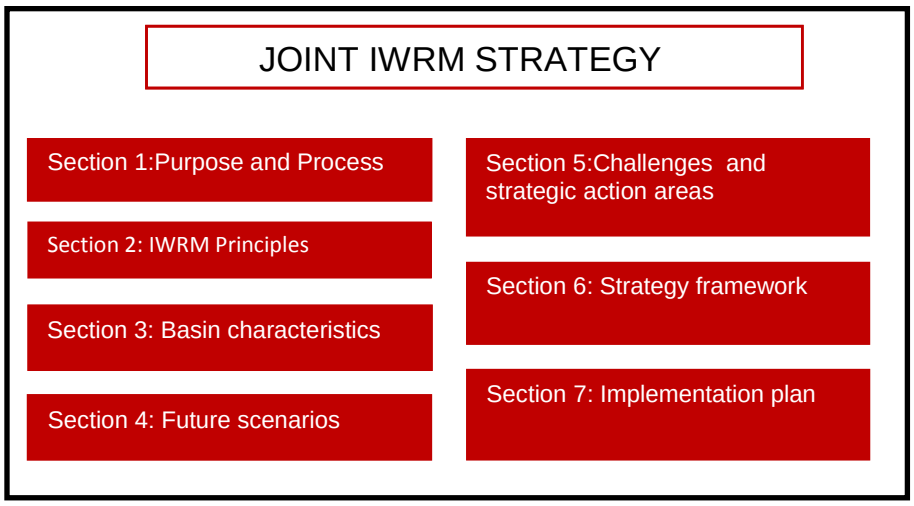

Figure 1-1: Components of the Joint IWRM Strategy of the Buzi River Basin

1.2 Purpose

Water resources development and utilisation within the Buzi River Basin is still at a low level for the basin as a whole, although there are differences between the countries. Currently, water utilisation in Zimbabwe is higher than in Mozambique. However, there are a number of new and planned developments such as biofuels and sugar cane production, notably on the Mozambican side, which will significantly change future water demand and allocation in the basin.

The development and management of this shared watercourse therefore requires cooperation, under a framework that promotes interdependence as well as joint management. The national water law and policies of Mozambique and Zimbabwe together with international water agreements determine the overall governance framework within which the Buzi River Basin is to be managed and developed. Still, the development of the Joint IWRM Strategy is a prerequisite for further

advancing water resources management in the Buzi River Basin. This JIWRM Strategy is the key instrument to develop and manage water resources in an integrated and sustainable manner and it is the primary mechanism to manage water across the sectoral and national borders in the Buzi River Basin.

The Joint IWRM strategy comprises background and detailed guiding documents for the responsible river basin authorities for further advancing the management of the joint water resources.

1.3 The Nexus Approach

The water, energy and food security nexus means that these three sectors are inextricably linked and that most actions in one sector will have impacts in one or both of the other sectors. A nexus perspective aims to increase the understanding of the interdependencies between the sectors and further influences other sectors of concern such as biodiversity and climate. A nexus approach integrates management and governance across sectors in order to improve water, energy and food security.

The challenge of applying a nexus perspective in terms of water, energy and food security for the Buzi River Basin has been a central approach in the JIWRM Strategy formulation process.

This strategy builds on the analyses of these choices i.e. potential Nexus scenarios. The rational is that the planning of water allocation and water infrastructure development and other water management measures look different for each Nexus Scenario option. Another central approach has been to study infrastructure options suitable for multi-purpose use e.g. energy production, irrigation and flood control.

1.4 Process

The development of the JIWRM Strategy has been undertaken as a consultancy. The Consultancy is undertaken by an association comprised of Sweco International of Sweden and its associates: Consultec and Austral COWI in Mozambique and Interconsult Zimbabwe in Zimbabwe.

The formulation process has been undertaken in three phases:

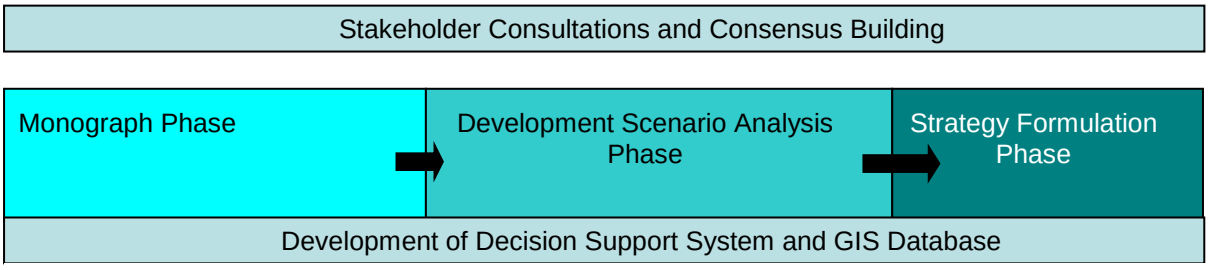

Figure 1-2: Joint IWRM Planning Process and Phasing

The principles and practices followed during the planning phases have been purposefully designed to institute an integrated (inter-sectoral) and participatory approach to the processes of managing and utilising the water resources. It is important that the JIWRM Strategy is based on scientific evidence, clear evaluation criteria and consensus in order to ensure trust and support for the Strategy and Implementation Plan. To this end, the assessment and analytic phases aimed at accurate identification and analysis of the water resources and demand, on the one hand, and the

environmental and social issues within the catchment, on the other. This is generally seen as key to sustainable use of an essential resource; and to mitigation against possible adverse impacts.

The Monograph Phase

The objectives of the Monograph phase are to i) create baseline data and information on the current state of the Buzi River Basin; ii) give directive focus for the Development Scenarios through a comprehensive analysis of the baseline data; and iii) define base-line indicators for monitoring of impacts, processes and progress.

The key delivery of the first phase, the Buzi Monograph Report (Figure 0.1), presents an introduction to the Buzi River Basin and provides an overview of the key characteristics, includeing a set of illustrative thematic maps of important features of the basin. The Buzi River Basin Monograph is thus intended to set the stage for future activities that will contribute to the overall development goals. Consequently, it presents baseline data on the current state of the water resources, socio-economic characteristics, environmental conditions, water demand, legal and institutional settings in the Buzi River Basin. The report further identifies priority water management issues and provides the preliminary directive focus for the subsequent project phases.

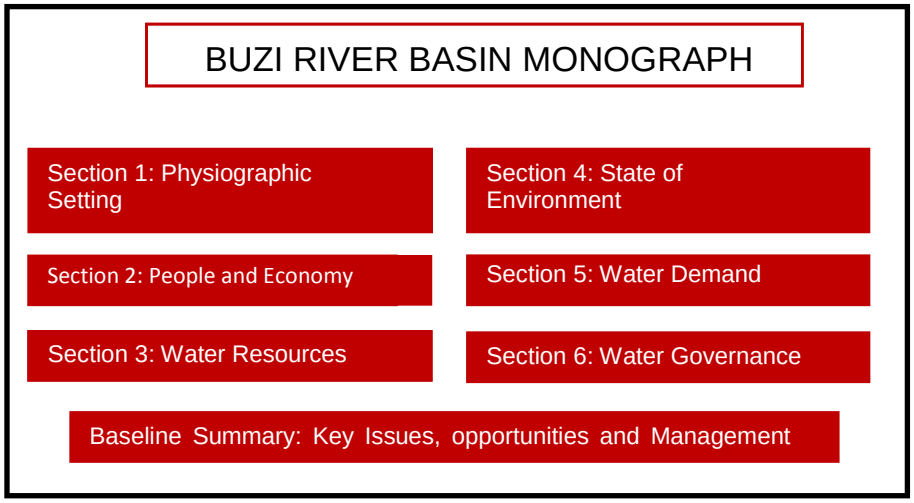

Figure 1-3 : Components of the Buzi River Basin Monograph

Development Scenario Phase

The Development Scenario summarises the finding of the scenario analysis phase. The purpose of the scenario phase was to analyse development options and alternative strategic actions to meet future water demand and management requirements.

Water has many uses and socio-economic development over time impacts on the water resource. In an era of climate change and uncertain global development dynamics, water planning is more complex than ever. Another challenge is that development planning is still often done sector-wise. Water strategies and plans should be robust and lay the foundation for optimal, equitable and sustainable use of the water resource and hence they have to be tested against multi-discipline criteria and different development scenarios.

The key steps involved in scenario analysis were review of sector plans and long term objectives, integrated analysis of development and management options, river systems analysis/water balance modelling and multi-criteria analysis.

The overall structure of the Buzi River Basin Development Scenario Report is as follows. The first section provides an overview of the river basin, specific characteristics and its future potential and challenges to be addressed. This baseline, is in subsequent sections followed by a presentation of sector plans, analysis of future water demand, and options to meet water management requirements in relation to the following key water user sectors in the Buzi River Basin: water supply and sanitation; agriculture and irrigation; livestock; afforestation; industry; hydropower; wildlife and tourism and environment. Thereafter, the results of the integrated analysis of development options are presented, where alternative water sources have been studied and where investment in large scale water infrastructure projects and flood protection have been given specific attention since such investments require detailed water balance and cost-benefit studies in order to find the most optimal and widely acceptable solution.

Special attention was given to strategic projects that create opportunities for poverty alleviation and socio-economic advancement such as development of small and medium dams to support expanding small- and medium-scale commercial agriculture, including livestock watering; guarding against droughts and supporting food security amongst subsistence farmers; ensuring adequate water supply to small towns where existing supplies have reached or are due to reach their limits; facilitating the supply of hydroelectric power to small towns and growth points; and generally developing storage capacity and regularising water use in the basin.

The preferred scenario would optimize social, economic and environmental benefits and thus, environmental and socio-economic screening through identifying benefits, impacts and mitigation measures have been a crucial part of the analysis. The assessment of the development options in a wider context is presented in a multi-criteria analysis matrix, combining basin wide IWRM indicators with a selection of economic, environmental and social indicators. Based on the outcome of the exercise, recommendations were made for the future development strategy.

The analysis of the water resource development scenarios and the macro-economy of the basin have thus guided the selection of strategic action projects presented in this Buzi JIWRM Strategy Report. It should be noted that a major part of the strategic actions identified are not related to augmenting the water supply by investing in water infrastructure projects. Infrastructure investment projects are important but must be supported by strategic management related action projects such as management of water use, disaster management, management of cross-cutting issues and enhanced monitoring, studies and knowledge management.

Strategic flood and drought management reduces vulnerability and contributes to poverty alleviation and socio-economic advancement, and is an example of an area for which different management options have been analysed and corresponding strategic actions have been defined.

Strategy Formulation Phase

The end-product, the JIWRM Strategy, comprises a set of Strategic Action Projects (SAPs). The SAPs address identified management challenges. It consists of short, medium and long-term interventions in support of integrated water resources management to meet socioeconomic development including poverty eradication and environmental integrity.

The Strategy proposes and promotes action projects and water infrastructure investments that are technically robust, socially acceptable and economically sound. The key characteristics of JIWRM Strategy are:

- the JIWRM Strategy has been prepared within the framework of SADC Revised Protocol on Shared Watercourse Systems (2000) and follows the principles given in the national water policy and legal frameworks in Zimbabwe and Mozambique.
- the JIWRM Strategy takes into account the physiographic, socio-economic and water management context within the river basin;
- the JIWRM Strategy contains plans for water allocation, take national water use priorities into consideration as well as and take into account the needs and expectations of existing and potential water uses;
- the JIWRM Strategy defines the need for catchment and environmental protection, including erosion prevention; and
- the IWRM Strategy is phased and progressive and constitutes separate components over time.

The Joint IWRM strategy comprises detailed guiding documents for the responsible basin water authorities. Nevertheless, the strategy and especially its implementation plan is a dynamic document that should be regularly reviewed and updated.

In addition, a simple/rudimentary Decision Support System (DSS), that includes hydrological and water balance models set up for the Buzi River Basin and a GIS database, has been developed as a basis for future monitoring, basin planning, and management.

The formulation of the Joint IWRM Strategy of the Buzi River Basin has been undertaken over the period of March 2010 - April 2013.

Stakeholder Participation and Consultation Process

Not only a scientific approach is important to build trust and ensure a consensus, equally important is the participatory approach. It is realised that the success of the strategy will depend on the motivation and commitment of many parties, especially those living and operating in the basin itself. The Project stakeholders have been identified and grouped in two major stakeholder groups explicitly i) key project stakeholders and ii) stakeholders at large (general public).

The key project stakeholders have been formally and regularly consulted during the execution of the strategy formulation project. This group had a special responsibility, to give advice and feedback on the Strategy work and deliverables as they represent a broader group of stakeholders and thus has the means to disseminate and involve a wider range of relevant stakeholders.

Additional stakeholders were reached through the project web-site. The purpose is to create awareness and support among the public at large residing and operating in the Basin and as such are important water managers, and likewise instrumental for the success of the strategy implementation.

The consultative and participation process involved seven sets of activities:

1. Consultations in the field
2. Definition of key stakeholder groups and lines of communication
3. Participation of Technical Advisors (TAs) in information collection and verification, and facilitating national level consultations.
4. Milestone stakeholder workshops for stakeholder information and feed-back
5. Expert and Steering meetings
6. Coordination with parallel projects
7. Project website

Consultations in the field and definition of key stakeholder groups were mainly carried out by the Consultant during the Monograph Phase. The TAs from the riparian states were assigned to facilitate national level consultations to ensure feedback on conclusions and recommendations from the key stakeholders groups on each milestone of the formulation process. This process also ensured the verification of input data and drawn conclusions. The TAs were employed by SADC and full time based at the implementing agencies.

Three international consultative workshops at key stages in the formulation process were undertaken back to back with Project Steering Committee meetings.

The JIWRM Strategy formulation process was undertaken under the overall direction of the Project Steering Committee, with representative from the head of water ministries and SADC, who was tasked with overseeing, commenting and approving the Consultant's technical work.

Both Zimbabwe and Mozambique have established stakeholder institutions with a fair representation of the identified basin stakeholders and these have been involved throughout the process and have been key participants on the formal stakeholder workshops attended by the PSC.

The project website *www.savebuzi.org* was established to support dissemination of information to stakeholders of the Buzi River Basin during the JIWRM Strategy formulation process.

2 IWRM PRINCIPLES

2.1 IWRM and Good Governance

Integrated Water Resources Management (IWRM) is generally regarded as a pre-requisite for achieving national goals related to poverty alleviation, economic growth, disaster resilience and climate change adaptation.

Good water governance is regarded a precondition for the practical implementation of IWRM.

IWRM has been defined as a comprehensive, participatory planning and implementation tool for managing and developing water resources in a way that balances social and economic needs, and that ensures the protection of ecosystems for future generations. Operationally, IWRM means applying comprehensive knowledge from multi-disciplinary scientific studies of the basin as well as the insights from diverse stakeholders to plan and implement sound and balanced solutions. In practice, this means to balance sometimes competing needs for environmental sustainability, economic growth, and social development and to communicate the inter-dependence between the three objective areas.

Water governance, can be defined as the range of political, social, economic, and administrative systems that are in place to regulate the development and management of water resources and provision of water services at different levels of society. Values, power, politics, and corruption are common positive and negative driving forces in water governance and consequently the fundamental requirements for *good water governance* are strong political will; responsibility and accountability; and inclusiveness, participation and responsiveness.

Transboundary Water Management (TWM) brings additional complexity since it is not governed by the same strong legal framework as the national water management dimension.

Figure 2-1. Water Uses in the Buzi River Basin.

2.2 IWRM Polices and Principles

The overall long term goal of the joint effort between Mozambique and Zimbabwe on the Buzi River Basin is to ensure development of integrated water resources management and related physical infrastructure development that contributes to regional integration and poverty reduction.

Water is a key factor of production in agriculture, industry and other types of economic activities and there are a number of direct and indirect linkages between IWRM and achieving national economic development goals. The JIWRM Strategy is supportive of the national development objectives of Mozambique and Zimbabwe and follows the principles stated in the regional and national water polices summarised in the following chapters.

2.2.1 Common Principles for SADC countries

SADC Regional Water Policy (RWP) of 2007 states the common intentions of the SADC member states for the application of the Dublin Principles and the IWRM best practices including related management tools e.g.: stakeholder participation; integrated planning; water demand management (WDM); conflict resolution; and gender mainstreaming.

The aim of the RWP is to harmonise the water governance and promote IWRM implementation. The RWP has nine thematic areas that address the management issues and challenges pertaining to the water resources of the SADC region and it aims tot optimise development opportunities. For each thematic area the RWP provides specific policy statements that are fairly measurable, which will facilitate progress monitoring.

The main policy areas and aims are:

- Regional Cooperation in Water Resources Management: aiming at water for regional integration and socio-economic development; cooperation in water resources management of shared watercourses; inter-sectoral and international cooperation; and harmonisation of national policies and legislation.
- Water for Development and Poverty Reduction: aiming at meeting water demand for basic human needs and for industrial development including water for food and energy security.
- Water for Environmental Sustainability: aiming at improving protection of environment, water quality management, and control of invasive alien species in watercourses.
- Security from Water-related Disasters: aiming at people's protection from water related disasters; and covering disaster prediction, and management and mitigation.
- Water Resources Information and Management: aiming at enhanced and transparent data and information acquisition and management; and information sharing.
- Water Resources Development and Management: aiming at river basin approach; integrated planning; dams and dam management; water demand management; and alternative sources of water.
- Regional Water Resources Institutional Framework: aiming at development and consolidation of institutional arrangements at regional and national levels and for Shared Watercourse Institutions purposefully designed for IWRM implementation.
- Stakeholder Participation and Capacity Building: aiming at enhanced participation and awareness creation; capacity building and training; gender mainstreaming; and research, technology development and transfer.

- Financing integrated water resources management in the region: aiming at sound financial strategies; financial sustainability, cost reduction and public-private-partnership.

The RWP provides guidance for the reform and harmonisation of national policies, strategies and legislation, which would also facilitate joint management.

International water agreements and conventions guide the planning, utilisation and management of common water resources. The international legal framework for the management of the Buzi watercourse constitutes, mainly:

- The Revised Protocol on Shared Watercourses in the SADC, 2000
- The Joint Water Commission (JWC) Agreement between Mozambique and Zimbabwe, 2004
- The UN Convention on the Law of the Non-Navigational Uses of International Watercourses, 1997

Application of the principles outlined in the above legal documents is of paramount importance for the use and protection of watercourses as well as the larger issue of beneficial cooperation between the two countries.

Figure 2-2 : The Buzi River.

Mozambique and Zimbabwe are not signatory parties of the UN Watercourse Convention. However they are signatory parties of the SADC Revised Protocol on Shared Watercourse Systems and have transposed it to national law. The Protocol recognises the principles of UN Watercourses Convention and includes specific provisions for equitable and reasonable utilisation", the "obligation to prevent significant harm" (Article 3 (10) (a)) and "notification of planned measures". The Protocol was signed in 2000 and came into force in 2003 it and stands as a regional legal framework to which all national laws and policies must conform.

The Protocol supports and directs the establishment of shared watercourse institutions (Article 5) and Agreements (Article 6). It also offers a detailed explanation of the meaning of equitable and reasonable use (Article 3 (8). In this respect, the Protocol supports the IWRM approach with an emphasis on sustainable development. With development as a focus it recognises the specific context of Southern Africa as having a high degree of under-development and lack of water infrastructure. This is also understood in its definition of "Management" whereby "Management of a shared watercourse" is defined as (i) planning the sustainable development of a shared watercourse and providing for the implementation of any plans adopted; and (ii) otherwise promoting the rational, equitable and optimal utilisation, protection, and control of the watercourse.

In accordance with the Revised Protocol on Shared Watercourses, the Governments of Mozambique and Zimbabwe signed ian Agreement in 2004 for the establishment and operation of a

Joint Water Commission (JWC) to advise the two countries on conservation, development and use of shared water resources, such as Buzi, Pungwe and Save. Both Mozambique and Zimbabwe have ratified the Agreement and transposed it to national law.

By signing and ratifying the JWC Agreement, Mozambique and Zimbabwe have committed themselves to the following principles with regard to the Buzi basin:

- Principle of sustainable development;
- Principle of sustainable utilization;
- Principle of prevention of harm;
- Principle of precaution;
- Principle of inter-generational equity;
- Principle of co-operation; and,
- Principle of equitable and reasonable utilisation

2.2.2 Key Principles of Mozambique

The National Water Policy (2007) directs water resources management in Mozambique. The policy formulation was driven by the recognition that insufficient resources and attention had previously been dedicated to the integrated water resources management issues. Specific challenges which needed more attention were identified with regard to the effective improvement of hydrological networks, the development of new hydraulic infrastructures (not at least for socio-economic development), integrated and participatory water resources management and planning, and finally the consolidation of the ARAs. The Policy thus elaborates on these areas and provides clear policy statements for the same.

In summary, the goals of the revised Water Policy comprise:

- Satisfaction of basic needs of human water consumption;
- Improvement of sanitation;
- Water efficiently used for economic development;
- Water for environmental conservation;
- Reduction of vulnerability to floods and droughts;
- Promotion of regional peace and integration; and
- Assurance of water resources for the development of Mozambique.

Reducing vulnerability is one key IWRM objective. Mozambique ranks third amongst the African countries most exposed to risks from multiple weather-related hazards and major floods, cyclones and droughts have a significant impact on the country's economy. The correlation between rainfall and overall GDP is strong which points to a vulnerable society. A considerable percentage of the population and are at risk.

The present institutional and legal set-up in Mozambique is essentially defined by the Water Law, Nr. 16/91, complemented by other legal documents providing for the creation of the various ARAs, for the legal framework for urban and rural water supply and sanitation, for the water tariff policy (1995) and, the Regulation of Licenses and Concessions of Water (2007).

The fundamental principles stated in the Water Law are:

- Unity and coherence in the management of river basins;
- Institutional coordination and public participation in the decision-making process;
- Compatibility of the water policies with the policies for regional planning and environmental conservation; and
- De-centralization in water resources management, particularly at the operational level.

Regarding the water use and exploitation, the waters are classified into waters of common use and waters of private use. Waters of common use are those consumed by a family, for domestic purposes, cattle and small scale irrigation, with no use of mechanisation. Common uses of water are free and do not require any licence or concession nor is any payment of tariffs involved. Waters of private use need an authorization that can be given by law, licence or concession, under the following general principles and constraints:

- Water supply for domestic use has priority over all other private use;
- No private use will be allowed if it conflicts with the water requirements for environmental conservation;
- Conflicts resulting from water scarcity to satisfy different requirements will be solved in function of the socio-economic value of each use; and
- The users of water for irrigation must use the water in an optimal way, taking adequate and economically justifiable measures to reduce water losses.

A specific policy for the tariff system, the Water Tariff Policy**,** was adopted. The principles that guide the water tariff policy are: User pays, Polluter pays, Equity, Environmental protection, Efficient use of water, Sustainability, and De-centralisation and participatory management. Further actions are needed to reinforce the water tariff system and increase the willingness to pay. For instance, it has been difficult to adjust the tariff for irrigation although progress has been seen.

The main objective of the National Water Resources Management (NWRM) Strategy (2007-2017) is to implement effectively the National Water Policy and to reach its various development goals for sustainable and integrated water resources management and development.

2.2.3 Key Principles of Zimbabwe

Zimbabwe does not have a single specific document that outlines national policy for the water sector. It is articulated primarily through the Water Act [Chapter 20:24] of 1998, in combination with related statutory instruments, water policies and implementation strategies. Besides the Water Act, current water governance framework has evolved from the implementation of the following policies and strategies: The Water Resources Management Strategy for Zimbabwe, “Towards Integrated Water Resources Management”, undated circa 1999; Domestic Water Supply and Sanitation Policy, Final Draft, December, 2004; the Millennium Development Goals 2000 to 2015; and the Public-Private Partnerships in Zimbabwe, Guidelines.

The key Zimbabwe water management principles are to promote the sustainable, efficient and integrated utilization of water for the benefit of all. It is based on three fundamental legal provisions:

1. The ownership of the nation’s water resource is vested in the State;
2. Equitable access to water by all Zimbabweans;

3. The establishment of national and grassroots stakeholder institutions to guide the integrated development, management, allocation and conservation of water resources.

Within these three fundamental provisions the national governance framework recognises the following principles:

- Water permits are issued with consideration taken to the basin wide water use
- Water resources should be managed in an integrated manner with a basin level. The establishment of Catchment Councils and decision making on the development, and management and use of water resources shall be undertaken at grassroots level, through the creation of catchment and sub-catchment councils
- No differentiation in management between surface and ground water
- Water pricing promotes efficient utilization and equitable allocation
- The 'user pays principle', for full cost recovery with a tiered system to allow cross subsidization between the different socio-economic sub-groups

The fundamental ingredient of the regulatory framework of Zimbabwe is the Polluter Pays Principle, which places the responsibility for pollution abatement and the costs of monitoring and management thereof on the polluter. The different levels of hierarchy in order of priority within the following consumer groups: a) primary (human, livestock) consumption; b) water for urban, industrial and mining purposes; c) environmental requirements; d) water for agricultural use; and e) reserves for future use. Allocation principles put emphasis on prioritisation of water use, proportional allocation and drought mitigation. With the exception of primary water use, all other uses of water must be approved by the State. These policies and management principles are supported by law.

The Water Resources Management Strategy (WRMS) of Zimbabwe advocates the importance of pricing dynamics in development financing of the water sector and the efficient resource utilisation. In the past, socio-political considerations have dominated decision making in the management of tariffs. The WRMS proposes the following strategies to achieve the objectives of commercialisation whilst promoting efficient use and safeguarding equity: average cost pricing through variants comprising a national mean price or catchment mean price; and site specific pricing. With regards to the funding of new water infrastructure it is envisaged that the private sector will take an active part in the financing, together with government and donor funds. Private sector involvement could be in the form of commercialisation of water utilities (combined money market financing and private-sector participation). It is realised in this context that the proposed participation of new players in the financing of the water sector will require a clear regulatory framework to ensure stability and safeguard the interest of the consumers. Guidelines have been worked out for private-public partnership.

Priority is also given to the development of a water allocation system that ensures an adequate environmental reserve, sufficient to maintain riverine and wetland ecosystems supported by initiatives to reduce siltation in rivers and dams, and the minimisation of detrimental environmental impacts from the development of the nation's water resources.

Moreover, the WRMS identifies the following sub-strategies in the field of Water Demand Management (WDM):

- Market-based strategies, employment of water pricing tools to control demand, and the polluter pays principle to discourage water pollution;

- Technology-based strategies (loss reduction and recycling initiatives in the urban sector, combined with more efficient irrigation methods in the agricultural sector);
- Mandatory strategies as a form of water rationing through the banning of hose pipes, swimming pools, etc. in times of shortages; and
- Public awareness.

2.3 Summary Governance Framework

The tables below give an overview of the enabling framework for the joint management of the Buzi Basin and shows the links between regional and national policies, laws and institutions at different management levels. As can be seen from the tables, the basic components required for a solid water governance framework are in place. However, there are needs for consolidation and strengthening of the key pillars, legislation and institutions.

Table 2-1 : Policy and Legal Framework.

Description	Regional	Mozambique	Zimbabwe
Legal and Policy Framework			
Water Policy	SADC: The Regional Water Policy (2005)	National Water Policy (2007) Water Tariff Policy (1998)	Various proclamations, e.g. Domestic Water Supply and Sanitation Policy, Final Draft, December, 2004
National Water Law		The Water Law (1991) *(a Draft Water Law Mozambique was prepared in 2005 but it has not beent put forward for public discussion and approval since then)* Regulation of Licenses and Concessions of Water (2007). Governmental decrees creating the delegated management framework for urban water supply (1998)	The Water Act [CAP 20:24], 1998; The Zimbabwe National Water Authority Act [CAP 20;25], 1998 Water (Permits) Regulations, Statutory Instrument (SI) 206 of 2001; Water (Waste and Effluent Disposal) Regulations, SI 274 of 2000; Water (Establishment of Catchment and Sub catchment Councils) Notice, SI 209 of 2000; Water (Catchment & Sub catchment Councils) Regulations SI 33 & 47 of 2000
International Water Law and Agreements	SADC: The Revised Protocol on Shared Watercourse Systems (2000)	Bi-lateral Agreement for the establishment and operation of a Joint Water Commission (2002)	
IWRM Strategy	SADC: The Regional Water Strategy (2007)	National Water Resources Management Strategy 2005-2017 (2007)	Water Resources Management Strategy for Zimbabwe, 1999/2000

Water sector planning is moreover governed by the policy and legal framework of other sectors, e.g. irrigation, energy, environmental and social development related sectors (poverty, gender, HIV/AIDS). Guidance documents of these key parallel policy areas are also in place.

Water institutions must be in place for policy formulation, implementation cross-sectorial decision making, coordination and outreach and at different levels. The current institutional set-up at the international, national, and basin levels for the management of the Buzi's water resources is illustrated in Table 2-2.

Table 2-2 : Institutional Framework.

Description	Regional	Mozambique	Zimbabwe
Council of Ministers for Water	SADC Council of Ministries for Water	National Water Council	National Water Steering Committee /Inter-ministerial Subcommittee on IWRM
Ministry /Department of Water *Responsible to oversee implementation of the SADC The Revised Protocol on Shared Watercourse Systems*	The SADC Water Division, within the SADC Directorate of Infrastructure & Services	Ministry of Public Works and Housing National Directorate of Water International Rivers Office	Ministry of Water Resources Development and Management Department of Water Resources (DWR) Zimbabwe National Water Authority (ZINWA)
River Basin Institutions	Joint Water Commission	ARA-Centro	ZINWA-Save Catchment Manager
Stakeholder Institutions		ARA-Centro Management Board Buzi Basin Committee	Save Catchment Council/ Budzi and Odzi Sub-Catchment Councils

3 BUZI RIVER BASIN CONTEXT

3.1 Biophysical Setting

The Buzi River Basin is a shared between the two countries of Mozambique and Zimbabwe (Figure 3-1). Total catchment area is approximately 28,900 km^2 out of which about 13% of the basin is part of the Zimbabwean territory while the Mozambican territory covers the remaining 87%.

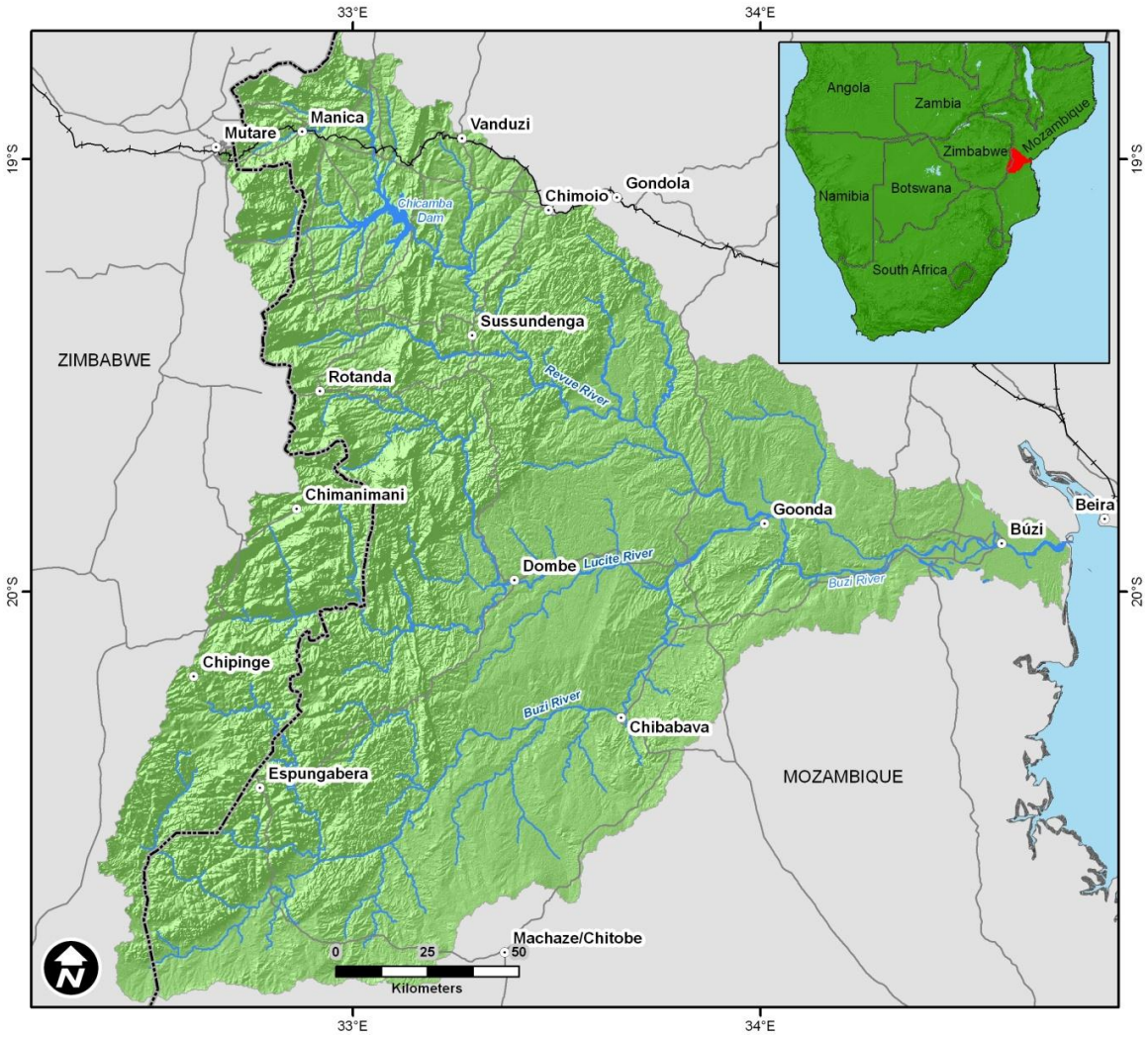

Figure 3-1 : Buzi River Basin.

Altitudes range from peaks up to 2,500 meters in the mountains down to sea level. The eastern parts of the basin are flat plains with low altitude and these areas are prone to flooding during the monsoon season.

The Buzi River Basin stretches over two climate types; a humid mountainous climate in the west and a tropical humid climate at the coast in the east. In the west the humid mountainous climate prevails due to the mountain range that is forming the border between Mozambique and Zimbabwe. In this region the mean rainfall can reach above 1,500 mm/year.

The amount of rainfall varies significantly from year to year, and during a very dry year the rainfall generates almost no runoff peaks in the rivers due to the high temperature and hence high

evaporation. During a wet year large floods can occur, especially the lower reaches are exposed to flooding. The highest flooding is normally caused by cyclones from the Indian Ocean which occurs, on average, every year or two in Mozambique.

Three major tributaries form the Buzi River Basin, namely; Buzi River, Lucite River and Revue River. They flow from the mountainous areas in the western part of the basin in Zimbabwe towards Mozambique in the east and the confluence is the Buzi River, which flows into the Indian Ocean.

A large portion (roughly 30%) of the Buzi River Basin consists of wooded/forested areas which include the land-cover types coastal forest, woodland (open and closed) and forest. Most of the coastal forested areas are located in the Upper Lucite sub-basin, in Mozambique. Patches of pioneer growth plantations can be identified in the upper catchment of the Buzi River, in the Chimanimani Mountains, and particularly in the Upper Lucite, Lower Revue and Lucite Zimbabwe.

Figure 3-2 : Buzi River Basin, Mozambique June 2010.

Figure 3-3 : Buzi River Basin, Mozambique June 2010.

Another dominant feature in the Buzi River Basin is the stretch of grasslands and open shrub-lands, which follow a north-easterly to south-westerly pattern from the south of the Lower Revue sub-catchment to the south-east of the Upper Buzi sub-basin. In the coastal area of the Buzi River catchment the vegetation is a mix of forests, woodlands and grasslands.

3.2 Water Resources Situation

3.2.1 Water Availability

The most probable estimate of surface water resources in the Buzi River Basin is approximately 5,700 million m^3 per year at the river mouth. Most areal runoff is generated in the mountainous sub basins and is declining going downstream. Most water is generated in the Upper Lucite (20%), Upper Buzi (16%) and Lower Revue (12%).

In Table 3-1 the natural MAR for a number of interesting geographical points is presented. These points include the border flows, the confluence flows, flow available for the Chicamba Dam and the flow at the estuary.

Table 3-1 : Estimated runoff at geographical point of interest. Based on the years 1955-75.

Type	Point of interest	Area [km^2]	MAR [Mm^3/year]	MAR [m^3/s]
Border flow	Buzi River	535	145	5
	Musirizwi River	786	213	7
	Rusitu River	901	326	10
	Zonde River	379	132	4
Flow at confluence	Buzi River	10498	1751	56
	Lucite River	6671	1967	62
	Revue River	8443	1778	56
Other	Estuary	28870	5685	180
	Chicamba Dam	2841	670	21

Due to the higher specific runoff in the mountainous areas in the western part of the basin, the distribution of generated surface water resources between the countries is skewed relative to the areal distribution. Despite only having 13% of the catchment area the Zimbabwean part generates 21% of the surface water volume.

With regards to the groundwater resources in the Buzi River Basin, an estimate based on an analysis of aquifer types and recharge conditions in the basin has concluded that 50% of the basin has a 'moderate' to 'high' groundwater potential and 50% of the basin has a 'very low' groundwater potential. "High potential" implies that the groundwater could be used for large abstraction purposes such as urban water supply and supplementary irrigation, while lower potential areas are more suitable for limited abstraction such as rural drinking water supply. The '*high potential'* aquifers occur in association with the 'karst' and 'unconsolidated intergranular' aquifers, within the central and "southern side" of the Buzi River Basin. They also extend to the coast. The '*moderate potential'* aquifers occur in association with the fissured aquifers in the central and upland portion of the Buzi River Basin. This groundwater will need to be accessed by drilling boreholes and the degree of success of drilling boreholes will be significantly variable. The '*very low yielding aquifers*' are associated with the low permeability rock types which are mainly the granites/gneisses, volcanic rocks and clays.

The groundwater recharge is estimated as approximately 2 500 Mm3/year (8% of the mean annual rainfall).

3.2.2 Floods and droughts

Floods and cyclones are frequent in the lower parts of the basin and recent extensive flooding occurred in 2000, 2007, 2008 and 2010. Flood magnitudes are high. Specific flood magnitudes vary from 0.2 $m^3/s/km^2$ at the river mouth to up to 0.9 $m^3/s/km^2$ in the smaller mountainous areas in Zimbabwe (Buzi River Basin) for a 100 years return period. Corresponding magnitudes for spillway design are from 0.6 to 11 $m^3/s,km^2$. The combination of high flood magnitudes and flat plains with low altitude and highly populated centres makes flooding one of the major water resources management challenges in the Buzi River Basin. Flood prone areas are: Buzi town and district (the estuary); the areas of Estaquinha and Goonda near the confluence of the Buzi and Revue Rivers; and Sussundenga district.

The Buzi River Basin is not severely exposed to droughts; recent rainy seasons have been more characterized by flooding. However during drought, low flow at the border can be reduced to less than 2 Mm^3/month. This has occurred for example in 1973 and more recently during the drought years 1991-92.

3.3 Ecological Status, Water Quality and Threats

The Buzi River Basin along with the adjacent Pungwe River Basin has been identified as a Key Biodiversity Area for freshwater conservation from a global perspective, based largely on the framework of vulnerability and irreplaceability criteria widely used (i.e. IUCN) in systematic conservation planning. Additionally the Buzi River system, together with the Upper and Middle Zambezi River systems and the Pungwe River system, contain the most diverse fish faunas within the southern African region. Several formal conservation areas are located in the Zimbabwean part of the Buzi Basin, but none in the Mozambican part.

In general the water quality in the Buzi River Basin is within acceptable range and the ecological status ranging from class C (moderately modified ecosystem with a loss and change in the natural habitats) and higher (detailed explanation is given in the Monograph Report). However, there are a number of areas of concern and there are threats in the Buzi River Basin to the future water quality and environmental integrity (Figure 3-4).

Figure 3-4 : Downstream of mining area in the Buzi River Basin.

The economic development in the Buzi River Basin is increasing and with this the pressure on the water resources. For instance, in mid-2010 there were more than 100 active exploration licenses in Manica, a third of which related to gold in the north-western part of the river basin, and the remainder related to a variety of metals commonly associated with greenstones (such as Cu, Fe, Pt), diamonds and coal in the south-western part of the basin, and industrial minerals.

The company Clean Tech Mining Ltd deserves a special mention as the company is locally owned and holds a small gold mining license which is being developed using rather simple but proven technology. The mine is rather unremarkable bar the fact that, as its name implies; rather ambitious attempts are being made to limit the environmental impact of the operations. This is in contrast to the operations of other small scale gold miners in the area Mining has been identified as the major pollution source impacting ecological status and water quality, both surface water and groundwater. Other sources are agriculture, human settlements, riparian deterioration and deforestation (siltation), and dams (change in flow pattern).

3.4 People and Economy

3.4.1 Population, livelihoods and vulnerability

The basin population is characterised by moderate density and a largely rural population. The only main urban areas are Beira and Chimoio in Mozambique and two smaller towns in Zimbabwe i.e. Chipinge and Chimanimani.

The total population of the Buzi Basin is shown in Table 3-2. Figure 3-5 clearly indicates that the Buzi River Basin in Zimbabwe covers a small and rural area.

Table 3-2 : Projected population in the Buzi Basin by country (2010-2030).

Country	2010	2020	2030
Mozambique	1,061,300	1,368,900	1,705,000
Zimbabwe	193,300	214,200	236,300
Total	**1,254,600**	**1,583,100**	**1,941,300**

Source: Consultant's estimates based on National Institute of Statistics (INE) in Mozambique (2007) and Central Statistical Office (CSO) in Zimbabwe (2002)

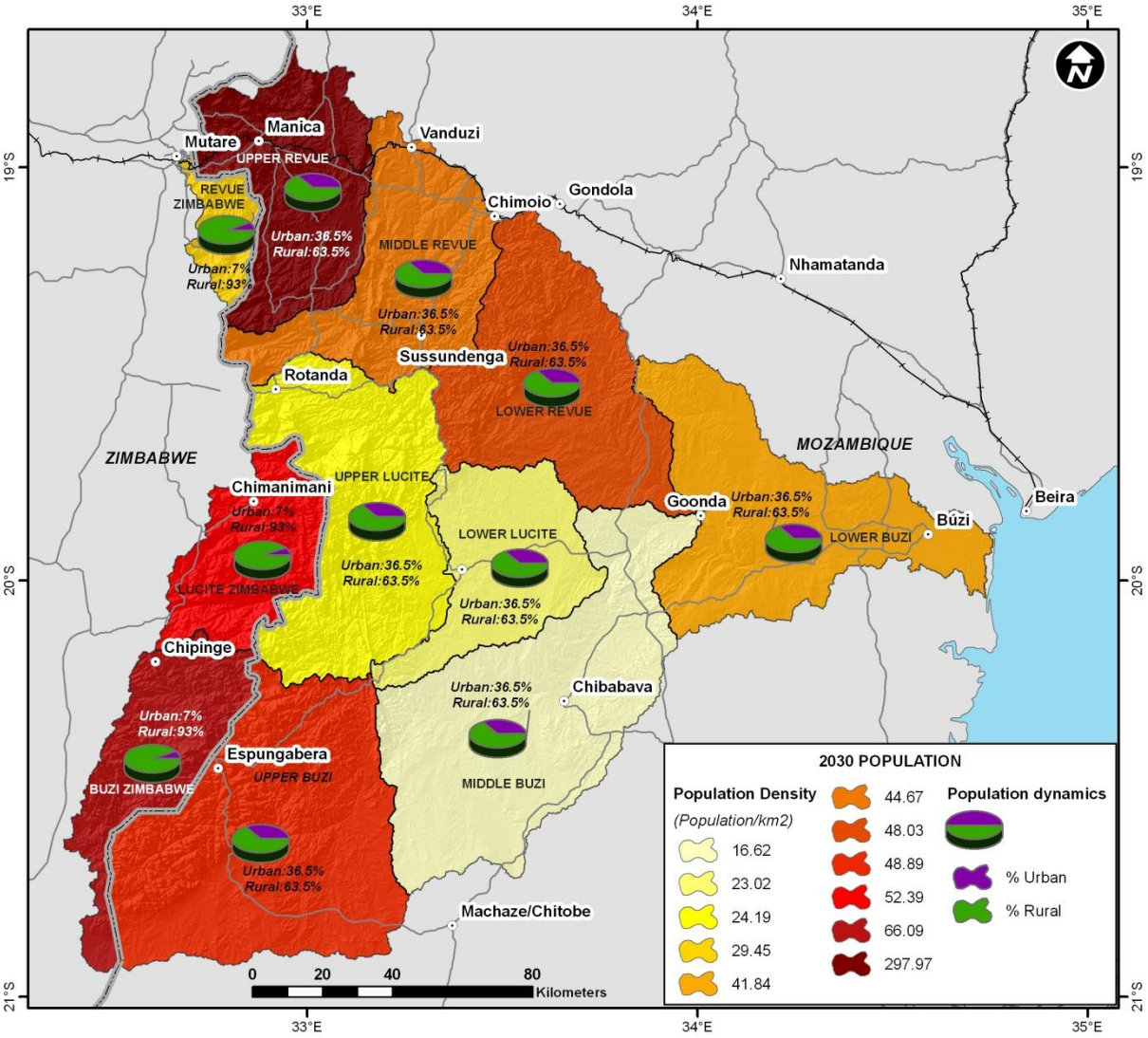

Figure 3-5: Basin demography by 2030

The main population trends in the basin are: urbanization, concentrated in and around main urban centres such as Chimoio, Manica and Buzi in Mozambique and Chipinge in Zimbabwe, and to a lesser extent in and around smaller towns and district centres in the basin; and in Mozambique migration from the south and central to the northern part of the basin, primarily to areas in and near the Beira Corridor. Other movements of people are from the basin to the growing cities of Beira, Maputo and Mutare, in order to take advantage of increased employment and educational opportunities in these cities.

Agriculture is the main means of livelihood in both countries within the basin. Life expectancy in Mozambique is slowly improving but poverty and illiteracy is still high. In Zimbabwe, life expectancy has drastically dropped since 1986-1990 and Zimbabwe has also had a 51% increase in the incidence of poverty between 1995 and 2003 (PASS, 2003). Economic difficulties and HIV/AIDS remain major threats to the economically active population in Zimbabwe.

Vulnerability in the Buzi River Basin is mainly related to floods and storms, particularly cyclones and periodic famines. Whereas there have been a number of droughts in the past decade, recent rainy seasons have been characterized by flooding in the Buzi Basin. The floods cause heavy economic

losses on the population in the Buzi Basin and the most affected groups are rural and poorer people living close to the banks of rivers and streams. Disaster Risk Management (DRM), coordination mechanisms and response plans were recently put in place.

Chronic vulnerability is also common i.e. related to food insecurity, water pollution (agro-chemicals and mining) and water and sanitation-related diseases. Most households in the basin, particularly in rural areas, are without access to electricity or safe drinking water and there is a high prevalence of water related diseases such as diarrhoea, malaria, and occasional cases of cholera.

Figure 3-6 : Águas de Chimoio drinking water treatment plant in Chimoio.

3.4.2 Economic sectors and water dependency

The Buzi River Basin has a strategic location and is connected to transport links to the SADC region through national highways and to the Middle East and Asia Pacific through the Beira Port.

Agriculture and Livestock

In the Zimbabwean part of the Buzi River Basin irrigation schemes have been developed and are operational to a generally higher degree than in Mozambique, although the current level of operation is low. The Buzi River Basin in Zimbabwe (Chipinge, Chimanimani and Mutare Rural) is heavily exploited for agriculture and related activities. Both the Burma Valley and Chipinge areas have intensive commercial farming, although a significant area of the Chimanimani Mountains is a national park.

On the Mozambican side, the single largest sector contributing to the Gross Domestic Product (GDP) in the Manica and Sofala Provinces within the Buzi River Basin is the agricultural sector. Still, only a fraction of the total suitable arable area is currently cultivated. The potential for expanding the area for irrigated agriculture is good. Important developments of relevance for the future socio-economic development in the Buzi River Basin in Mozambique include an increasing number of

investments in large-scale commercial farming projects and associated agro-industries, especially for the production of biofuels based on sugar cane and *jatropha*.

In general, livestock keeping in the basin area is associated with rural livelihood activities. Livestock production is good in the Buzi basin area in Mozambique while in the Zimbabwean part of the basin i.e. along the eastern border of Zimbabwe, livestock keeping is not a major livelihood or commercial activity.

The agricultural sector consumes large amounts of water and for irrigation projects to be regarded feasible requires assurance of supply four out of five years i.e. an 80% assurance level.

Forestry

The Buzi basin has considerable forest resources, particularly in the central and eastern parts of the basin along the border between Mozambique and Zimbabwe. The land cover mapping indicates that more than 40% of the area is covered by forest.

In Zimbabwe, forestry contributes approximately 3% of the GDP, largely from exotic plantations and commercial indigenous timber. Most of these are in Chimanimani and Mutare rural which are located in the Buzi basin. However, no expansion plans in the forestry sector in the basin area are indicated in provincial plans or similar documents.

In Mozambique, almost 60% of the total area of the basin is covered with natural forest of various types. The basin has good potential for the development of afforestation, with more than 500,000 ha of land classified as suitable to moderately suitable in Mozambique. Although there is a forestry sector, there are no plans according to the Ministry of Agriculture to develop afforestation and extend current forestry areas within the Buzi River Basin. As demand for forest products and transportation and other infrastructure improve, it can be expected that the exploitation of this valuable resource will also increase in Mozambique.

Afforestation does not require irrigation, with the exception of nurseries for young plants. However, it has been widely recognised that massive afforestation of species that is alien to the natural vegetation, e.g. eucalyptus or pine, would result in excessive streamflow reduction in comparison with traditional plants.

Figure 3-7. Forestry in the Buzi River Basin, Zimbabwe.

Industry

No large industries are located in the Buzi River Basin outside the urban centres. However, there is considerable potential for the development of industries within the basin, in particular industries relating to agro-processing, transportation services and mining along the Beira Corridor and in major urban centres in and near the basin. Industrial development on the Mozambican side is hampered by the lack of reliable water supply.

Mining and mineral resources

The Buzi river catchment covers areas known to be prospective for gold and base metals. In the basin in Zimbabwe artisanal gold mining is common, although most of it is done illegally at night. A major problem is that the illegal mining takes place in the Chimanimani National Park. There are also quarrying activities in Mutare R

ural. The fact that exploration and mining activities may cause significant environmental impacts is well known. Such impacts may include the contamination of water resources through the discharge of processing chemicals or waste into streams and rivers.

There are a growing number of investments in mining and associated processing facilities, especially in the central and western parts of the basin. Within the Buzi Basin, the mining and mineral potential is mainly for gold, lime, coal, iron, asbestos, bauxite and diamonds. Natural gas is also being investigated in the Lower Buzi.

An inventory of the mining related sites in the Buzi River Basin is given in Figure 3-8.

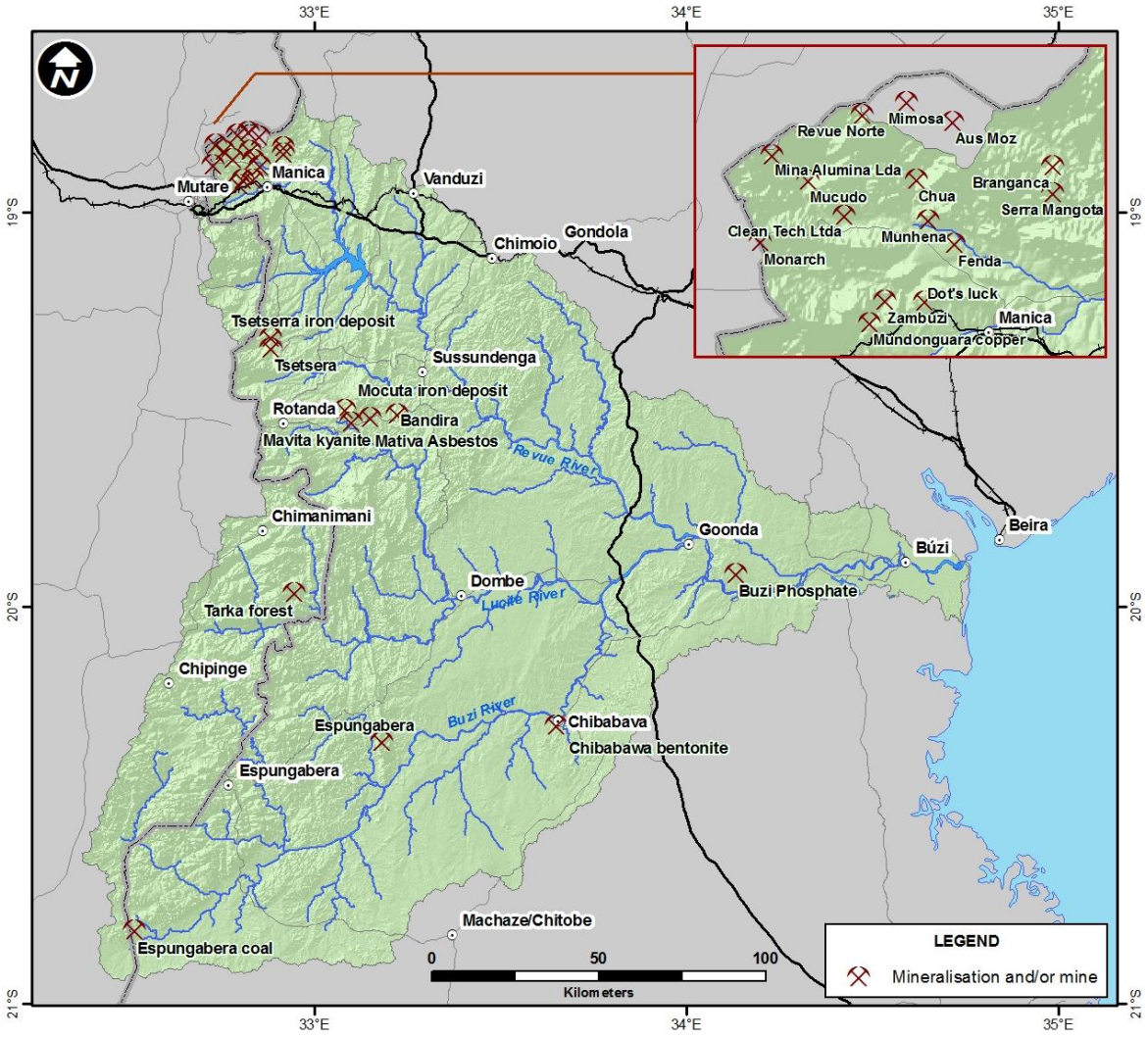

Figure 3-8: Map showing the location of the more important mineral deposits in the Buzi river catchment.

Tourism

Within the basin in Zimbabwe, Chimanimani and Chipinge districts are particularly rich in tourist attractions and there are a number of protected forests, parks and tourist areas. In Mozambique, in spite of having considerable potential, tourism is generally undeveloped within the basin, in spite of the potential presented by the Chimanimani National Reserve.

3.5 Water Utilisation and Demand

The main current water use characteristics in the Buzi River Basin are:

- Urban water use in Chipinge in Zimbabwe and Chimoio (using water from Chicamba Dam) in Mozambique.
- Rural water supply and small villages in the river basin in both countries; water demand is, however, very low comparable to for example,. irrigation water demand.

- Commercial agricultural use mainly located in the Burma Valley and the Chipinge area in Zimbabwe, as well as the lower Buzi flood plains in Mozambique used for sugar cane.
- Energy production, explicitly the Chicamba and Mavuzi hydropower dams in Mozambique, evaporation from the Chicamba Dam being the only consumptive use.
- Industrial use, not included in the urban water use, is currently poorly developed. However, one sugar cane mill in the Buzi village can be defined as an industrial water user.
- Water for livestock in the Manica Province in Mozambique although the total figure for water demand is rather small.
- Small afforested areas in Zimbabwe and Mozambique.
- Environmental water requirements. Besides the conservation areas in the upper part of the basin, requirements to maintain ecological flows are mainly limited to the estuarine area.
- Tourism is poorly developed in the Buzi River Basin, with the exception of Chimanimani and Chipinge conservation areas which are frequently visited by tourists. However the water requirements of these areas are covered by the environmental water requirements

The knowledge of present and future water demand in Zimbabwe and Mozambique is one of the cornerstones of the JIWRM Strategy. The water demand has thus been estimated per country, per sub basin as well as per water use sector.

The current water demand in the Buzi River Basin can be characterised as low in comparison with water availability, especially in Mozambique. However, the future water demand is a function of the potential for increased demand for various sectors, which in turn is dependent on the choice of development –nexus and the likely economic growth in the region of the Buzi River Basin. The JIWRM Strategy is based on the analysis of potential increase in water demand up to the year 2030 for different Nexus-scenarios (i.e. energy-focused, irrigation-focused, or balance development of both sectors). Future water demand is based on projected development scenarios ranging from probable to high demand scenarios for that period.

The development of the Buzi River Basin is determined by a number of driving forces and is controlled by the general macro-economic growth, sector policies and investments. It also depends on the introduction of demand management instruments and water allocation measures.

The following clusters of driving forces have been identified:

- Demographic (population growth; migration pressures; urbanization).
- Economic (economic development rate, rate of water works investment).
- Technological (water use efficiency).
- Social (poverty; inequity, health, education).
- Governance (policies, power structure; level of conflict; globalization).
- Environmental (water-related diseases; soil salinization; water pollution; ecosystem health).
- Climatic (possible future changes in temperature, evapo-transpiration/evaporation, precipitation, river flows and frequency of droughts and floods).

These driving forces have been considered and their relevance for the Buzi River Basin has been determined in the estimate of future water demand and in the determination of development options.

The findings from the sector review have given the following guiding principles for sector-specific development:

Water Supply. Supply of clean drinking water is of highest priority in both countries. Full development of water supply infrastructure coverage in order to meet the urban and rural water demand is therefore a strong planning objective.

Irrigation. Revitalisation and restructuring of the agricultural sector is in focus in Zimbabwe. Extensions and new projects are in focus in Mozambique. Hence the irrigation sector is assumed to increase substantially in the basin up to 2030.

Hydropower. The current planning objectives point at increased hydropower production in the basin. Large scale development of hydropower schemes is foreseen in national plans in Mozambique and specific projects have been defined within the Buzi River Basin (e.g. Tsate or Muenezi).

Considering the various sectors of consumptive demand, it is clear that irrigation is by far the most dominant water user with urban water supply as a distant second. With regards to the current demand per sector (direct uses) for the Buzi River Basin, it can be concluded that in Zimbabwe agriculture represents for 93% of the demand, urban and rural water supply for 2.5%, and the industry for 4%. In Mozambique agriculture stands for 47% of the water demand, while the urban and rural water demand stands at 38% and industry 11%. Irrigation also represents the major expansion of water demand in the future.

Figure 3-9 : Women selling oranges in the Buzi River Basin. Mozambique, June 2010.

A comparison of total MAR and total demand shows that in 2010 the total consumptive demand of water (i.e. excluding evaporation and other non-direct uses) is only 4.2% of MAR, which confirms the general view that water resources are at present in abundance in the Buzi River Basin, Table 3-3. However, when environmental flow requirements are included, this shows that development potential is not that large if the standard method for EFR estimation in Southern Africa is applied.

Table 3-3 : Water demand contra natural MAR in the Buzi River Basin.

	2010	2020	2030
Direct uses + existing dam evaporation	4.2%	12%	19%
Including EFR (Desktop)	33%	41%	48%

Water demand is much larger in Zimbabwe due to a higher degree of development and commercial farming. For the Buzi River Basin, Mozambique water demand is only 15% of the current water demand in Zimbabwe. Water demand and use is much larger in Zimbabwe, although the surface area is substantially smaller. The Buzi catchment in Zimbabwe is heavily exploited for agriculture and related activities. Both the Burma Valley and Chipinge area have intensive commercial farming, while a significant area of the Chimanimani Mountains is a National Park. The mid and lower reaches of the basin in Mozambique are not as intensively utilised at present. However, there are a number of new and planned developments such as biofuels and sugar cane production, which will significantly change future water demand and allocation in the basin.

Future development of water demand is mainly related to agricultural expansion, predominantly in the central and lower basin in Mozambique for large scale sugar cane and biofuel development. In the long term (2020-2030) further development increasing water demand may also be seen along the Chimoio-Mutare road (part of the Beira Corridor) as well as in the Burma and Chipinge areas in Zimbabwe, where infrastructure is well developed. The increase in water demand is significant and will create a more water-stressed river system, especially if high levels of environmental flow requirements shall be met.

4 CHALLENGES AND STRATEGIC ACTION AREAS

4.1 Water shortages areas and other challenges

As seen from baseline analysis and scenario analysis a number of future management challenges are evident. For the Buzi River Basin the following key issues are noted:

Water for meeting basic needs - The coverage rate for water supply and sanitation for urban and rural areas is still far from the national targets. A large portion of the population has little access to secure water sources in both countries. Social infrastructure is generally better in Zimbabwe than in Mozambique however with the current economic difficulty most of the social infrastructure is in poor condition and the service level at a minimum. The lack of access to water is reflected by the high prevalence of water-borne diseases and general low scoring on health indicators.

Figure 4-1: Queuing for water, Mozambique 2011

Water for pro-poor rural development: A common challenge in Southern Africa is food security and national efforts are put on improving small scale and subsistence farming. In Zimbabwe the trend during 1985-2000 was the transition from rain-fed farming to irrigated agriculture. This transition was triggered by severe droughts in the early 1980s. A similar initiative has recently started in Mozambique. Currently, support to micro dams and small scale agricultural support are under implementation in both Zimbabwe and Mozambique. Up-scaling of such initiatives are needed in the basin area. In addition, in Zimbabwe, the demographics and socio-economy of the area has undergone major changes the last 10 years and the population in the area is today no longer composed of a few large scale commercial farmers. Instead it is composed of a number of small and medium sized farms that need different type of water supply infrastructure and more financial support for investments.

Water for socio-economic development - Securing water for socio-economic development is a main water resources management challenge. Coverage of small to medium sized reservoirs for secured water supply for irrigation is not adequate compared to the aspirations of the stakeholders. Besides the hydropower, the middle section of the Buzi River Basin in Mozambique has so far been largely underdeveloped. This area is sparsely populated and has good potential for irrigation/commercial agriculture, agro-forestry and agro-industry development. Industrial development on the Mozambican side is hampered by the lack of reliable water supply. The private sector does not have

the resources to invest in basic infrastructure that is in the national interest such as water, energy and roads. It is recognised in both countries that public-private partnerships will be a prerequisite to meet the development challenge. Substantial investment funds will be required for the water resources management process and the necessary water infrastructure.

Water for energy: Agriculture and population growth are not the only driving forces for water infrastructure development. The need for additional hydropower generation will also require development and regulation of the Buzi Basin rivers. Energy deficits exist in the whole of southern Africa. Mozambique and the Buzi River Basin already is a major producer of hydropower but the potential is far from fully developed. New hydropower schemes are planned in the Buzi River Basin as stated in national energy plans. However, it is not expected the potential will be fully developed since, in Mozambique, there are parallel plans to develop new hydropower plants in the Zambezi and Lurio River Basins.

Water for sustaining vital ecosystems - Terrestrial and aquatic ecosystems produce a range of economic benefits. The ecosystems depend on water flows, seasonality and water-table fluctuations and have water quality as a fundamental determinant. Securing water for the future and for the environment are integral parts of the policy and legal frameworks of both countries. Any water infrastructure development must consider Environmental Flow Requirements (EFR) and climate change aspects and thus new development will most likely consider this demand and allocate water to this user to a larger extent than has been traditionally done. Environmental water requirement is a recognised as primary water use in both countries. However, no established standards exist for calculating Environmental Flow Requirements (EFR). At the moment, there is no major problem with environmental flow however key water quality parameters are locally not within an acceptable range due to urban, agriculture and mining activities. Moreover, the anticipated influx of investors' calls for coordinated and regulated development. Overall, there is an insufficient appreciation of the value of water, and the effort required to make water available on a sustained basis. Inadequate attention to environmental impacts will – if no measures are taken – result in that water is wasted, water resources are polluted, and aquatic habitats degraded.

Flood and drought management - Water vulnerability is high. The coastal and adjacent inland areas of the Buzi River Basin are highly susceptible to flooding, both from storm surges accompanying cyclones and flooding from precipitation upstream. The human, material, social and economic impacts of floods are exacerbated by the increasing human settlements in the buffer zones and flood plains of the Buzi River estuary. Flood management is of high priority, notably for Mozambique.

Buzi Basin is only moderately exposed to droughts but when a drought occurs vulnerability is high because of poverty and reliance on rain-fed crops. Flood and drought management is thus of high priority in combination with improved basic infrastructure in irrigation and water supply.

Climate Change - Moreover, climate change estimates predict (although very preliminary) higher flood peaks during wet months and prolonged dry seasons. Climate change trends and regional models were reviewed during the Monograph phase and it was concluded that future climate change will most likely cause a more variable climate in the Buzi River Basin. The estimated Mean Annual Runoff (MAR) based on 1955-75 will probably be higher in the future but rainfall will mainly be concentrated in a few months during the year. Despite the higher MAR, droughts may therefore be more common and rainfall will start later, following the dry season. Floods may be more severe and likely more frequent.

Water governance - The progress with regards to water reforms has a positive trend towards creating the enabling policy and legal framework but lags behind on the institutional and management side. Policies, water acts, regulations and guidelines are in place whilst management efficiency in terms of water monitoring and provision of information, water use management and protection is low. Unclear roles, inadequate resources in terms of skilled staff, vehicles, equipment and finance and some structural issues such as integrity and accountability aspects are some of the causes for institutions incapability to efficiently undertaking mandated functions.

Future development scenarios and water management challenges in the Buzi River Basin will require appropriate governance frameworks, at bi-lateral, national and sub-national levels. A firm governance framework requires not only a comprehensive policy and legal structure but also an institutional set-up that consists of effective coordination mechanisms, clear roles and responsibilities, planning processes, and financing in place.

It should also be noted that in order to meet the obligations of transboundary water management, improved implementation of IWRM principles at national level is required. Current low capacity to undertake mandated functions, such as monitoring and water resources information management (including water assessment, flood and drought forecasting, simple water balance calculations), water use allocation and pollution control makes it difficult to fulfil international obligations.

In Zimbabwe, the primary focus is to shape the operation to match the available funds and human resources and to make a strategy to secure and re-establish the institutional memory. Once the staff positions are filled, major training packages would be beneficial considering the generational shift in the staffing and the limited number of senior staff that can transfer the institutional memory

For the management of the Buzi river basin in Mozambique, the review shows that initial steps have been taken towards implementation of IWRM. ARA-Centro is building on experience from the Pungwe basin in its current efforts to improve service efficiency in the Buzi Basin. In Mozambique, the focus will be on strengthening the Buzi branch office of the ARA-Centro, and important functions such as surface water monitoring, a key for efficient IWRM, and water use management, groundwater monitoring and pollution control.

IWRM at basin level requires major human and financial resources. Finance generated from, economic tools such as water user fees, is not expected to meet the rising cost of water management within the planning horizon i.e. up to 2030. Considering that human and financial resources are scarce at national levels, practical implementation of efficient water management in the Buzi River Basin will thus remain a challenge and careful evaluation of priority IRWM functions is important for future institutional sustainability.

Summary Challenges

In conclusion, for the JIWRM of the Buzi River Basin, four key area water management challenges were identified, explicitly:

- Assurance of water supply to key water users sectors.

- Water quality and aquatic ecosystem health.
- Water related vulnerability, notably floods and droughts.
- Water governance and IWRM implementation, with special focus on the Transboundary Water Management (TWM) dimension.

4.2 Multi-criteria analysis of development options

System analysis have been undertaken during the Strategy formulation process, to find out where water infrastructure investments are needed to improve the assurance of water supply to the primary users (people and ecosystems), and main economic sectors (agriculture, energy and industry). For this purpose a Water Resources Yield Model (WRYM) for Buzi River Basin was established.

In the first run, the WRYM model set up for the Buzi River Basin tested the water balance and the assurance of supply for the following scenarios:

- Baseline Scenario, representing the water infrastructure, water demand and the hydro-meteorological conditions existing in 2010, at the basin scale;
- No Action Scenario, representing the river system characteristics and water balance for a scenario with the estimated water demand in 2030 and the existing water infrastructure (2010). The No action scenario thus looks at a scenario where no new large scale water storage and regulating infrastructure schemes are implemented.

In the Baseline Scenario most of the current users are fully supplied. However, there are some shortages in supply in a few locations in Zimbabwe were the incremental catchments supplying the water users are smaller. For the No Action Scenario the results indicated that water supply to key water users would be below acceptable levels. Consequently, it is essential to increase the storage volume and the regulatory functions of the river to underpin the socio-economic development in the Buzi River Basin.

Based on the various structural projects identified to improve assurance of supply to key users, development scenarios was defined and tested through the system analysis. Within the time span of 20 years, three different water infrastructure development scenarios were analysed, i.e. low, intermediate and full development.

As a basis for the scenario construction a number of aspects have been considered. Primary uses have the highest priority and both countries envisage full coverage with regards to water supply and sanitation for the rural and urban population. The scenarios chosen were principally about developing the irrigation and hydropower sectors and at the same time ensuring water supply for primary uses, including environmental flow requirements. Priority allocation was given to primary users (urban, rural, livestock, industry and EFR) over hydropower and irrigation.

At present there are no international best practices to guide the development principles in the Buzi River Basin with regards to EFR. The future approach will be subjected to international negotiations. However, for this joint IWRM strategy formulation process an environmental flow of 10% was agreed between the two countries as an acceptable approach in the basin wide system analysis.

Based on the yield analyses (WRYM) conducted the following could be concluded:

- The current hydropower requirements being placed on Chicamba Dam are significant. As stated in previous reports the water supply outlet is too high and the water levels are likely

to be drawn down below the outlet.. To solve this, either the outlet pipe needs to be lowered or the hydropower demand on the dam needs to be reduced by adding storage in the Revue upstream of Mavuzi (e.g. Tsate or Muenezi).

- Additional storage, over and above the planned Mirror dam, is required in the Zimbabwe portion of the catchment to bring the assurance of supply to an acceptable level for the 2030 planning horizon.
- On the Mozambican side, the Lucite Cintura dam has a much larger impact than Buzi Muiracuene dam. Lucite is the key for the planned irrigation developments, while Buzi (after Lucite) has hydropower production as the major driving factor.

The Tsate, Muenzi, Buzi and Lucite projects are considered to have moderate environmental and social impacts. In the case of Tsate and Muenzi the impact on river hydrology is low. In the case of Buzi and Lucite the impacted areas are relatively remote and are only sparsely populated, with very little existing infrastructure and no protected areas. Of the four projects, the Tsate Hydropower Project is considered to have the highest power-to-environmental impact ratio.

Alternative development options to dams for water supply could be conjunctive use of ground water and inter-basin transfers. The option of conjunctive use of ground water to meet water demand in the agricultural and civil sector is theoretically an alternative to the identified dams. Further studies are thus necessary to assess the feasibility of the ground water option. It should be noted, though, that this option is very uncertain with regards to demand satisfaction and hydrogeological feasibility hence the reason for lower scores than the dam options in the multi-criteria analysis. Moreover, it does not provide added values such as hydropower generation, or flood control.

The alternative option to hydropower schemes, i.e. Tsate, Muenezi and Buzi dams for power generations is to develop other sources of energy. In the case of southern Africa, the alternative is mainly focused on the development of non-renewable sources such as coal and natural gas.

Considering all multi-criteria aspects, a desirable planning scenario comprising prioritised development projects has been defined.

4.3 Addressing the Challenges

In order to address the four key challenge areas, a number of strategies have been formulated as presented below.

4.3.1 Meeting water demand and allocation priorities

Background

Water demand includes consumptive and non-consumptive demand. A water demand study estimates the water which needs to be reserved or allocated for a specific use. As informed by the water demand study, the key water demand sectors are:

- Water for urban and rural domestic needs
- Water for sustaining ecosystem health and services
- Water for agriculture
- Water for energy production
- Water for industries and commerce

Strategic objective

The Joint Buzi River IWRM Strategy aims at meeting key water allocation principles stated in national and regional governance documents. Specifically it aims at allocating water in the following priority order:

- Primary uses - domestic needs and ecological requirements
- International obligations
- Pro-poor development
- Economic development

Of highest priority is to satisfy basic human needs by securing a basic water supply for people with the unit consumption rates stated in the national policy documents. This implies that the first objective is to ensure that sufficient quantities of raw water are available to provide for the basic water needs of the current and future population.

The other priority use is for sustaining aquatic ecosystems. The Buzi JIWRM Strategy aims to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the basin water resource. This implies ensuring sufficient water of an appropriate quality to sustain healthy aquatic ecosystems. Regarding eco-system services and ecological flow requirements (EFR), the Monograph Report provides a review of methods that could be applied to the Buzi Basin and presents resulting EFRs applying the different methods. This review could be used as a basis for future practices in the Buzi River Basin.

The countries are committed to the Revised Protocol on Shared Water Courses in Southern Africa and the Joint Water Commission (JWC) agreement. There are no detailed specifications e.g. minimum releases. However the countries have committed to meet the general obligations related to equitable and sustainable use of shared water sources, such as the Pungwe, Buzi and Save rivers. The aim is to develop a comprehensive agreement detailing and specifying the general obligations and to ensure implementation.

Water for pro-poor development before large scale commercial uses is another key issue for the joint effort embarked on by the riparian countries on the sustainable development of the shared Buzi River Basin. The overall objective of the Buzi JIWRM Strategy is pro-poor development. This implies actively reserving water and allocating finances for pro-poor development.

Subject to a reserve for water for priority uses being secured, water for economic development should be allocated between sectors based on multi-criteria evaluations. In this regard consideration should be given to strategically important investments for the national economy. The Nexus water, energy and food security perspective is one important aspect of this and multi-purpose use of infrastructure investments is another.

Key strategies/strategic actions

To promote sustainable use, the key strategic actions are to enforce demand management regulations and instruments, including:

- water user fees and other charges
- reduce losses within water piped systems and irrigation schemes
- institute water restriction measures in emergency situations (e.g. droughts)

For the Buzi River Basin the strategic actions are to promote the introduction and application of WDM instruments. Developing allocation guidelines (targets and limits) for each sector, water use

tariffs, and information packages are examples of regulatory, economic, and informative instruments covered under the *Buzi JIWRM Strategy Framework - Institutional Strategic Action Area*.

4.3.2 Assure water supply

Background

The first challenge is to reserve water according to the above listed allocation principles. The second challenge is to ensure access to the allocated water. With the current development rate in each water use sector, water shortage areas in the tributaries can be expected if no measures are taken. By regulating the flow of water in the tributaries through a system of reservoirs and dams, a better distribution can be achieved over the year, which would ensure an effective utilisation of the considerable surplus of water. By efficient WDM the precious water resources can be managed in a more sustainable and equitable manner. WDM comprises the application of various management instruments i.e. technical, regulatory, informative, and economic instruments.

To increase the storage volume and the regulatory functions of the river will be essential to underpin the socio-economic development in the Buzi River Basin. The key function of the basin water authorities is to drive implementation from planning, to feasibility and EIA level, to implementation and ensure optimal and sustainable infrastructure development.

To be successful in allocating water and finances according to defined allocation listed principles will require a committed and dedicated water sector, actively driving basin planning and implementation towards sustainable water management and associated outcomes of healthy people, rich biodiversity and a prosperous economy.

With regards to sustainable use, the guiding principle for the Buzi River Basin is to go from a narrow focus on resource development to a broader orientation of options, notably effective water use and control through regulations and tariff systems. Nevertheless, the fact remains that water is not the limiting factor in the Buzi River Basin. There is sufficient water for development if planned carefully. Currently, the lack of investment in water storage and supply systems is a limiting factor for socio-economic development. The Buzi River Basin, as a whole, has sufficient water resources to meet its short and long term requirements as illustrated in the Development Scenario Report. The key challenge is instead related to need to respond to the planning objectives of each sector and ensuring timely access and water delivery to the users. The reliable supply of water in sufficient quantities and quality required is a crucial input to economic growth and job creation. Consequently, the immediate focus for the Buzi River Basin will remain on infrastructure development until a basic level is achieved. However, in parallel, strengthening the use of water demand management (WDM) tools, notably economic tools and allocation principles, is of high priority in order to improve the recognition of the true value of water and the safe guarding of this valuable resource.

Strategic objective

The strategic objective is to increase storage volume and regulatory functions of the river in order to respond to the demands of the key water uses.

Key strategies/strategic actions

To ensure supply of water at acceptable quality, there will be a need for reservoirs, irrigation infrastructure, water supply and distribution networks and pollution control structures such as waste water treatment plants.

The strategic objective is to meet the challenge of providing water in an optimal, sustainable and equitable manner to underpin economic development in a demand driven manner. This objective will require a closer coordination between the key water user sectors, notably agriculture, energy, environmental protection and the basin water authorities in the Buzi River. It will also require Environmental Impact Assessments (EIAs) to be carried out for all proposed projects in the Buzi JIWRM strategy.

Conjunctive use of ground water will be central in the future water infrastructure development in the basin. Historically, ground water as a "hidden" resource has not been given the same attention as surface water despite the fact that groundwater is the dominant source for domestic water supply within the rural communities.

The few paying water users will require more effective and more efficient water management and management of scarce resources. This implies investment in improved planning, incorporation of financial management as a critical part of water management, and the commitment to focus on operations and management. Substantial investment funds will be required for the water resources management process and the necessary water infrastructure. It is recognised in both countries that public-private partnerships (PPPs) will be a prerequisite to meet the development challenge. One interesting option to be piloted is the negotiation of package land and water concessions and management contracts in order to encourage private operators of irrigation infrastructure.

To address the need for investment in the Buzi River Basin, the key strategic actions are:

- Contribute to coordinated development of key water use sectors through active involvement in planning and implementation of water supply and sanitation, irrigation and hydropower projects.
- Increase storage volume and regulations of the river system through the implementation of prioritised large scale water infrastructure projects.
- Increase storage volume and regulations of the river system through development of a system of small and medium dams.
- Undertake development planning, project feasibility studies and EIAsUndertake fund raising activities and actively find avenues to mobilise funding e.g. through PPPs.
- Implement viable projects
- Plan for operation and maintenance

In order to meet the future water management requirements a number of development options have been proposed and analysed. Notable among these are the Mirror dam in Zimbabwe and the Tsate, Muenezi, Lucite/Cintura and Buzi/Muiracuene dams and hydropower schemes in Mozambique.

The water balance study clearly shows that the planned Mirror dam in Zimbabwe is urgent to meet the urban demand of Chipinge and surrounding irrigation needs. In addition to Mirror dam, additional storage in terms of smaller farm dams is required to bring the assurance of supply to an acceptable level on the Zimbabwean side. In Mozambique, the four projects Tsate, Muenzi, Lucite Cintura and Buzi Miracuene are all found relevant to meet different planning objectives. The study found that the Lucite Cintura is the key for the planned irrigation developments and flood control. The Lucite Cintura dam has a larger impact than the others with regards to satisfying water demand and is thus a priority investment. The major driving factor for the Tsate, Muenzi and Buzi Miracuene projects would be hydropower production while Lucite Cintura has a multi-purpose potential. In summary the direct benefits of the Lucite Cintura project include hydropower, irrigation and flood control while the benefits of the Tsate, Muenzi and Buzi Miracuene projects would be hydropower production.

Considering all multi-criteria aspects, the following development projects and time frames are foreseen:

- 2012-2020: Implementation of Mirror dam in Zimbabwe and Tsate dam in Mozambique in parallel with further basin wide studies for small and medium dams, ground water development and pre-feasibility/ feasibility studies of specific projects notably Muenezi and Lucite/Cintura projects.
- 2015-2025: Implementation of selected small and medium sized development projects e.g. small dams, dykes and ground water projects in Zimbabwe and Mozambique.
- 2020-2030: Implementation of Muenezi and Lucite/Cintura projects in Mozambique.
- 2030 and beyond: Implementation of Buzi/Miracuene project.

4.3.3 Ensure water quality and sustaining ecosystem services

Background

As mentioned previously, the Buzi Basin includes national parks and sensitive areas, and this must be considered in water sector planning. Further conservation actions in protecting sensitive areas (Chimanimani, the Chicamba dam and the Buzi estuary) are needed to maintain the current aquatic ecosystem integrity of the river system.

Attention to the environmental aspects will be important in the basin where major development projects are planned. In addition, deterioration of water resource quality and ecosystems due to pollution from urban, mining and agricultural activities as well as deterioration of water habitats due to exploitation is a threat. Mitigating measures are needed to deal with this problem. Both structural and non-structural measures are required.

The fact that exploration and mining activities may cause significant environmental impacts is well known. Such impacts may include the contamination of water resources through the discharge of processing chemicals or waste into streams and rivers. Adequate storage and control of waste and tailings is therefore usually the most important construction at any mine site, with regards to preventing downstream environmental impacts. Additionally, impacts on water quality may be caused by the removal of vegetation, and opening up of new areas to erosion, which causes an increase in the sediment loading of downstream areas.

Strategic objective

Contribute to a healthy, ecologically sustainable and protected water environment through improving protection of environment and water quality management.

Key strategies/strategic actions

Environmental management and protection is a cross-cutting responsibility cutting across several sectors. Mainstreaming of environmental aspects versus developing specific strategic actions for dealing with cross-cutting issues are often debated at an academic level. In order to lift environmental safe-guarding high on the agenda, the key strategy for the Buzi planning is to promote specific action projects addressing protection and conservation.

The safeguard of the ecosystem and the development of sectors such as fishing and tourism are closely connected with the knowledge of the environment flow. Hence it is recognised that the development capacity of the basin depends on the respect of these environmental flows. Water allocation to meet the environmental flow requirement is not a major problem at the moment.

However, future plans do include a number of dam infrastructures and significantly increased water abstractions for mainly irrigation development, and increased attention to EFR guidelines will be required. A priority action is thus for the two countries to commission a joint EFR study to determine a mutually agreeable methodology.

Actions to maintain the good quality of surface and groundwater resources are necessary. This will include the implementation of a suitable pollution control framework and structural investments to prevent pollution risks from urban areas and agriculture, industrial and mining activities.

With regards to larger scale mining and formal prospecting activities, the existing laws and regulations are adequate however enforcement is inadequate. It is therefore a matter of ensuring that the relevant institutions have the capacity to properly enforce these frameworks. For example, the issue of ensuring that there are adequate plans and resources for rehabilitation once mining has finished assumes considerable importance, as illustrated by the current situation whereby there are a number of abandoned mines in the basin to which no rehabilitative measures were ever applied.

Efforts to support artisanal and small scale mining must be accompanied with a strengthened commitment and capacity to supervise, control and enforce the existing laws and regulations. Thus, miners may not work in protected areas; they are required to not discharge tailings straight into rivers; and once they have mined out a site, they should rehabilitate it. In line with the need for strengthened capacity to supervise and control, the coordination and cooperation between the two countries' agencies also needs to improve. Thus, the resources needed to control and supervise mining activities in the river basin do not necessarily all need to be supplied by the ministries responsible for mining.There are considerable benefits from sharing resources between ministries responsible for mining and water and the environment since the problem of gold mining is multi-disciplinary. . On this subject inter-ministerial action groups is seen as a way to improved law enforcement.

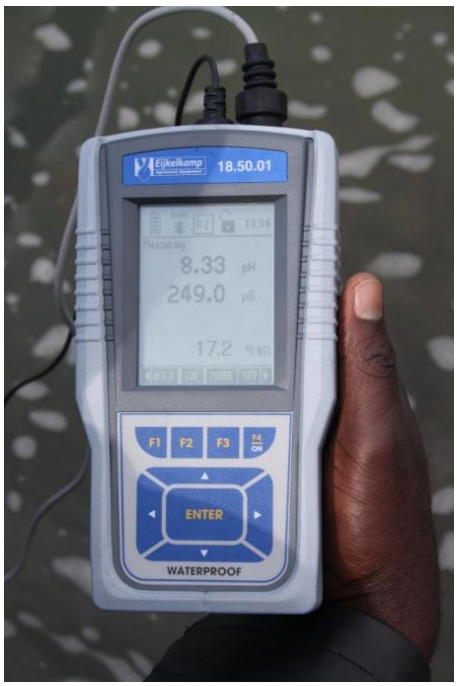

Figure 4-2 : Measuring of pH, temperature and conductivity in the Buzi River Basin, Zimbabwe June 2010.

All in all protection of the Buzi Basin water resource needs to advance for the benefit of a healthy population, sustained ecosystems and a prosperous economy. This requires an integrated and cross-sectoral approach including both surface and ground water resources. Formal mechanisms, e.g. cross-sectoral working groups, for strengthening collaboration around protection, conservation and pollution control should be developed.

Improved efficiency in protection of biodiversity and maintaining water quality will be reached mainly by increasing the knowledge on current ecosystems and by implementing suitable cross-sectoral management of the priority issues and areas. In this respect, the priority cross-cutting and transboundary strategic actions are:

- Develop and implement erosion management programs
- Accelerate water source protection activities

- Determine water requirements for sustaining aquatic ecosystems. Environmental water (flow and quality) at key points must be jointly determined. This implies that water bodies need to be classified and quality objectives need to be determined at basin level.
- Establish water quality management plans and enhance monitoring of water quality
- Enhance pollution control functions. Specifically, implement programs for pollution control of informal mining areas.
- Pollution control structures need to be developed in critical areas and pollution control needs to be enforced basin wide.

The implementation of these strategic actions is of high priority and will require immediate actions. Monitoring and enforcement follow up activities will required medium and long term support interventions. Table 4-1 lists areas that are recommended to be prioritized in a monitoring program for water quality.

Table 4-1 : Suggested prioritised areas of water quality.

Area	Explanation
Northwest Manica	The area of northwest Manica is an area where mining occurs. Mining is a large risk to the water quality and special attention should be placed on monitoring both upstream and downstream mining activities.
South of Chimoio	South of Chimoio has shown higher values of conductivity than the rest of the basin. One explanation could be discharge from the city of Chimoio as the river downstream of a city always is at risk of pollution from the city.
Border Manicaland/ Mossurize	Data indicate extremely low pH in the area and this should be monitored and assessed to conclude whether the phenomenon is natural or anthropogenic.
East Buzi – Estaquinha	The area is the location of large-scale agriculture which involves a high risk of pollution.
Rusitu River	The area needs urgent action as there are gold mining activities in the areas surrounding this river.

4.3.4 Reduce Vulnerability

Background

Reduction of vulnerability is highly prioritised in national policy documents and it is recognised that this strategic action area is an important cornerstone of pro-poor development.

One action to enhance pro-poor development is to reduce exposure and vulnerability of the population of the River Basin to water-related disasters such as floods, droughts and accidental pollution of the watercourses. Among other measures, efficient disaster management is thus an essential component in reducing the vulnerability of the population of the River Basin.

Strategic objective

Reduce the human, material, social and economic impacts of water related disasters and climate change. The measures aim at forecasting water disasters and future climate change impacts and to implement procedures to reduce the impact of these risks on the local population.

Key strategies/strategic actions

Introduce coordinated measures for climate change adaptation and disaster management, notably floods and drought as well as accidental pollution.

In order to address vulnerability, important strategic actions - other than basic water supply and sanitation interventions – are to:

- Develop disaster management plans, notably flood and drought
- Develop a climate change adaptation strategy

The future hydro-climatic situation may entail different characteristics for river hydrology as well as water demand (due to higher evapotranspiration). However, insufficient data is available at regional level to predict trends. The effective functioning of a quality-controlled hydrologic network of measuring stations for rainfall, evaporation, water levels and river flows, groundwater and water quality is an essential requirement for this purpose.

In this respect, the key objectives of a climate change strategy for the water sector are the following:

- Increase preparedness for potential changes in productivity and increased pressure on natural resources
- Integrate climate change considerations in the short-, medium- and long-term water planning processes
- Increase the capacity to provide information about necessary design consideration for important infrastructure such as roads, railway and dams with regards to flood magnitudes and safety aspects; and irrigation infrastructure with regards to assurance of supply and water storage planning.

Disaster management refers to all aspects of and activities relating to the planning for, implementation and response to disasters including before, during and after disaster activities and involving mitigation, prevention, preparedness, emergency response, recovery, rehabilitation and reconstruction. It also refers to the management of risks, vulnerability and the consequence of disasters. Disaster management is multi-sectoral and several national agencies play distinct and separate roles.

The water authorities play an important role with regards to floods, droughts and accidental pollution of water courses especially concerning knowledge and information management. Coordination with national disaster management institutes is essential for developing a sustainable strategy for flood and drought management.

Figure 4-3 : Flood inundations January 2008 In the Buzi and the Pungwe rivers, and the maximum inundation 1997-2005.

Hence, the strategic objectives of the disaster management plan are:

- Managing floods and droughts to mitigate and minimise harm to humans, environment and economic values
- Knowledge of inundation areas for different flood magnitudes
- A functioning flood warning system
- A functioning drought warning system
- Knowledge of key pollution risks and a functioning warning system for accidental pollution

In order to undertake such functions, firstly, a reliable monitoring system covering a minimum number of key stations is a must for any further development of a flood management system. The efficiency of disaster management functions will thus depend of the expansion of the monitoring network.

The disaster management plan will build on the Flood and Drought Management Strategy for the Pungwe River Basin (Sweco, 2012), which involves the same implementing agencies.

4.3.5 Create responsive and efficient water governance

Background

Increased economic development in the Buzi River Basin will put more demand on water resources management. To improve performance and respond to new developments, the national water governance frameworks and IWRM implementation need to advance.

Strategic objective

To create responsive and efficient water governance. Responsive and efficient water governance is necessary to meet international and national obligations. The key strategy is to strengthen the institutional and legal framework to meet international and national obligations related to the shared Buzi river basin.

The target beneficiaries are the JWC, the DWR, ZINWA and ZINWA-Save in Zimbabwe, DNA/ARA-Centro and basin stakeholder organisations.

Key strategies/Strategic actions

Institutional development actions are foreseen at three management levels. i.e.: i) transboundary level, ii) national level, and iii) sub-national level. Within these levels, it is recognised that high performance of three dimensions is essential for efficient implementation of IWRM explicitly: enabling environment; institutions; and management. In this respect, the priority actions to address governance challenges lie within those three dimensions, with a clear focus on institutional consolidation and the enhancement of management procedures.

Priority measures are:

- Operationalization of the JWC
- Institutional consolidation and strengthening of national and sub-national water authorities
- Promotion of stakeholder participation and cross-sectorial coordination

4.3.5.1 Transboundary framework required for joint management

The strategic objective of this action is to detail and operationalize the principles of the SADC revised protocol and the JWC Agreement.

With the signing of the SADC Protocol, Zimbabwe and Mozambique have committed to the principles of equitable use, no harm, prior notification and cooperation. The principles include:

- Maintain a proper balance between resource development for a higher standard of living for their people and conservation and enhancement of the environment to promote sustainable development;
- Pursue and establish close cooperation with regard to the study and execution of all projects likely to have an effect on the regime of the shared Buzi watercourse;
- Exchange available information and data regarding the hydrological, hydro geological, water quality, meteorological and environmental condition of shared Buzi watercourses;
- In their respective territories, utilize the Buzi water resources in an equitable and reasonable manner and participate in the protection.

To meet international obligations it will be necessary to put the following mechanisms in place:

- A comprehensive agreement for the shared river basin based on the Buzi JIWRM Strategy study and following the orientations of the JWC and the revised SADC Protocol.
- Information exchange mechanisms, compatibility of technologies and procedures for collection and management of information.
- A joint river basin management institution, established and operational.
- Harmonisation of national legislation in accordance with the terms in regional, bi-lateral or multi-lateral agreements signed and ratified by riparian states
- International agreements transposed to national law.
- Mechanisms for joint development and implementation of joint initiatives

With the signing of the JWC Agreement, the basic transboundary governance framework has been established. In addition, the Buzi JIWRM Strategy constitutes a document that comprise well-defined objectives, mutually beneficial goals and development priorities, all stated in a long-term integrated river basin management plan

The Buzi JIWRM Strategy will thus constitute the basis for further advancing the transboundary governance framework. The next step will be to negotiate a comprehensive joint agreement covering the three rivers, Buzi, and adjacent Save and Pungwe. A comprehensive agreement covering the three river basins, in a similar way as the IncoMaputo agreement, seems preferable to separate agreements for each of the basins, allowing for better trade-offs between the two countries. It would also be more efficient in terms of allowing for a single River Basin Organization in the future.

Important aspects to be regulated in the agreement include detailed principles for water development; water allocation between sectors and the two countries under various contexts (e.g. in normal situations and in times of drought).

To this end it is assumed that the water sharing agreements will provide detailed procedures for: water allocation including EFR procedures; consultation procedures; co-ordination mechanisms; systems for environmental and hydrometeorological monitoring; exchange of information; disaster

management (flood, drought and accidental pollution); and development guidelines (e.g. joint or/and independent EIA studies for projects with transboundary impacts, dam safety procedures).

Joint formulation and decision making of procedures and norms would benefit from the preparation of discussion/background papers on each subject to be prepared by independent parties. The papers would review and provide options for the detailed procedures. The review project would also entail analysis and specification of an institutional set-up for implementation of the agreement.

The other important action is to establish the JWC Permanent Secretariat and a Technical Committee to support the JWC with administration, management, coordination, communication and screening as well as M&E functions. The original objective of JWC is to "act as technical adviser to the parties (Zimbabwe and Mozambique) on matters relating to the conservation, development and utilization of the water resources of common interest and identify areas of cooperation related to intergraded water resources management and development". Thus, the current functions of the JWC are merely advisory and the composition consists only of three officials appointed by the appropriate ministry in each country, assigned to meet at least twice a year.

The medium-term priority action for the JWC is to establish the JWC Permanent Secretariat, a coordinating body, with competent and adequate staffing for the efficient implementation and monitoring of bi-lateral agreements and the Joint Buzi IWRM Strategy.

This implies that an agreement must be reached about:

- The role of the secretariat within an existing or planned hierarchical structure of a river basin organization;
- The objectives, powers, functions, roles and responsibilities;
- The establishment structure;
- The planning, programming, execution of tasks and reporting duties;
- The preparation of procedural guidelines;
- The financial control and accountability

It also requires that its capacities would have to be strongly increased (human resources, offices, means of transport, etc.).

In case of a joint investment of e.g. hydropower projects, the option of upgrading the cooperation mechanism to an authority must be considered. However, this is seen as a long term consideration and no strategic action project dealing with this subject is included in the current Buzi JIWRM Strategy. In summary, the priority strategic actions are:

- Establishment of the Buzi Water Charter
- Establishment of the JWC Permanent Secretariat including preparation of legal and regulatory framework and procedures for JWC Secretariat
- Technical support to JWC Secretariat

4.3.5.2 National Institutional Framework

The specific objective is to enhance capacity at the national and regional level to address the challenges of water resources management in Zimbabwe and Mozambique and strengthen the institutional framework for water resources development.

Efficient water resources management requires structures to be in place to establish communication and information systems, establish regulations and financing arrangements, conduct development works, devise systems for accountability, develop organisational capacity and coordinate activities. At management level, major challenges with regard to the organisational capacity are evident. Current service efficiency of the mandated functions is low, although there are differences between the two countries. Operational tools, procedures and resources at the decentralised level are not in place at an adequate level.

The lack of appropriate skills and capability in the right places has been identified as a critical challenge in the sector, from water engineers, to project management, to leadership and governance. Increased skills and capacity are required for improved water management and governance. Important strategic actions should also focus on mobilising the skills and resources available across the entire water sector, including government, the private sector and civil society through e.g. national procurement of consultancy services.

Another constraint is that integrated planning and water use management and infrastructure development is not as effective as required to ensure sustainable development. Enhanced water governance demands integrated governance between the water authorities and relevant ministries, notably in the environmental, agriculture and energy and mining sectors.

An institutional strengthening programme is therefore required to improve management tools and increase the service efficiency of the water management institutions. The strategic institutional development actions, singled out are deemed to be of high priority in order to meet the future water management challenges foreseen in the Buzi River Basin.

Regarding the legal enabling framework major efforts have been made to harmonise national legislation in accordance with regional, bi-lateral or multi-lateral agreements signed and ratified by the two governments. Further harmonisation between the countries is thus not deemed as a priority at the moment. Instead enforcement of the current legislation is the main priority in order to be able to comply with bi-lateral agreements and ensure a sustainable use and development of the shared Buzi water course. However, at national level some further consolidation of the legal and institutional framework is needed. In some cases the mandates overlap and existing water legislation is not fully coordinated with other sector legislation. A legal review is required to clarify roles and responsibilities. The legal/institutional review will cover several ministry and administrative levels. Expected results would be amendments where necessary in the legal framework.

The strategic objectives and priority actions relevant for the joint management of the Buzi River Basin are presented below.

The economic challenges prevailing in Zimbabwe have resulted in weakened institutional structures. Hence, it can be concluded that the institutional capacity to perform mandates has declined from a previously good service level to a currently unsatisfactory level.

For the ZINWA-Save the following institutional consolidation processes need to be completed:

- General institutional strengthening, i.e. increase of human resources and equipment
- Capacity building programs
- Inter-ministerial coordination

In Mozambique, at Buzi River Basin level, the ARA-Centro Business Plan for the period 2012-2016 contains a number of proposed measures to develop its operation al tools and internal procedures and protocols. It is essential that the proposed measures are implemented as planned. The proposed package of actions addresses the institutional consolidation process, the need to assure

sufficient human resources and support efficiency by developing a number of internal management tools. A most urgent action is to make the Management and Fiscal Councils operational.

It is expected that inter-ministerial coordination and communication will be improved once the communication plan is in place and the management council is operational whereby the council will have the mandate to resolve cross-cutting issues in order to avoid gaps and overlaps.

Consequently, the following institutional consolidation processes need to be completed for the ARA-Centro:

- Further institutional consolidation at ARA-Centro headquarters in Beira concerning the departmental set-up, equipping and staffing;
- Operationalization of the Fiscal and Management Councils;
- Cross-sector planning needs to be facilitated and coordinated through establishing necessary partnerships, processes and protocols;
- Development of the Buzi branch office (UGB); and
- Formal establishment and strengthening of the Buzi Basin Committee.

4.3.5.3 Water Resources Management

The strategic objective is that the national basin water offices responsible for management of the Buzi River Basin should fulfil mandated functions at an acceptable level for ensuring a sustainable development of the basin's water resources, notably: water allocation, monitoring, information management , pollution control , basin planning, economic and financial management , sector coordination and stakeholder participation, flood and drought management, water infrastructure development and mainstreaming of cross-cutting issues e.g. gender, HIV/AIDS, pro-poor development, and environmental protection.

WATER ALLOCATION AND UTILISATION - Allocating water to major water users and uses, maintaining minimum levels for social and environmental use while addressing equity and development needs of society.

The strategic objective is that major water users are known and are managed through a licensing (or permit) system. Strategic actions to achieve the objective comprise:

- Review legislation to clarify roles
- Accelerate registration and licensing of surface and groundwater users according to the regulations.
- Determine social and environmental reserve at sub-catchment level and minimum release related to the international perspective.
- Setting water allocation targets/limits for all sectors including special regulation during drought events. (Mainly relevant for Mozambique. Zimbabwe has made major progress on this issue)
- Increase institutional capacity to perform simple water balance calculations at sub-catchment level in order to examine allocation criteria for compliance with IWRM principles.
- Promote water loss reduction.
- Obtain formal commitments from different water use sectors.

MONITORING AND INFORMATION MANAGEMENT - Implement effective monitoring systems that provide essential management information and identify and respond to infringements of laws, regulations and permits. Provide essential data necessary to make informed and transparent decisions for development and sustainable management of water resources in the basin.

Adequate knowledge and information management is deemed as a prerequisite to meet future water management requirements. The strategic objective is to create an improved mechanism for monitoring, collection, management and exchange of data that is essential for the joint management and development of the Buzi River Basin. It is recognised, in this regard, that the core of such system is the monitoring systems, procedures and protocols for data exchange, i.e. the entire process of data collection, compilation, quality control, storage, dissemination and exchange of data. The necessary basis for a functioning knowledge and information management system in the Buzi River Basin is an improved monitoring network. The key strategic actions are to

- Expand the monitoring systems for hydrometeorology, groundwater, water quality and sediment monitoring;
- Develop and install a comprehensive basin-wide water information system to support integrated river basin management; and
- Pool the resources between international, national and sub-national level.
- Develop procedures and protocols for data sharing
- Improve capacity through target training.

Secondly, it will be crucial to further develop the information management system. This major effort is referred to as the Enhanced Knowledge and Information System (EKIS) Phase II and aims to create an improved mechanism for monitoring, collection, management and exchange of data that is essential for the joint management and development of the Buzi River Basin. The EKIS phase II will build on existing systems and expand the initial EKIS implemented under the SWCSP. EKIS II will comprise both technical equipment as well as the human and institutional capacity strengthening of the regional and national water authorities. The EKIS will have two overall functions, namely to: i) support the basin organisations in their regular water resources planning and management tasks; and ii) facilitate the exchange of information between the basin managers in the two countries.

A thorough review of data required for water resources management on the river basin scale was undertaken during the Monograph phase guided by the above approach and considering priorities, feasibility and long term sustainability. The monitoring and exchanging of data and information for water resources management at basin scale are furthermore categorised into four purposes (Figure 4-4).

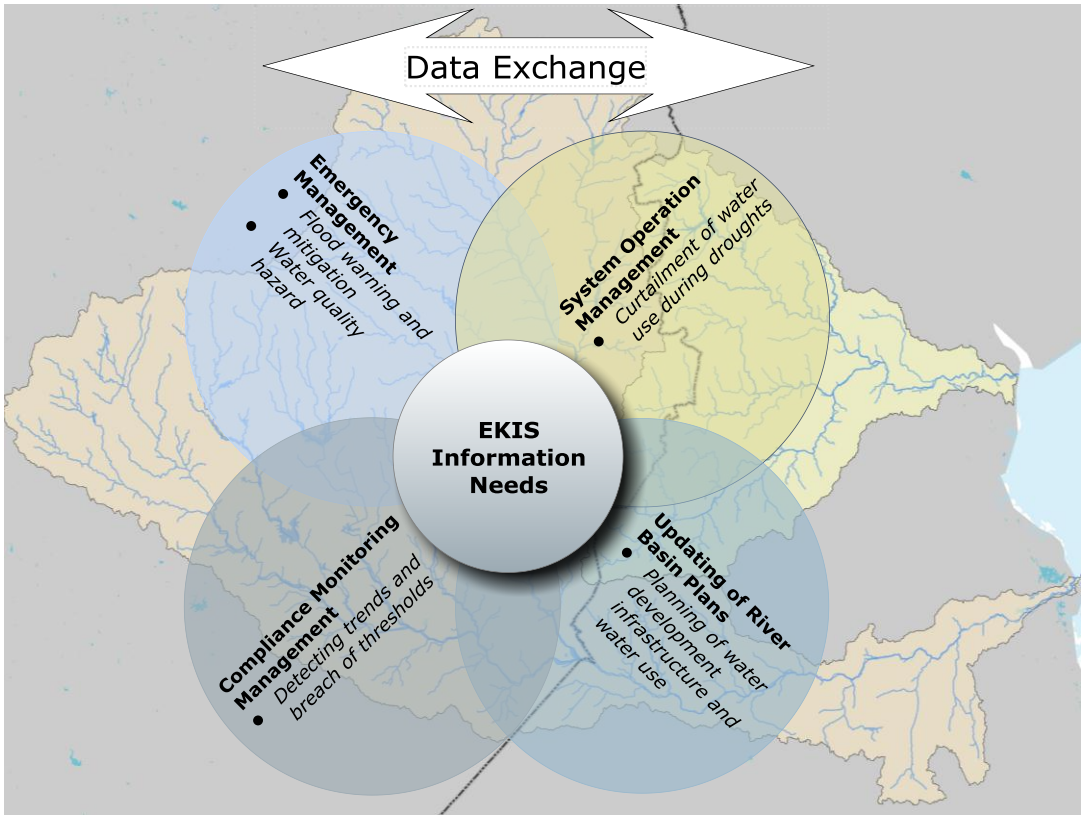

Figure 4-4 : River basin management and planning requires various types on data and information, collected and exchanged at different cycles depending on data type and purpose.

POLLUTION CONTROL - Managing pollution using the polluter pays principle and appropriate incentives to reduce most important pollution problems and minimise environmental and social impacts.

The strategic objectives are: i) the extent of the pollution problem is known; ii) the trends being monitored; and iii) major polluters are known and managed through a licensing (or permit) system.

In order to strengthen the pollution control functions, the priority strategic actions comprise:

- Improve knowledge of pollution sources
- Accelerate registration and licensing of polluters according to the regulations
- Increase institutional capacity to perform compliance monitoring and enforcement
- Review legislation to clarify roles for pollution control
- Dedicated programs to deal with priority pollution issues.

BASIN PLANNING - Prepare and regularly update the Basin Plan incorporating stakeholder views on development and management priorities for the basin, and using it to inform the annual work plans.

Development of national basin and sub-catchment management plans are called for in the national water policy documents of Zimbabwe and Mozambique. It is also important to recognise that, in most cases, water is only one of a number of inputs required for economic growth and development. Access to water for basic needs and production is important, but without access to other resources

such as markets and transport infrastructure, it is unlikely to achieve the desirable outcomes of a healthy people, healthy ecosystems and prosperous economy.

Water resources planning must be integrated into national, provincial and local planning, and must be addressed in all growth and development strategies. This implies that the Buzi JIWRM Strategy and Implementation Plan must be integrated with the national and regional plans of Zimbabwe and national and provincial plans of Mozambique.

With regards to groundwater the Strategy formulation process, although rudimentary due to lack of information and data, clearly demonstrated that in terms of volume, groundwater is largely an untapped resource. As a starting point to ensure sustainable development of the ground water use it will be necessary to develop an Integrated Catchment Groundwater Management Strategy.

The corresponding strategic actions for the Buzi River Basin include:

- Strengthen ZINWA-Save's and ARA-Centro's planning capacities
- Based on the Buzi JIWRM Strategy develop national sub-catchment management strategies and plans for both surface and ground water
- Integrate transboundary and national basin strategies into ZINWA-Save's and ARA-Centro's business plans and annual work plans
- Coordinate between basin plans and regional/provincial plans

ECONOMIC AND FINANCIAL MANAGEMENT - Applying economic and financial tools for cost recovery and behaviour change to support the goals of equitable access and sustainable benefits to society from water use.

The application of economic tools is a key instrument to enhance water demand management (WDM). The objective for the Buzi river basin is to achieve water use efficiency and pollution reduction through use of economic and financial instruments.

The corresponding priority strategic actions are to:

- Improve the application of tariffs in water use management
- Improve billing and revenue collection through increased institutional capacity and effective customer services
- Enhance financial accountability through effective internal auditing.

STAKEHOLDER PARTICIPATION - Implement stakeholder participation as a basis for decision making that takes into account the best interests of society and the environment in the development and use of water resources in the basin. The strategic objectives are:

- Effective cooperation between government agencies with responsibilities for water management or water use in the basin.
- Stakeholder participation is institutionalised.
- Awareness increased on IWRM among the general public.
- Improved knowledge, attitudes and practices in relation to local IWRM/basin management.

Figure 4-5 : Field trip in the basin 2010.

Priority strategic measures are:

- Accelerate the consolidation of stakeholder participation institutions and operation i.e. to provide them with adequate resources and communication tools to perform their roles. Target institutions are the Buzi Basin Committee in Mozambique and Save Catchment Council, Budzi (and Odzi) sub-catchment councils in Zimbabwe.
- Enhance capacities of Buzi River Basin authorities to promote community-based IWRM.
- Enhance capacities of Buzi Basin stakeholder institutions to promote community IWRM projects and conduct appraisals.
- Construction of IWRM facilities for visibility and awareness creation.
- Create River Awareness Kit

GENDER AND HIV/AIDS MAINSTREAMING – Consider gender and HIV/AIDS aspects in the human resources management and in operative functions.

In Mozambique, the National Water Resources Management Strategy (NWRMS) (2007-2017) calls for increased female participation. However, no specific short term strategies or targets are defined. With regards to gender, the statutes of ARA-Centro aim for the participation of all users. No national guidelines for the composition and gender balance of river basin committees exist in Mozambique. In Zimbabwe, there are no standard guidelines related to the proportion of women in stakeholder bodies or water committees

National HIV/AIDS policy and strategies are available at national level in both countries. Within the water sector, HIW/AIDS issues are addressed in the water policy and strategy documents. It is recognised that access to clean water and food security can assist in keeping those affected by HIV/AIDS healthy and economically active. The key strategy of the water sector policy documents is ensuring that HIV/AIDS is mainstreamed into their business though human resources management.

HIV/AIDS policy linked to water resources management is in place but the degree of practical implementation and number of staff trained and familiar with HIV/AIDS policies, rights and obligations is uncertain. It would be essential to ensure HIV/AIDS is mainstreamed into the human resources of the ZINWA-Save and ARA-Centro, through approval and implementation of their respective HIV/AIDS policies as a first step.

The strategic objectives are equal participation of women and men in decision making on water and water management; and ensure that national policies on HIV/AIDS response and staff rights are institutionalised.

The priority strategic actions of the Buzi JIWRM Strategy comprise:

- Promote and increase participation of women in water affairs at all levels. This includes women holding technical staff positions within the basin water offices.
- Approve drafted internal guidelines and train staff in HIV/AIDS policies, rights and obligations as well as access to prevention and counselling procedures

5 STRATEGY FRAMEWORK

The Strategy formulation process has provided substantial information about the range of institutional, social, economic, environmental and technical challenges and opportunities confronting both people and institutions within the Buzi Basin related to water. The review points to the numerous avenues through which such challenges are being, and can be, addressed. It also underscores the integrated dimension of IWRM and the need to view the activities included under the 'Buzi River Basin Joint IWRM Strategy' in relation to other complementary initiatives e.g. in the transport, agriculture and energy sectors.

The Strategy formulation process has studied potential development scenarios. Specifically, a coordinated set of storage and regulating infrastructure to meet water demand have been studied – and priority investments have been identified as a result from the multi-criteria analysis. Additionally, the review indicates that a set of coordinated actions are needed to enhance water management and governance in the basin. Such supporting action projects are important to meet the future water challenges and to achieve the IWRM objectives, stated in international as well as national policies and legislation. As a result a number of priority strategies have been formulated to address identified challenges and contribute to sustainable development.

There is a need to invest in priority investment projects and programmes such as knowledge and information management, and water resource protection. To meet the future water management challenges, an array of measures have been defined under the form of a Strategy Framework comprising strategic action projects (SAPs) to be implemented at short, medium or long term time frames in order to address key water management issues.

The priority management and institutional issues and actions that have been singled out are those important to fulfil the mandates under SADC shared Protocol and JWC Agreement. In planning the strategic framework, a balance of strengthening the basic framework for transboundary cooperation as well as working on national issues in water resource management has been chosen. The rationale is that it is important to focus on the national level IWRM as a way to strengthen TWM.

The action projects are defined and composed following the analysis of the development scenarios. These actions are responding to issues that are highlighted in the previous chapters.

The strategic actions which have been considered and evaluated under this phase are deemed to contribute to a desirable state for the Buzi River Basin of socio-economic development, reduced vulnerability, sustainable use of water and regional integration.

Some actions have already been defined in provincial plans and national water strategies as well as in energy plans. Other actions have been defined specifically in the framework of the JIWRM formulation process to respond to identified key issues in the Buzi river basin. Some have financing solutions in place. Other will depend on mobilisation of additional investment funds and on the regular operational budget.

It is important to recall that the Buzi JIWRM Strategy aims at actions in relation to the management of the water resource. In order for the water sector actions to contribute to the general socio-economic development and poverty alleviation of the basin area, these actions should be coordinated with the provincial plans, which cover a broader framework of socio-economic development measures.

In summary, the Strategic Framework and Plan is informed by the development scenarios. It translates the priority strategies into Strategic Action Projects (SAPs) consisting of structural projects and non-structural measures which will support the sustainable development of the basin. Priority areas of action are those where the authorities and members of the JWC have a direct

mandate such as to assure water supply at the right time, quantity, and quality and at the same time assure efficient, equitable and sustainable use.

For the JIWRM of the Buzi River Basin, four strategic action areas were identified, specifically:

- Meeting water demand and assurance of water supply to key water using sectors.
- Ensuring water quality and sustaining aquatic ecosystem health.
- Reducing water related vulnerability.
- Enhancing capacity to fulfil international and national obligations in order to ensure sustainable use and development.

The SAPs are organised under the corresponding action areas 1) infrastructure development, 2) environmental protection, 3) vulnerability reduction and 4) institutional strengthening. In this respect, it should be noted that the SAPs are inter-linked and several SAPs address more than one challenge area.

The time frames and costs indicated in the strategic framework are related to the implementation phases and investment costs of the strategic action projects. The cost recovery procedure is to be assessed in detail in pre-feasibility and feasibility phases. Operation and maintenance costs and regular activities of the basin water authorities to uphold and sustain the strategic actions are seen as the responsibility of the regular staff and budgets of designated authorities.

The non-structural SAPs (institutional issues) are intended to advance the practical implementation of key IWRM principles. SAPs are thus designed to support introduction of new working methods for a period of time until such working procedures have been institutionalised or mainstreamed into the regular functions.

Table 5-1 presents the Buzi JIWRM Strategy Framework. Appendix 1 comprises a detailed presentation of the SAPs and expected outcomes.

Table 5-1: Buzi JIWRM Strategy Framework

Challenge	Strategic Area	Action
Meeting Water Demand	Coordinated Water Infrastructure Development	**Component 1.1: Major dam and hydro-power projects**
		SAP 1.1.1: Mirror Dam
		SAP 1.1.2: Tsate Hydropower Project
		SAP 1.1.3: Muenezi hydropower project
		SAP 1.1.4: Lucite/Cintura Multipurpose Project
		SAP 1.1.5: Buzi/Miracuene Multipurpose Project
		Component 1.2: Small and medium infrastructure projects
		SAP 1.2.1: Small and medium dams and weirs
		SAP 1.2.2: Assessment and development of the Dombe Alluvial aquifer
		Component 1.3: Mobilisation of investment funding
		SAP 1.3.1: Development funding mechanisms and piloting
Maintain WQ and Environmental Health	Cross-sectoral Environmental Actions	**Component 2.1: River Protection**
		SAP 2.1.1: Pollution control structures
		SAP 2.1.2: River Protection
		Component 2.2: Water Quality Management
		SAP 2.2.1: Environmental flow study
		SAP 2.2.2: Water quality management plans
Reduce Vulnerability	Climate Change and Disaster Management	**Component 3.1: Disaster Management**
		SAP 3.1.1: Disaster Management Plan
		SAP 3.1.2: Flood control structures
		Component3.2: Climate Change Management
		SAP 3.2.1: Climate change adaptation strategy
Efficient Water Governance	Institutional Consolidation and Strengthening	**Component 4.1 Institutional Management Framework**
		SAP 4.1.1: Establishment of JWC Secretariat
		SAP 4.1.2: Institutional consolidation, Zimbabwe
		SAP 4.1.3: Institutional consolidation, Mozambique
		SAP 4.1.4: Legal review and enforcement

		Component 4.2: Water Resources Management
		SAP 4.2.1: Water use management system
		SAP 4.2.2: Pollution management system
		SAP 4.2.3: Enhanced Knowledge and Information Management Phase II
		SAP 4.2.4: Sub-basin plans
		SAP 4.2.5: Groundwater management strategy
		Component 4.3: Stakeholder Participation and Cross-Sectoral Coordination
		SAP 4.3.1: Technical support to stakeholder organisations
		SAP 4.3.2: Community Basin Management Projects
		SAP 4.3.3: River awareness kit

Figure 5-1 overleaf, presents a spatial overview of important basin planning features.

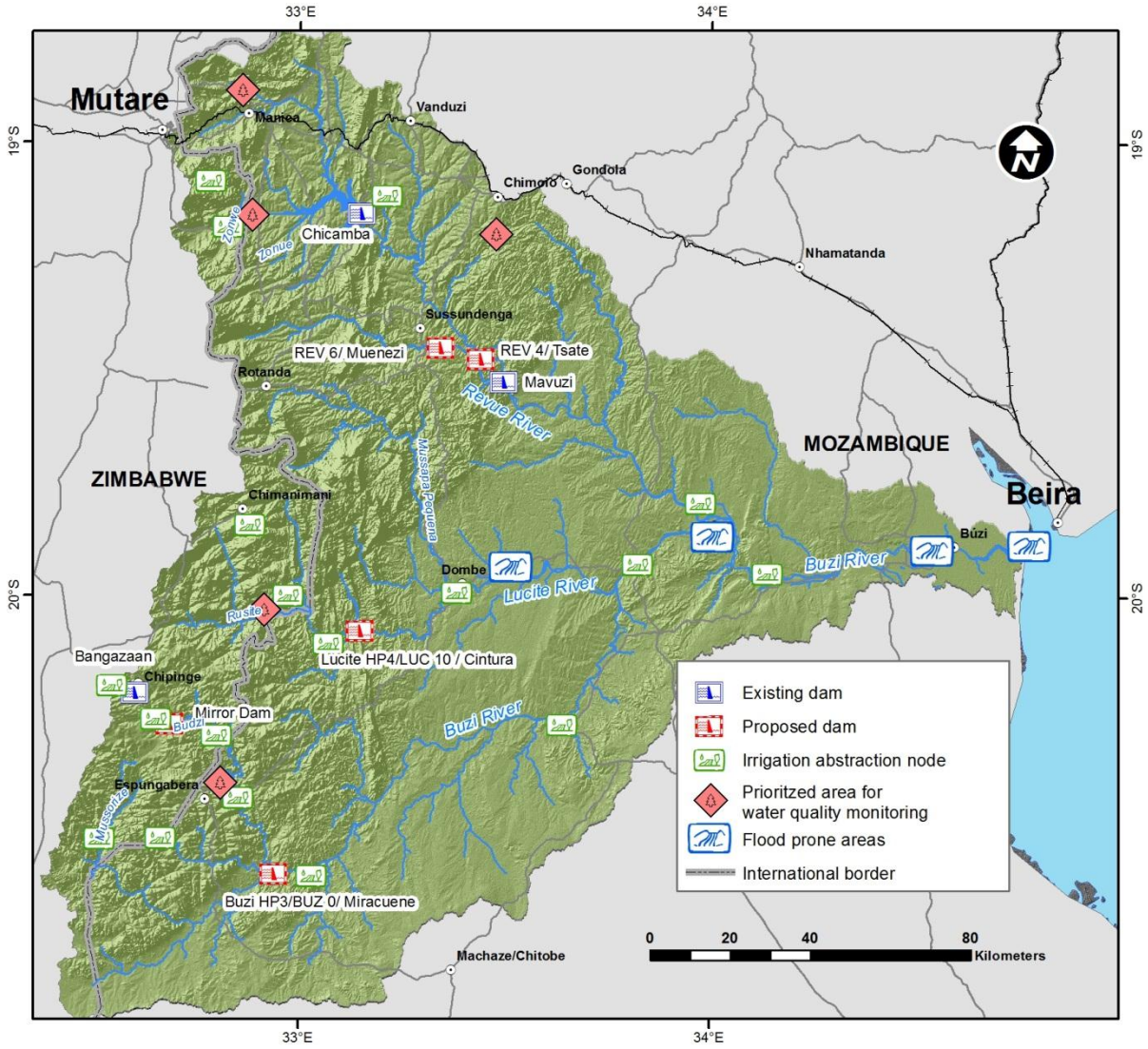

Figure 5-1: Spatial overview of key features for the planning consideration

6 IMPLEMENTATION APPROACH AND PLAN

6.1 Implementation Arrangements

The Joint IWRM Strategies for Pungwe, Buzi and Save River Basins are to be implemented simultaneously. This requires efficient management structure. The implementation of the JIWRM Strategy will be coordinated by the JWC with support as necessary from the planned Secretariat and Technical Committee.

DWR and ZINWA in Zimbabwe and DNA through its International Rivers Office in Mozambique are the main drivers of JWC functions. The role of ZINWA-Save and ARA-Centro is, however, crucial and many of the functions required for transboundary water management are performed by these offices.

The role of the planned JWC secretariat would be to: i) coordinate actions and report to each riparian's high-level administration; and ii) delegate implementation to the two countries.

It is assumed that the JWC Secretariat will delegate the implementation of the majority of the strategic actions to the national basin water authorities in both countries and to only retain full responsibility for oversight, coordination and specific basin wide joint actions. In relation to the latter, the Secretariat would explore the option of joint planning, joint development and joint ownership of potential investments e.g. monitoring stations, dams and hydropower schemes to optimise the benefits while promoting mutual management.

The Secretariat would have a responsibility to monitor the parties' compliance with the JWC Protocol and the Comprehensive Bi-lateral Agreement, once in place. Apart from compliance monitoring, an operational JWC will have a responsibility to monitor the implementation of the Buzi Joint IWRM Strategy, which would be carried out in accordance with the agreed work plan and defined indicators.

There should be standing rules for regular meeting of the Secretariat to oversee the compliance with the JWC Agreement and later the Comprehensive Agreement as well as to discuss issues of mutual interest. The appropriate number of meetings would depend on responsibilities delegated, but would be at least once a year.

There should be close cooperation between the JWC and the SADC Water Division, which plays an important role in TWM in the region and is already involved in the Buzi River Basin. SADC can provide coordinated support to different themes of the Strategy as well as in making use of political processes imbedded in SADC. In particular it will be important to engage the SADC level for regional integration and out of basin benefit sharing projects impacting several countries in Southern Africa. Investing in large-scale hydropower production in the Buzi River for the benefit of the region is an example of an issue that would benefit from being lifted to a higher level.

A fee based on a percentage of the budget of JIWRM Strategy and Implementation Plan would be dedicated to cover the operational costs, as negotiated between the countries and potential external financiers.

The implementation of the Buzi JIWRM Strategy and Implementation Plan is the responsibility of the JWC, through the executive organ, the JWC Secretariat. However, there should be substantial involvement of the national and sub-national water authorities, as well as the local governmental institutions (agriculture, mining, environmental, etc.), civil organisations and non-governmental organisations, and finally water users.

For the implementation of SAPs, lead institutions as well as supporting actors have been defined. Using the various supporting players working on various themes will strengthen integrated governance, management and development of the Buzi River Basin. It will also strengthen the capacities of parallel organisations, both government and stakeholder institutions, of the IWRM approach.

The foreseen institutional set-up for the transboundary water management of the Buzi and the adjacent Pungwe and Save River Basins is illustrated in *Figure* 6-1.

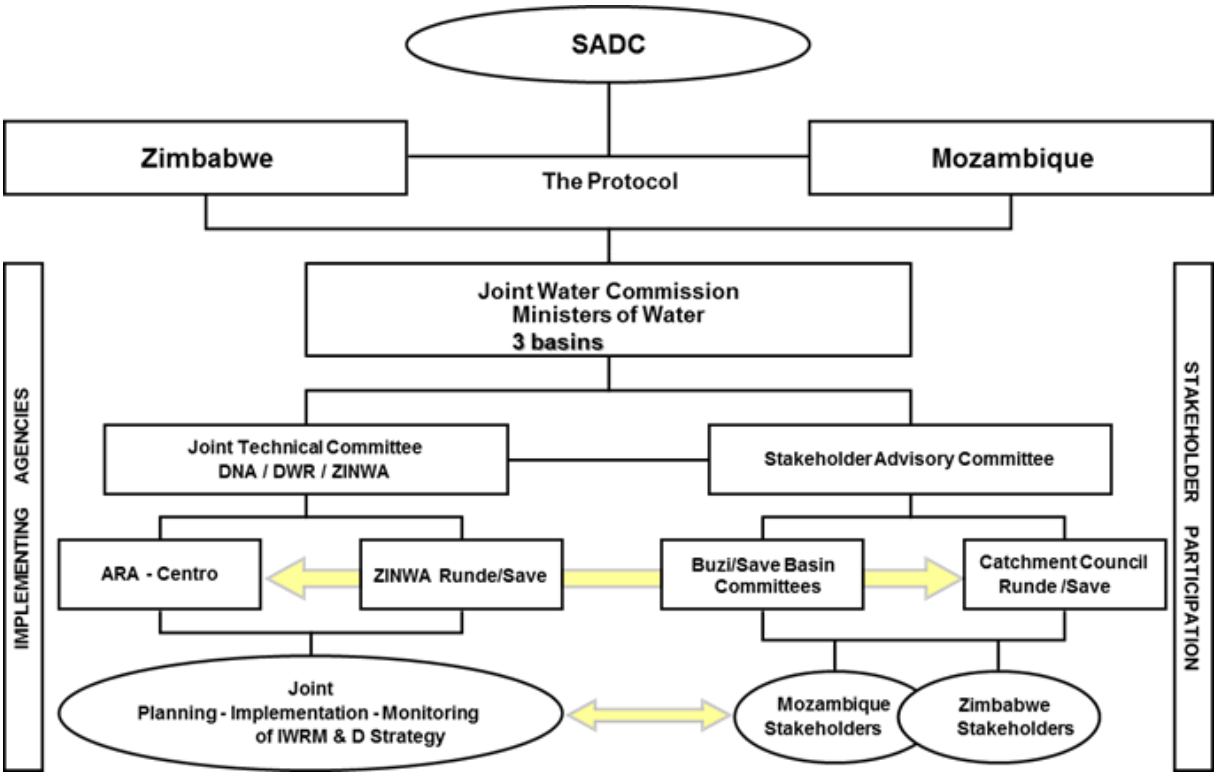

Figure 6-1 *: Institutional implementation of the Buzi JIWRM Strategy Plan.*

The Buzi JIWRM Strategy Framework and Implementation Plan (Table 0-1) summarises the implementation arrangements with an indication of the time horizon for implementation (short, medium and long-term) and main implementing agencies. The implementation plan defines proposed lead organizations and key supporting actors that should be actively engaged in these activities. This prosed plan is meant to guide and ensure implementation of the strategic directions and describe how, when, by whom, and to what cost the different components of the strategy can be implemented. However, the plan is subject to changes upon final negotiations among the involved actors.

6.2 Phasing of Strategic Actions

The Buzi JIWRM Strategy and implementation plan covers the period 2013 - 2030.

The implementation plan takes the different SAPs, and prioritizes them time-wise. It categorizes the SAPs in initiatives that need to be undertaken in the short-term (0-2 years), medium-term (3-10 years) and long-term (10-15 years).

Table 6-1 illustrates the scheduled implementation of the SAPs.

Table 6-1: Phasing of Strategic Action Projects

Challenge	Strategic Area	Action	Time Frame		
			Short Term (0-2 years)	Medium Term (3-10 years)	Long Term (10-20 years)
Meeting Water Demand	Coordinated Water Infrastructure Development	**Component 1.1: Major dam and hydro-power projects**			
		SAP 1.1.1: Mirror Dam	x		
		SAP 1.1.2: Tsate Hydropower Project	x	x	
		SAP 1.1.3: Muenezi hydropower project	x	x	
		SAP 1.1.4: Lucite/Cintura Multipurpose Project		x	x
		SAP 1.1.5: Buzi/Miracuene Multipurpose Project		x	x
		Component 1.2: Small and medium infrastructure projects			
		SAP 1.2.1: Small and medium dams and weirs		x	x
		SAP 1.2.2: Assessment and development of the Dombe Alluvial aquifer		x	
		Component 1.3: Mobilisation of investment funding			
		SAP 1.3.1: Development funding mechanisms and piloting		x	
Maintain WQ and Environmental Health	Cross-sectoral Environmental Actions	**Component 2.1: River Protection**			
		SAP 2.1.1: Pollution control structures		x	
		SAP 2.1.2: River Protection		x	
		Component 2.2: Water Quality Management			
		SAP 2.2.1: Environmental flow study	x		

		SAP 2.2.2: Water quality management plans	x	x	
Reduce Vulnerability	Climate Change and Disaster Management	**Component 3.1: Disaster Management**			
		SAP 3.1.1: Disaster Management Plan	x	x	
		SAP 3.1.2: Flood control structures		x	x
		Component3.2: Climate Change Management			
		SAP 3.2.1: Climate change adaptation strategy	x		
Efficient Water Governance	Institutional Consolidation and Strengthening	**Component 4.1 Institutional Management Framework**			
		SAP 4.1.1: Establishment of JWC Secretariat	x	x	
		SAP 4.1.2: Institutional consolidation, Zimbabwe	x	x	
		SAP 4.1.3: Institutional consolidation, Mozambique	x	x	
		SAP 4.1.4: Legal review and enforcement	x		
		Component 4.2: Water Resources Management			
		SAP 4.2.1: Water use management system	x		
		SAP 4.2.2: Pollution management system		x	
		SAP 4.2.3: Enhanced Knowledge and Information Management Phase II	x	x	
		SAP 4.2.4: Sub-basin plans		x	
		SAP 4.2.5: Groundwater management strategy		x	
		Component 4.3: Stakeholder Participation and Cross-Sectoral Coordination			
		SAP 4.3.1: Technical support to stakeholder organisations	x	x	
		SAP 4.3.2: Community Basin Management Projects		x	
		SAP 4.3.3: River awareness kit	x	x	

6.3 Financing Arrangements

6.3.1 Estimated budget

The total cost of the defined SAPs amounts to roughly 400 MUSD. This is the cost for strategic actions deemed important to advance water resources management including infrastructure development, water resources protection and transboundary cooperation. The foreseen coordinated infrastructure development represents 92% of the estimated budget and comprises budgets for feasibility studies, environmental mitigation and resettlement costs as well as investments costs. As illustrated in Figure 6-2, the estimated budget for infrastructure development in Mozambique is larger than in Zimbabwe. The reason is the anticipated large scale dam and hydro-power projects on the Mozambican side. The Mozambican territory covers the 87% of the basin area.

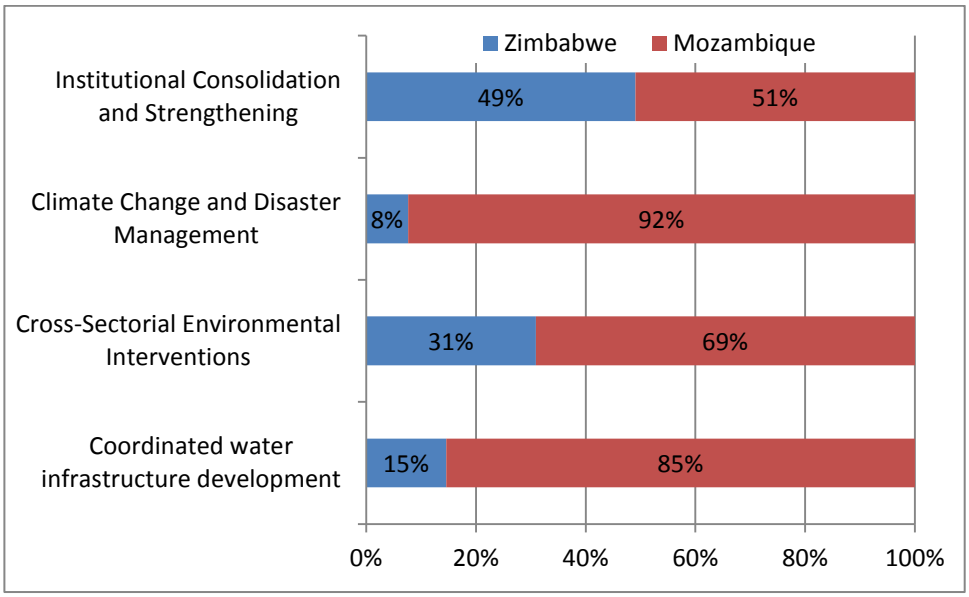

Figure 6-2: Division of budget between action areas and countries

Table 6-2 provides a detailed presentation of the budget and its various elements.

Table 6-2: Buzi JIWRM Strategy Total Budget (kUSD)

Action Area	Tot	Zw	Mz	%Zw	%Mz
Coordinated water infrastructure development	380 200	55 400	324 800	15%	85%
Cross-Sectorial Environmental Interventions	11 000	3 400	7 600	31%	69%
Climate Change and Disaster Management	5 900	450	5 450	8%	92%
Institutional Consolidation and Strengthening	16 300	8 000	8 300	6	51%
Component					
1.1: Major dam and hydro-power projects	328 300	35 000	293 300	11%	89%
1.2: Small and medium infrastructure projects	51 400	20 200	31 200	39%	61%
1.3: Mobilisation of investment funding	500	200	300	40%	60%
2.1: River Protection	10 400	3 100	7 300	30%	70%
2.2: Water Quality Management	600	300	300	50%	50%
3.1: Disaster Management	5 500	250	5 250	5%	95%
3.2: Climate Change Management	400	200	200	50%	50%
4.1 Institutional Management Framework	2 900	1 450	1 450	50%	50%
4.2: Water Resources Management	2 900	1 300	1 600	45%	55%
4.3: Stakeholder Participation	10 500	5 250	5 250	50%	50%

6.3.2 Financing sources

The strategic objectives of the defined financing arrangements are to:

- Ensure funding is available for infrastructure investments as well as for programmes such as water use/demand management (WDM) and conservation, information management, skills development and effective planning.
- Ensure access to water by the timely conversion of options into actions through effective proactive organizing, financing and implementation strategies. This encompasses studying and planning potential joint actions and investments.
- Proactively guide the allocation of financial resources so that sufficient resources are dedicated to achieving priority outcomes.

The development of the Basin will require accelerated investments in water infrastructure over the coming decades. Ideally these investments will be made jointly between the public and the private sector. The reason being that the private sector has not only the financial means but also the expertise required to realise water infrastructure projects. Apart from shouldering part of the investment costs, the private sector can be involved with planning activities and technological innovations.

In parallel with mobilisation of governmental and external funding for the required infrastructure development, it is therefore recommended to continue promoting public-private partnerships (PPPs) by intensifying investment promotion and marketing oriented functions and to facilitate the institutionalisation of PPPs through pilot projects.

In this respect, it will be necessary for the regional water authorities to keep abreast with regional learning processes in order to gain knowledge on suitable PPP mechanisms.

In order to successfully drive and implement PPPs, it is a necessity for the national and basin water authorities to play a strong role in taking investment opportunities for the private sector from identification phase to bankable projects and to interact with a wide range of actors. ZINWA, in Zimbabwe and DNA/ ARA-Centro may need further support in this field.

In this context, it should be noted that the international community has realised the need to bridge the capacity gap for taking investment opportunities for the private sector from identification phase to bankable projects in emerging economies. In response to this identified gap, members of the international community have established the Private Infrastructure Development Group (PIDG). The PIDG is a coalition of nine development agencies and operates through seven specialized financing and project development facilities that partner with the private sector with a focus on emerging Africa and Asia. In the first ten years, from 2002 to 2012, funds committed by PIDG have exceeded $1bn for more than 130 projects. Projects facilitated and financed cover several sectors and sizes and includes the hydropower, water and sanitation and irrigation sectors. There are facilities for both the private and the public sectors to access support, e.g. in feasibility phases and know-how,e.g. fiscal and legislative aspects at governmental level to go from identification of opportunity to implementation and running in the form of concessions or similar.

There is an evident opportunity to tap in to these financing and supporting facilities. Further information is provided at the PIDG web-page www.pidg.org.

Also recommended is performing an evaluation of the potential for the hydropower projects to generate carbon emission reductions (CERs) for possible sale on the international market for carbon, which in case of both Mozambique and Zimbabwe is the Clean Development Mechanism (CDM). The evaluation would assess the degree of additionally to the project's emission reductions relative to a preliminary project baseline, estimate the volume of CERs generated by each project, and identify potential buyers of resulting CERs.

The JIWRM Strategy comprises actions to introduce new financing concepts, as those discussed above.

Finance from the public sector will naturally be required as the financial base for accelerating coordinated investments. This requires appropriate tariff setting and enforcement, effective and long-term financial planning as well as business and project viability. An important step is the integration of the basin plans in the regional/provincial and national planning documents in order to ensure timely financing of the actions.

Apart from the aforementioned sources of finance, support from the so-called international financing institutions (IFIs) will be necessary in order to accelerate the investment ratio. In this respect it should be noted, that some projects already have funding e.g. feasibility study of the Tsate Hydropower Project from the Swedish government. In summary, it can be concluded that there are several initiatives ongoing in the Buzi River Basin that are closely related to central aspects of the JIWRM Strategy. The JWC and later the Secretariat would be the natural hub for coordination and mobilization of funds.

Costs for operation and maintenance of water infrastructure are to be covered by revenue generated by the basin water authorities

Essentially regular operation costs of basin water authorities are currently based on three sources of revenue – tariffs, taxes and transfers from central government. The Buzi JIWRM Strategy comprises actions to increase the financial income from tariffs and taxes. Still, the Buzi Strategy process as

well as previous and parallel studies, indicate that these financial resources will be insufficient to meet the requirements to comply with mandated functions for a longer period of time. This implies that the basin water authorities will continue to be dependent on financial support from the central government and/or from other external sources.

It should be emphasised that the costs indicated in the Buzi JIWRM Strategy framework are related to the implementation phases and investment costs. Operation and maintenance costs and regular activities of the basin water authorities to uphold and sustain the strategic actions are the responsibility of the regular staff and should be covered by the budgets of the designated authorities.

The most relevant funding sources for each SAP are listed in Table 6-3.

Table 6-3: Potential funding sources per strategic action

Challenge	Strategic Area	Action	Funding Sources
Meeting Water Demand	Coordinated Water Infrastructure Development	**Component 1.1: Major dam and hydro-power projects**	
		SAP 1.1.1: Mirror Dam	Central Government External Funding / coordination with parallel projects Alternative funding sources e.g. PPP
		SAP 1.1.2: Tsate Hydropower Project	Central Government External Funding - Swedish Government for the Feasibility Study Alternative funding sources e.g. PPP, CDM
		SAP 1.1.3: Muenezi hydropower project	Central Government External Funding / coordination with parallel projects Alternative funding sources e.g. PPP, CDM
		SAP 1.1.4: Lucite/Cintura Multipurpose Project	Central Government External Funding / coordination with parallel projects Alternative funding sources e.g. PPP, CDM
		SAP 1.1.5: Buzi/Miracuene Multipurpose Project	Central Government External Funding / coordination with parallel projects Alternative funding sources e.g. PPP, CDM
		Component 1.2: Small and medium infrastructure projects	
		SAP 1.2.1: Small and medium dams and weirs	Central Government and Local Authorities External Funding / coordination with parallel projects Alternative funding sources e.g. PPP

		SAP 1.2.2: Assessment and development of the Dombe Alluvial aquifer	Central Government and Local Authorities External Funding / coordination with parallel projects
		Component 1.3: Mobilisation of investment funding	
		SAP 1.3.1: Development funding mechanisms and piloting	Central Government External Funding Alternative funding sources e.g. PPP
Maintain WQ and Environmental Health	Cross-sectoral Environmental Actions	**Component 2.1: River Protection**	
		SAP 2.1.1: Pollution control structures	Central Government and Local Authorities External Funding / coordination with parallel projects
		SAP 2.1.2: River Protection	Central Government and Local Authorities External Funding / coordination with parallel projects
		Component 2.2: Water Quality Management	
		SAP 2.2.1: Environmental flow study	Central Government External Funding
		SAP 2.2.2: Water quality management plans	Central Government External Funding
Reduce Vulnerability	Climate Change and Disaster Management	**Component 3.1: Disaster Management**	
		SAP 3.1.1: Disaster Management Plan	Central Government External Funding
		SAP 3.1.2: Flood control structures	Central Government External Funding
		Component3.2: Climate Change Management	
		SAP 3.2.1: Climate change adaptation strategy	Central Government External Funding

The operationalization of the JWC will require long term commitments on equal contributions from the riparian countries, Mozambique and Tanzania but will also depend on external funding. The remaining institutional SAPs will depend on funding from the central government and external sources.

6.4 Monitoring and evaluation framework

In programmes and projects, M&E is a key management and steering tool which enables the measurement and evaluation of the performances of the actions undertaken to achieve the objectives and targets. M&E is also important from accountability and bench-marking perspectives. M&E includes the collection, processing, analysis, assessment and dissemination of information.

An M&E mechanism, especially of a complex programme such as the Buzi JIWRM Strategy, is a system involving several levels of management and coordination in different environments.

As mentioned previously the JWC, through its national organs and later the Secretariat, will have the responsibility to monitor the implementation of the Buzi Joint IWRM Strategy, which would be carried out in accordance with the agreed work plan and defined indicators.

There is currently a strong effort in both Mozambique and Zimbabwe to advance water management through the application of the TWM/IWRM principles in accordance with international conventions and regional directives as is reflected in this JIWRM Strategy. The Monograph phase assessed the current performance of joint and integrated river basin management by the application of a set of quantifiable performance indicators. The review showed that practical implementation of TWM/IWRM is still a challenge. The TWM/IWRM review indicators (detailed in Appendix 2) and collected baseline data will constitute a basis for the M&E Framework of the Buzi JIWRM Strategy.

The indicators are divided into three categories, specifically:

- IWRM Outcome Indicators
- Performance indicators for Transboundary Water Management (TWM)
- Performance indicators for basin water authorities

IWRM Outcome Indicators

Success in TWM/IWRM must ultimately be measured by improvements on the ground. IWRM objectives relates closely to progress in achieving other national goals as stated in e.g. Poverty Reduction Strategy Papers (PRSPs). It should be noted though that the progress in achieving set targets is attributed the combined synergy effect of a broad range of national actions of which IWRM implementation is one of the prerequisites.

The M&E framework comprises indicators divided under four objective areas:

- Water for meeting basic needs (domestic use and food security);
- Water for vital ecosystems and sustained ecosystem services;
- Water for socio-economic development (agriculture, energy and industry); and
- Reduced water-related vulnerability (extreme water related events and climate variability).

Under each objective area, indictors have been defined. Examples of measurable indicators are:

- proportion of total water resources used;
- balance of use between states;
- water efficiency index for major sectors; and
- economic impact of flooding and drought.

As an illustration, the applied indicators and obtained baseline values on IWRM outcomes indicate that increased investment in water infrastructure and improved efficiency of water resources management in the Buzi River Basin would be essential to make further progress towards the desirable outcomes of a healthy river basin system and optimal, sustainable and equitable use/access of the basin's water resources.

Performance indicators for Transboundary Water Management (TWM)

Mozambique and Zimbabwe are parties of the SADC Protocol on Shared Watercourses. To this end, the Buzi TWM performance indicators should give an indication of the degree of implementation with regard to the SADC Protocol on Shared Watercourses. Pertinent to the transboundary dimension, the indicators thus relate to the capacity to deal with general transboundary management functions, including:

- observation of the principles of unity and coherence of the river basin, cooperation, precaution and prevention;
- participation in joint studies on shared river basins as the basis for negotiations on agreements;
- development of comprehensive agreements for shared river basins, following the orientations of the SADC Protocol and monitoring enforcement of the agreements;
- development and implementation of joint initiatives;
- information exchange mechanisms, compatibility of technologies and procedures for collection and management of information;
- participation in joint shared river basin management institutions and assurance of their technical and financial sustainability;
- harmonisation of national policy and legal framework; and
- compliance monitoring.

With regards to the base-line situation it can be concluded that the enabling transboundary governance framework is in place in terms of international (general) agreements and institutions. The progress towards the strengthening and operationalization of current TWM will be monitored through the application of defined indictors presented in Appendix 2.

Performance indicators for basin water authorities

These performance indicators are directly linked to the mandated functions of the ARA-Centro and ZINWA-Save and indicate degree of institutional establishment, capacity and service efficiency. The indicators furthermore give an indication of the level of IWRM implementation in practice compared to policies i.e. the SADC Regional Water Policy and national water policies.

In this respect the indicators relate to the general core functions of national basin authorities, notably:

- water allocation;
- pollution control;
- basin planning;
- monitoring;
- information management;

- economic and financial management;
- stakeholder participation; and
- flood and drought management.

In addition, specific indicators have been defined to monitor performance related to cross-cutting aspects notably, HIV/AIDS, gender and poverty.

The plan will be subject to comprehensive reviews on a regular basis i.e. every five years, in order to take into account progress and experiences of each five-year period. Development of shorter term “operational plans” is moreover recommended to be developed every five years period.

6.5 Communication and Advocacy Arrangements

Effective communication and advocacy of the JIWRM Strategy is instrumental in ensuring that the strategies and SAPs as well as their rational are understood and accepted, as a mean to facilitate practical implementation.

The strategic objectives for the communication and advocacy framework are:

- put in place an effective communications operational framework;
- encourage dialogue among stakeholders at all levels; and
- ensure timely dissemination of strategies and guidelines at all levels.

Specific communication tools will be used to reach each target group. In this respect, the identified key target groups for the Buzi JIWRM Strategy are:

- SADC - The rationales to target this level are regional coordination at policy and legal level and coordination of large scale benefit sharing interventions, especially in the energy and agricultural sectors.
- Public at large - The rational is to benefit from people/actors who have special interest in the region, be it investors, researchers, and/or developing partners.
- Basin stakeholders including local government – Active participation of the people living in the basin and cross-sectoral involvement are pivotal factors for successful implementation of IWRM.
- National Water Sector - The rational is “internal” awareness creation in order to ensure that the transboundary IWRM strategy is mainstreamed into national and sub-basin strategies, planning documents and management systems.

Most of the communication mechanisms to be applied are inbuilt in the Buzi JIWRM Strategy Action Projects (SAPs). This approach has been selected to facilitate operationalization of the communication framework.

Established communications mechanisms for enhancing the awareness and consensus on the Buzi JIWRM Strategy as the key guiding document are:

- Communication and advocacy of the Buzi JIWRM Strategy and coordination with SADC and development partners are proposed as key functions of an operational JWC (SAP 4.1.1)
- Development of the river awareness kit for the general public (SAP 4.3.3)

- Utilisation of efficient communication tools for outreach to basin stakeholders e.g. radio broadcasting and information packages (e.g. SAP 4.2.1 and 4.3.1)
- Support to inter-ministerial coordination (SAPs 4.1.2 and 4.1.3)
- Institutional training and strengthening programmes (SAPs 4.1.2 and 4.1.3)
- Implementation of Community Basin Management Projects (CBMPs) to support awareness creation through “learning by doing” by implementation of demonstration projects on the ground (SAP 4.3.2).

7 BIBLIOGRAPHY

CAP-NET, UNDP, Integrated Water Resources for River Basin Organisations. June 2008

Central Statistical Office, 2002. Provincial Profile: Manicaland Province. CSO, Harare, Zimbabwe.

COBA, 1982. Avaliação do Potencial de Desenvolvimento e Aproveitamento dos Recursos Hidráulicos da Bacia Hidrográfica do Rio Buzi. DNA, Maputo

Consultec, April 2012. Pungwe Basin Transboundary Integrated Water Resources Management And Development Programme (PP2). Preparation of a Business Plan for ARA-Centro. Final Report – Mai Report. Government of Mozambique, 2007. The revised National Water Policy. Ministry of Public Works and Housing.

Government of Mozambique, 2007. The National Water Resources Management Strategy. Ministry of Public Works and Housing.

Government of Mozambique, 1998. National Tariff Policy. National Directorate of Water, Ministry of Public Works and Housing. .

Government of Mozambique 1991. National Water Law, Lei No. 16/91. National Directorate of Water, Maputo.

Government of Mozambique October 2010. Strategic Plan for Agricultural Development (PEDSA) 2010-2019. Ministry of Agriculture.

Government of Mozambique June 2012. Tender Dossier Procurement Of Tehcnical Consultancy Services For The Feasibility Study Of The Revue River Basin - The Tsate Hydropower Project. EdM Ministry of Electricity (Electricidade De Moçambique, E.P).

Government of Zimbabwe, 2002. Environmental Management Act [Chapter 20:27] of 2002. Government Printers, Harare, Zimbabwe

Government of Zimbabwe.1998. Water Act (Chap 20:24). Government Printers, Harare, Zimbabwe

Government of Zimbabwe, 1998. Zimbabwe National Water Authority Act (Chapter 20:25). Government Printers, Harare, Zimbabwe.

Government of Zimbabwe 1999. WRMS Secretariat (circa 1999, undated). Towards Integrated Water Resources Management: Water Resources Management Strategy for Zimbabwe, WRMS Secretariat, Government of Zimbabwe.

Government of Zimbabwe (undated). Operational Manual, Management of Flooding Emergencies in Zimbabwe.

Government of Zimbabwe (2004). Framework and guidelines for A National Policy on Drought Management. United Nations Office for Project Services, UNDP

INGC, May 2009, Hydrology and River Basin Analysis, Climate Change Report, Climate Change on Disaster Risk in Mozambique: Synthesis Report, National Institute for Disaster management (INGC), ed. By van Logchem B and Brito. R.

INE – National Institute of Statistics. 2010. Population census 2007. Maputo, Mozambique

International Monetary Fund, 2011. Republic of Mozambique National Poverty Reduction Plan. IMF Country Report No. 11/132. June 2011.

K. Nhundu1, C. Gwata and A. Mushunje 2010. Impacts of Zimbabwe European Union micro-project programme in funding smallholder irrigation projects on food security and income levels: A case study of Mopane irrigation scheme in Zvishavane, Midlands province, Zimbabwe. African Journal of Agricultural Research Vol. 5(14), pp. 1759-1771, ISSN 1991-637X ©2010 Academic Journals, South Africa 2010.

Lázaro, (1997) APROVEITAMENTO DOS RECURSOS HIDRÁULICOS DOS RIOS PUNGOÉ E BÚZI by Dália Lázaro.

Madamombe E.K. (2004). Integrated Flood Management: Case Study Zimbabwe: Flood

Management Practices – Selected flood prone areas Zambezi Basin. World Meteorological Organisation and Global Water Partnership.

Manica Provincial Government, 2011. Manica Provincial Development Strategy 2011-2015

National Directorate of Water, 2005: Draft National Water Law, (proposed revision)

NORCONSULT, Mozambique Power Studies – Rural Electrification in Niassa – Mbahu Hydropower Project Technical Review, Volume 1A, Report for Electricidade de Moçambique, August 1988

NORCONSULT AS, "Generation Master Plan For The Mozambican Power Sector", Report for the Ministry of Energy of the Republic of Mozambique, July 2009

Norconsult and Vattenfall, Mozambique Regional Transmission Backbone Project, Final Draft Report for Electricidade de Moçambique, September 2011

OECD 2011. African Economic Outlook 2011. OECD Publishing (OECD Development Centre). ISBN: 9789264111752. 16 Jun 2011.

PASS 2003. Poverty Assessment Study Surveys (PASS) by Ministry of Public Service Labour and Social Welfare. Zimbabwe..

SADC Revised Protocol on Shared Watercourses (2000)

SADC Regional Water Policy (2005)

SADC Regional Strategic Action Plan on Integrated Water Resources Development and Management (2005- 2010)

Sofala Provincial Government, 2008. Sofala Provincial Development Strategy 2008-2017

Sweco, 2005. The Pungwe River Basin Joint Integrated Water Resources Management and Development Strategy. Phase II Pungwe River Basin Development Scenario. December 2005.

Sweco, 2006. The Pungwe River Basin Joint Integrated Water Resources Management and Development Strategy. November 2006

Sweco, August 2009 Final Report: PP2 Monitoring Mission Report - Poverty, Cross-cutting, Sustainability and Monitoring Framework. Swedish International Development Cooperation Agency (Sida).

Sweco October 2011. Development of the Buzi River Basin Monograph and Joint Integrated Water Resources Management Strategy, Buzi Monograph Main Report.

Sweco, 2012 Pungwe Basin Transboundary Integrated Water Resources Management and Development Programme (PP2). Flood & Drought Management Strategy.

UNESCO IHE, December2007. Evaluation of Sector Approaches in the Water Sector Country Report, Mozambique.

World Bank. 2002. China Water Resources Assistance Strategy.

World Bank, AFTWR, August 2007. Mozambique Country Water Resources Assistance Strategy: Making Water Work for Sustainable Growth and Poverty Reduction.

ZINWA, 2009. 'Draft Save River System Outline Plan'; ZINWA Save/Save Catchment Council, 2009. Mutare

APPENDICES

Appendix I: Description of Strategic Action Projects

Action Area 1: Infrastructure Development

Challenge area: Sustainable use and assurance of water supply to key water using sectors

Strategic Area: Coordinated water infrastructure development

Priority measures:

The coordinated infrastructure development projects include six categories:

1. Dam projects for water supply, irrigation, and hydropower – including small and medium dams and off-river projects for water supply, irrigation, and hydropower
2. Flood control structures other than dams
3. Pollution control structures
4. Ground water development
5. Mobilisation of investment funding

Component 1.1: Major dam and hydropower projects

The strategic objectives are to develop the storage capacity and guarantee the supply to the priority users and to promote renewable energy through increasing the production of hydropower in the basin. This objective will be achieved in coordination with the provincial authorities in Zimbabwe and Mozambique and the private sector,

On the basis of the technical, economic, environmental and social screening, all identified dam projects remain interesting alternatives. The priority projects for urgent implementation are Mirror Dam in Zimbabwe, and Tsate Dam in Mozambique.

A design report for the Mirror was prepared 1991. A feasibility study of the Tsate Hydropower Project was initiated during 2012. For the Muenezi, Lucite/Cintura and Buzi/Miracuene projects, it is desirable to make further project investigations in two separate and distinct steps, pre-feasibility study and feasibility study.

Currently, there is no observed river flow data from both Buzi and Lucite Rivers at or near the dam sites. Therefore, data collection on the flow characteristics is urgent and its implication for further investigation is extremely crucial.

The feasibility studies and detailed designs including the compensation survey can be undertaken in parallel for the identified multipurpose projects. However, the construction phase can be implemented in sub-phases, starting with the Lucite Multipurpose Project.

Name of SAP	**SAP 1.1.1: Mirror Dam**
Location	Zimbabwe
River basin:	Budzi sub-catchment in sub-zone FB.
Main Purpose:	To supply water for domestic and industrial supply of the Chipinge town
Secondary Purposes:	To supply water for irrigation of tea and coffee
Approximate size (km^2) and volume (Mega m^3):	Inundation area: 2 km^2 Full Supply Volume: 22.9 Mm^3
Approximate Costs:	35 million USD
Time frame:	2 years starting in 2014
Existing design basis	Detailed Design level. No geotechnical investigations have been prepared.
Considerations:	**Infrastructure considerations**: • The farm areas are located up-stream of the dam and pumping would be necessary, should the water be used for irrigation. • The estimated cost and resulting unit cost per m^3 water is estimated to be higher than average because of the topography, geology and soil characteristics at site are not the most optimal for earth dams. **Environmental and social considerations**: • The dam is very important to supply primary users **Local and Regional Relevance:** Local high relevance. In 2010, the rationed supply to Chipinge is approximately 2.1 Mm3/year. This can be compared against an unrestricted projected demand of 3 Mm3/year in 2010 and 9.6 Mm3/year in 2030.

Name of SAP	**SAP 1.1.2: Tsate Hydropower Project**
Location	Mozambique
River basin:	Revue River
Main Purpose:	Hydropower
Secondary Purposes:	
Approximate size (km^2), volume (Mega m^3) and installed capacity (MW):	Estimated storage volume: 30-40 Mm^3 Installed capacity: 50 MW
Approximate Costs:	136.6 M USD
Time frame:	Feasibility level 2012-2013. Construction 3 years starting in 2016
Existing design basis	Feasibility study initiated 2012.
Considerations:	**Environmental and social considerations**: • Good power to environmental ratio. No significant impact on natural resources and river flow. • Unlikely that resettlement will be required. **Local and Regional Relevance:** EDM does have two hydro-power stations and the water rights from 650 to 100 m.a.s.l on the River Revue and an obvious interest in maximising the return from these assets. Sustainable and reliable hydropower production is crucial for EDM to provide power for the development of the Mozambican economy and welfare to the society in general. Access to modern and renewable energy to increase country's electrification is one of the means to create better living conditions and alleviate poverty in Mozambique. Furthermore Southern Africa is experiencing supply problems with the biggest economy in Africa – South Africa – presently suffering from rolling black-outs and thus it is obvious that a prudent utility in the region needs to study supply security issues in detail. Already a considerable number of investments (national and international) in such areas as agriculture, agro – industrial projects, mining, heavy sands, smelters, and others are on standby due to the inability of EDM to guarantee supplies. (Tender Dossier, Tsate HPP, EDM and Sida. 2012).

Name of SAP	**SAP 1.1.3: Muenezi Hydropower Project**
Location	Mozambique
River basin:	Revue River
Main Purpose:	Hydropower
Secondary Purposes:	Flood control
Approximate size (km^2) and volume (Mega m^3):	Estimated storage volume: 60-100 Mm^3 Installed capacity: 21 MW
Approximate Costs:	55.7 MUSD
Time frame:	Feasibility level 2015. Construction 3 years starting in 2018
Existing design basis	Previous studies include Hidrotécnica Portuguesa ("HP") 1957, COBA 1980, Lazaro 1997
Considerations:	**Environmental and social considerations**: • Compared to Tsate, Muenezi is considered to have a poorer power to environmental ratio because of relativity lower installed capacity and larger impact on river flow and natural resources. • Unlikely that resettlement will be required. **Local and Regional Relevance:** See Tsate Hydropower Project.

Name of SAP	**SAP 1.1.4: Lucite/Cintura Multipurpose Project**
Location	Mozambique
River basin:	Lucite River
Main Purpose:	Irrigation
Secondary Purposes:	Hydropower and flood control
Approximate size (km^2), volume (Mega m^3) and installed capacity (MW):	Inundated area: 30 km^2 Estimated storage volume: 722 Mm^3 Installed capacity: 14.5 MW
Approximate Costs:	53.3 MUSD
Time frame:	5 years for pre-construction activities 2015-2020. 10 years for construction activities 2020-2030.
Existing design basis	COBA 1980, Lazaro 1997. No geotechnical investigations have been undertaken
Considerations:	**Infrastructure considerations**: • There is no observed river flow data from both Buzi and Lucite Rivers at or near the dam sites. Therefore, data collection on the flow characteristics is urgent. **Environmental and social considerations**: • Relatively poor power to environmental ratio because of some loss in natural resources, livelihoods and change in hydrology • Some resettlement will be required at both sites. No major populated areas are located within the reservoir areas however a number of dwellings exist. **Local and Regional Relevance:** Water for planned irrigation schemes has a high local relevance. Water for hydropower has a high relevance both locally and regionally. See Tsate Hydropower Project. Flood control adds value to the project.

Name of SAP	**SAP 1.1.5: Buzi/Miracuene Multipurpose Project**
Location	Mozambique
River basin:	Buzi River
Main Purpose:	Hydropower
Secondary Purposes:	Irrigation and flood control
Approximate size (km^2) , volume (Mega m^3) and installed capacity (MW):	Inundated area: 70 km^2 Estimated Storage volume: 842 Mm^3 Installed capacity: 21 MW
Approximate Costs:	47.7 MUSD
Time frame:	5 years for pre-construction activities 2015-2020. 10 years for construction activities 2020-2030.
Existing design basis	COBA 1980, Lazaro 1997. No geotechnical investigations have been undertaken
Considerations:	**Infrastructure considerations**: • There is no observed river flow data from both Buzi and Lucite Rivers at or near the dam sites. Therefore, data collection on the flow characteristics is urgent. **Environmental and social considerations**: • Relatively poor power to environmental ratio because of some loss in natural resources, livelihoods and change in hydrology • Some resettlement will be required at both sites. No major populated areas are located within the reservoir areas however a number of dwellings exist. **Local and Regional Relevance:** Water for hydropower has a high relevance both locally and regionally. See Tsate Hydropower Project. Flood control adds value to the project.

Component 1.2: Small and medium infrastructure projects

Small and medium dams and weirs

The specific objective of this critical development project is to identify, assess and prioritise small and medium-sized dams for future development and to implement priority projects.

By constructing small farm dams in the Buzi Basin, a better distribution can be achieved over the year, which would ensure an effective utilisation of the considerable surplus of water. As there are large areas with suitable soils, such surplus water resources could be used for irrigation purposes.

It should be noted that there is an increasing tendency towards stream-bank cultivation with destructive consequences for aquatic habitats, soil erosion and pollution of aquatic systems. The development of small dams and weirs to expand gravity-fed irrigation upstream, and small irrigation dams further from river banks, could reduce stream-bank cultivation while improving water and land use practices more generally. A detailed review at the local level and a strategy for improving the situation is believed to be useful on both sides of the border within the basin area.

Additional storage is required in the Zimbabwe portion of the catchment. A list of proposed dams is available and is a good starting point. Similarly, in Mozambique, the Manica Provincial Strategy plans to rehabilitate and construct small dams in all districts for water supply to people, industry and irrigation. On the Mozambican side of the basin, a large number of small dams were built prior to the 1970s however many of those have been flushed away or are degraded due to age. Many of the dams are consequently no longer safe and fit for the purpose. An inventory of small dams on the Mozambican side of the basin is needed.

In summary, the development and rehabilitation of small and medium-sized dams in the Buzi River Basin is important for several reasons, including: providing reliable irrigation water to support expanding small- and medium-scale commercial agriculture, including livestock watering; guarding against droughts and supporting food security amongst subsistence farmers; ensuring adequate water supply to small towns where existing supplies have reached or are due to reach their limits; facilitating the supply of hydroelectric power to small towns and growth points; and generally developing storage capacity and regularising water use in the basin.

The Small and Medium Dam Development Strategy for the Buzi River Basin will identify potential dam sites, existing dams and runoff-abstraction points and design a clear strategy for small and medium dam development/rehabilitation together with relevant stakeholders. The second phase aims at actual rehabilitation of existing dams and the construction of new small to medium dams; weir and hydropower projects as indicated by the strategy produced in phase one. This phase will involve feasibility studies, detail design studies and construction and/or rehabilitation of around 10 small and two medium dams in the Buzi River Basin, or as indicated by the small and medium dam strategy.

Name of SAP	**SAP 1.2.1: Small and medium dams and weirs**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	Local water supply
Secondary Purposes:	
Approximate size (km^2) , volume (Mega m^3) and installed capacity (MW):	Small dams up to 1 Mm^3 Medium dams up to 20 Mm^3
Approximate Costs:	Strategy phase: 0.4 MUSD Feasibility and construction phase: 50 MUSD
Time frame:	2015-2025
Existing design basis	Some site have been identified
Considerations:	**Infrastructure considerations**: **Environmental and social considerations**: EIA according to national legislation will be required **Local and Regional Relevance:** High local relevance for pro-poor development

Ground water development

The groundwater assessment undertaken during the monograph phase, although rudimentary, indicates that the aquifer in the Dombe area has potential for large scale abstraction. This Quaternary deposit is also delineated on the National Hydrogeological Map. It should thus be considered to conduct a groundwater resource assessment in this area to study the potential for conjunctive use of surface water/groundwater for supplementary irrigation.

Name of SAP	**SAP 1.2.2: Assessment and development of the Dombe Alluvial aquifer**
Location	Mozambique
River basin:	Buzi
Main Purpose:	Detailed assessment of groundwater potential of the Dombe alluvial aquifer. Aquifer parameters (recharge potential, sustainable aquifer yield, storage potential) to be derived from detailed field investigations, including exploratory drilling and test-pumping.
Approximate Costs:	1 million USD
Time frame:	2015-2020
Existing design basis	Not available
Considerations:	Surface-groundwater interaction, Conjunctive use of surface water/groundwater for large scale irrigation

Component 1.3: Mobilisation of investment funding

The development of the Basin will require substantial investments in water infrastructure over the coming decades, notably dams in Mozambique. Ideally these investments will be made jointly between the public and the private sector. The reason being that the private sector has not only the financial means but also the expertise required to realise water infrastructure projects. Apart from shouldering part of the investment costs, the private sector can be involved with planning activities and technological innovations. The specific objective is to promote new funding mechanisms and to facilitate the institutionalisation of these through pilot projects.

Name of SAP	**SAP 1.3.1: Development funding mechanisms and piloting**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	Increase funding for infrastructure development ▪ Investment Promotion (Build on existing investment initiatives) ▪ Development PPP mechanisms and pilots for local infrastructure co-financing
Description of action(s):	▪ Create awareness and consensus among line Ministries, private sector stakeholders and the water users about different options and modalities for Public Private Partnership (PPP) in Irrigation and drainage (I&D / water supply and sanitation (WSS) infrastructure management and development; assess the overall potential for improved and/or expanded I&D/WSS service delivery using a PPP approach; and describe the necessary actions for creating an enabling environment for PPP in the irrigation and water supply and sanitation sector; ▪ Prepare possible PPP transaction models to help the Governments of both countries engage the private sector in public water service provision. ▪ On the basis of agreed transaction models, prepare two PPP pilot operations in I&D / WSS for implementation. ▪ Prepare CDM projects i.e. prepare Project Idea Note (s) (PINs) for use in presenting the hydro-power projects to potential purchasers of the CERs resulting from each project. ▪ Overall strengthening of the financial systems regarding sourcing and disbursement of funds to projects.
Approximate cost:	500,000 USD
Time frame:	2015-2020
Considerations:	**Local and Regional Relevance:** High local relevance

Action Area 2: Cross-Sectoral Environmental Actions

Overall objective: A healthy, ecologically sustainable and protected water environment.

Challenge area: Ensure water quality and sustaining aquatic ecosystem health

Strategic area: Cross-Sectoral Environmental Actions

Priority measures:

There are two components within this field i.e. Component 2.1: River protection, and Component 2.2: Water quality management.

The actions linked to this field are planned to be initiated on a short and medium term planning horizon and require long term monitoring and follow up activities.

Component 2.1: River Protection

Strategic Objective: Addressing key causes of environmental degradation.

Strategic Actions:

- Pollution control of informal mining areas
- River protection

Pollution control of informal mining areas

Artisanal and small scale mining is causing extensive impacts on the river water quality in the upper Revue river system, down to the Chicamba dam. The Lucite River is similarly impacted by increased amounts of suspended matter which mainly derives from mining activities in the Zimbabwean parts of Chimanimani Hills. In mid-2010, this impact was noticeable at least 60 km downstream of the mining activities.

Impacts may include the contamination of water resources through the discharge of processing chemicals or waste into streams and rivers. Adequate storage and control of waste and tailings is therefore usually the most important construction at any mine site, with regards to preventing downstream environmental impacts. Further, impacts on water quality may be caused by the removal of vegetation, and opening up of new areas to erosion, which causes an increase in the sediment loading of downstream areas.

The objectives would be to assess the possibilities of constructing small siltation dams in the tributaries with extensive gold mining activities. If feasible, siltation dams would rapidly improve the water quality.

The main scope of work would be feasibility studies followed by design, construction and management of tailing dams. The first task would be to perform a feasibility survey of the Buzi basin area, to identify possible small dam sites, to conduct preliminary design of one or more settling or tailing dams, to estimate the cost to construct and operate these dams and also an analysis of the ownership of these dams as a legal body must be responsible for the dams e.g. mining association, local administration or the regional water authorities. The second part of the action project would be the design, construction and management of the tailing dams.

Name of SAP	**SAP 2.1.1: Pollution control structures**
Location	Zimbabwe and Mozambique
River basin:	Mainly in the Revue and Lucite Rivers (include Budzi and Odzi sub-catchments in Zimbabwe)
Main Purpose:	Reduce pollution through construction of tailing and sedimentation dams and rehabilitation of mining areas.
Project components:	Feasibility studies followed by design, construction and management of tailing and settling dams.
Approximate Costs:	Strategy phase, feasibility and construction phase: 10 M USD
Time frame:	2015-2020
Existing design basis	Not available
Considerations:	**Environmental and social considerations**: EIA according to national legislation will be required **Local and Regional Relevance:** High regional (down-stream) relevance

River protection

Deforestation and stream-bank cultivation with destructive consequences for aquatic habitats, soil erosion and pollution of aquatic systems is a problem. Reducing stream-bank cultivation and improving land use practices more generally is needed. A detailed review at the local level and a strategy for improving the situation is believed to be useful on both sides of the borders within the basin area.

The pressure on the protected and sensitive areas is thus increasing. Further conservation actions in protecting sensitive (Chimanimani and upper reaches of the Lucite river, upstream of the Chicamba dam, and the Buzi estuary) are needed to maintain the current aquatic ecosystem integrity of the river system.

A River Protection Strategy needs to be developed and implemented. This strategy must be centred on community mobilisation and participation. The problem is a multi-disciplinary problem and must be handled jointly between the Ministries of Water, Agriculture and Environment.

The actions aim to mitigate erosion and water quality deterioration in the basin by acquiring a better knowledge of the eroded areas and by implementing sustainable agricultural, forestry and mining practices. It is proposed to identify strategic actions on key issues at inter-ministerial level and with the full participation of stakeholders, specifically:

- To identify and prioritise priority erosion points in catchment areas through survey of catchment areas and mapping of erosion points;
- To identify conservation priorities and protection zoning;
- To identify strategic action for the informal/formal and large scale and small scale mining;
- To identify strategic actions to encourage the widespread use of sustainable agricultural practices in order to stem deforestation and soil loss associated with farming practices;
- To identify strategic actions for managing bush burning practices to limit erosion;
- To identify strategic actions for protected area management;
- To identify strategic actions for estuarine and coastal zone management especially since legislation is weak in this area;

- Integrate environmental concerns into river basin management and provincial planning; and
- Set up appropriate institutional structures and implement sub-catchment management, monitoring and enforcement.

Name of SAP	**SAP 2.1.2: River protection**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	The main objectives of this proposed action are: • Definition of water protection zones severely restricting developments of those areas for the protection of surface and ground water protections sources. For the Buzi River Basin, the initial recommendation is that protection zones are defined around the Chicamba dam; • Definition of priority areas where there is need for coordinated environmental management actions. For the Buzi River Basin, the initial recommendation is that conservation actions are needed in the following sensitive areas explicitly in the Chimanimani area and along the Lucite river, and at the Buzi estuary to maintain the current aquatic ecosystem integrity of the river system: • Budzi Sub-Catchment plan (water and environment) in Zimbabwe; and • Buzi basin plan (water and environment) integrated with district and provincial plans in Mozambique
Time frame:	3 years. 2015-2020
Cost:	400,000 USD
Considerations:	**Local and Regional Relevance:** High regional (down-stream) relevance

Component 2.2: Water Quality Management

Strategic Objective: Addressing key causes of environmental degradation.

Strategic Actions:

- Environmental flow requirements
- Water quality management plans

Environmental flow requirements

Challenge area: Ensure water quality and sustaining aquatic ecosystem health

Strategic objective: The protection of the biodiversity for the purpose of preserving the existing rich fauna and flora of the basin and to maintain good water quality. This preservation will be reached mainly by increasing the knowledge on current ecosystems and by developing suitable management packages.

Priority measure: Carry out a comprehensive, multidisciplinary environmental flow assessment for the three river systems, in order to determine the desired quantity and quality of freshwater flows.

The reason for calculating environmental flow requirements (EFR) as part of the Buzi River Basin strategy formulation process is to guide the water authorities in Mozambique and Zimbabwe for the future planning of water resources development in the Buzi River. Future plans do include a number of dam infrastructures and significantly increased water abstractions for mainly irrigation development. It is therefore essential for the water authorities to take the estimated EFR volumes

into account when agreeing on joint limits for future development based on water resources availability. Zimbabwe and Mozambique must therefore agree and jointly state in a bilateral agreement what EFR method should be applied and then adjust the future planned development in accordance in each country. The bilateral agreement shall thus include EFR as total volume of natural MAR to be reserved for environment at various development levels, nature of impacted environment and agreed border flows and outflow to the estuary to be ensured by the two countries.

The basis for such agreement will be provided by the EFR estimates in the Monograph phase and by the system analysis of the Buzi River Basin in the development scenario phase that tested the potential full development scenario with a 10% reserve for EFR.

The proposed objective of this strategic action would be to jointly agree on the guiding principles for flow requirements (quantity) and water quality standards (quality) necessary to achieve a desired state of health of aquatic ecosystems in order to meet biodiversity protection targets and maintain a desired level of output of ecosystem services, taking trade-offs (value of water use) into account. This would require some further studies at selected sites for determining site specific environmental flow requirements.

Name of SAP	**SAP 2.2.1: Environmental flow study**
Location	Zimbabwe and Mozambique i.e. the Buzi, Pungwe and Save River basins
Project components:	Carry out a comprehensive, multidisciplinary environmental flow assessment for the three river systems, in order to determine the desired quantity and quality of freshwater flows, based on: • Detailed ecological baseline studies at selected sites • Estimates of values of water use • Consultation with stakeholders
Time frame:	18 months. 2013-2015.
Cost:	300,000 USD

Water quality management plans

Challenge area: Ensure water quality and sustaining aquatic ecosystem health

Strategic objective: Maintain the quality of surface and groundwater supplies through improved water quality information and standards.

Priority measure:

Name of SAP	**SAP 2.2.2: Establish water quality management plan**
Location	Zimbabwe and Mozambique i.e. the Buzi, Pungwe and Save River basins
Project components:	▪ Establish baseline water quality conditions and determine deviation from natural conditions ▪ Develop water quality targets for fresh water bodies dependent on their potential use which take into account human health, and maintenance of biodiversity and ecosystem integrity, and undertake appropriate modelling to define detailed, spatially-explicit water quality requirements. ▪ Identify main threats to water quality and possible interventions to prevent the deterioration of water quality, based on a review of best practice. Such interventions could be regulatory measures or incentive measures. ▪ Develop water quality management plan ▪ Implement effective monitoring systems of water quality (in coordination with EKIS actions).
Time frame:	2013-2020. 2 years implementation and 2 years follow up activities
Cost:	300,000 USD

Action Area 3: Disaster Management and Climate Change

This component deals with vulnerability reduction actions other than infrastructure interventions.

Overall objective: Eliminate or reduce the human, material, social and economic impacts of floods, drought and climate change

Challenge area: Reduce water related vulnerability, notably food insecurity and floods and droughts

Strategic Area: Coordinated measures for climate change adaptation and disaster management

Priority Measures:

The measures aim at forecasting natural disasters and future climate change impacts and to implement procedures to reduce the impact of these risks on the local population by creating the River Basin population is moderately prone to disasters and climate changes impacts. The need to put robust systems in place is non-negotiable although it is not seen as a short term priority action.

Strategic Actions:

- Develop disaster management plans
- Develop climate change adaptation strategy

Component 3.1: Disaster Management

Disaster management plans

Challenge area: Reduce water related vulnerability, notably food insecurity and floods and droughts

This component deals with vulnerability reduction actions other than infrastructure interventions.

Overall objective: Eliminate or reduce the human, material, social and economic impacts of floods, drought and climate change

Priority Measures:

The strategic approach for joint water resources management for the Buzi as well as Pungwe and Save river systems is to increase the capacity of the water authorities to forecast, inform on and manage measures to alleviate impacts of water related disasters.

The disaster management plans would be developed with full participation of relevant institutes and must include the clarification of roles and management procedures.

The following action projects should be carried out in tandem with implementation of the recommended key components of the EKIS II (Hydro-Climatic Data Monitoring System and Data Management, Exchange and Decision Support).

Name of SAP	**SAP 3.1.1: Disaster Management plan**
Location	Zimbabwe and Mozambique i.e. the Buzi, Pungwe and Save River basins
Project components:	Three key flood management activities proposed to be undertaken are: • Flood mapping studies • Flood forecasting modelling • Development of flood management plans The proposed drought management strategic actions are: • Forecast modelling to enable long-term sensitivity forecast for drought warnings • Post-drought analysis • Establishment of drought management procedures that are coordinated with national rescue authorities. Protocols should be signed between involved institutions defining the responsibility of

	each one regarding data collection, management and dissemination during the dry season and during a drought at national and transboundary levels. • Drought Management Plans. The proposed actions related to accidental pollution are: • Mapping of pollution sources, risks and potential impact • Set-up effective and rapid notification and communication systems, including for accidental pollution • Prepare emergency action plans for accidental pollution
Time frame:	3 years. 2013-2020 (continuing on Pungwe Project Initiative)
Cost:	Total 1,300,000 USD. 800,000 USD for floods. 300,000 USD for droughts, 200,000 for accidental pollution.

Flood Control Structures

Strategic action: The proposed strategic actions include installation of infrastructure (i.e. regulating dams and dykes). Currently, protection dykes exist only for two cities at the banks of the Limpopo River and for large scale irrigation perimeters (Chokwe, Lower Limpopo and the sugar cane estates). The tasks encompass feasibility studies followed by design, construction and management of additional dykes.

Name of SAP	**SAP 3.1.2: Flood control structures**
Location	Mozambique
River basin:	Lower Buzi
Main Purpose:	The objective of the proposed SAP is to prevent and mitigate flood impacts through protection with dykes of urban settlements installed in the flood plains, adequate design of roads and bridges that cross the flood plains and other flood prone areas.
Project components:	Feasibility studies followed by design, construction and management of dykes.
Approximate Costs:	Strategy phase, feasibility and construction phase: 5 M USD
Time frame:	2015-2025
Existing design basis	Some sites have been identified
Considerations:	**Environmental and social considerations**: EIA according to national legislation will be required **Local and Regional Relevance:** High local relevance

Component 3.2: Climate change adaptation

Challenge area: Reduce water related vulnerability, notably food insecurity and floods and droughts

Overall objective: Eliminate or reduce the human, material, social and economic impacts of floods, drought and climate change

Strategic actions: Study climate change impacts on water resources and plan adaptation measures

The first step would be to take into account the potential effects of climate change on the Buzi river hydrology, and consequently water availability. A selection of the CORDEX downscaled projections would be used to derive future precipitation and temperature series that will be input to the hydrological model to project hydrological impacts for the Buzi River Basin. CORDEX is an ongoing research project called the Coordinated Regional Downscaling Experiment.

The second step would be to rerun the established water balance model (systems analysis) for the Buzi river basin with the updated data. This exercise would allow a sensitivity analysis of the development scenarios from a climate change point of view.

The updated data should be distributed to planners and developers as a way to provide expertise for local climate change planning to increase resilience to climate change.

Name of SAP	**SAP 3.2.1: Climate change adaptation strategy**
Location	Zimbabwe and Mozambique i.e. the Buzi, Pungwe and Save River basins
Project components:	Carry out a climate change sensitivity analysis of proposed development scenario, based on: • Updated hydrology assessment • Updated water demand • Updated WRYM • Plan of adaptation measures • Communication strategy
Time frame:	2 years starting 2015
Cost:	400,000 USD

Action Area 4: Institutional Consolidation and Strengthening

Challenge Area: Water Governance and IWRM Implementation

Strategic Action Area: Institutional Consolidation and Strengthening

The fourth category of actions are related to water management and institutional requirements coming about from the foreseen increased development as well as international and national obligations of the water authorities.

Overall objective: A committed and dedicated water sector, actively co-operating and contributing towards sustainable water management and associated outcomes

The specific objective is to enhance capacity at the national and regional level to address the challenges of water resources management in Zimbabwe and Mozambique and strengthen the institutional framework for water resources development.

Priority Measures:

- Institutional management framework
- Water resources management
- Promotion of stakeholder participation and cross-sectoral coordination

Component 4.1: Institutional management framework

Operationalization of JWC

Challenge area: Water governance and IWRM implementation, with special focus on the Transboundary Water Management (TWM) dimension.

Strategic objective: The general aim of this component is to provide the JWC, the DWR/ZINWA-Save and DNA/ARA-Centro with the legal and regulatory mechanisms they will need for effective implementation of international obligations.

Strategic action projects:

- Joint formulation and adoption of the Buzi, Pungwe and Save Bi-lateral comprehensive agreement
- Establishment of JWC Permanent Secretariat and Technical Committee

The first objective is to detail and operationalize the principles of the SADC revised protocol and the JWC Agreement by supporting the formulation of the Buzi, Pungwe and Save bi-lateral comprehensive agreement.

The Joint IWRM Strategies for Pungwe, Buzi and Save River Basins are to be implemented concurrently. This will need an efficient management structure. The second objective is thus to establish a JWC Permanent Secretariat and a Technical Committee to manage the three shared basins Pungwe, Buzi, and Save.

There should be adequate resources in terms of human resources, financial resources and equipment for the compliance and progress monitoring. Monitoring involves collecting, analysis and presentation of information. The Secretariat would have a responsibility to monitor the parties' compliance with the JWC Protocol and the Comprehensive Bi-lateral Agreement, once in place. Apart from compliance monitoring, an operational JWC will have a responsibility to monitor the implementation of the Joint IWRM Strategy, which would be done against the agreed workplan and defined indicators. It is foreseen to establish this secretariat in the short to medium term, i.e. before 2020.

Name of SAP	**SAP 4.1.1: Establishment of JWC Secretariat**
Location	Zimbabwe and Mozambique
Project components:	• Joint formulation and adoption of the Buzi, Pungwe and Save Bi-lateral comprehensive agreement • Establishment of JWC Permanent Secretariat and Technical Committee and support to its operation
Time frame:	Phase 1: 2013-2015. Phase 2: 2015-2030
Cost:	Total 1,200,000 USD. Phase 1: 450,000 USD. Phase 2: 750,000 USD (150,000 USD/year.

Institutional consolidation of ZINWA-Save and ARA-Norte

The aim in both countries as stated in national policy and legislation is to develop financially autonomous basin water authorities with adequate physical infrastructure, tools and human resources to undertake mandated functions. This component focuses on strengthening the basin institutions and management capacity.

Name of SAP	**SAP 4.1.2: Institutional consolidation, Zimbabwe**
Location	Zimbabwe
Project components:	• General institutional strengthening, i.e. increase of human resources and field / office equipment • Capacity building programs. Provide training of high and medium level staff with short and oriented courses in the key water management functions and basin issues, notably hydrology, hydrogeology, water quality and environmental management. Training can be implemented in collaboration with universities • Inter-ministerial coordination
Time frame:	5 years. 2013-2025
Cost:	800,000 USD

Name of SAP	**SAP 4.1.3: Institutional consolidation, Mozambique**
Location	Mozambique
Project components:	• Further institutional consolidation at ARA-Centro headquarters in Beira concerning the departmental set-up, staffing and operational procedures • Operationalization of the Fiscal and Management Councils • Development of the Buzi branch office (UGB) • Capacity building centred on EKIS. Provide training of high and medium level staff with short and oriented courses in the key water management functions and basin issues, notably hydrology, hydrogeology, water quality and environmental management. Training can be implemented in collaboration with universities • Inter-ministerial coordination
Time frame:	5 years. 2013-2025
Cost	800,000 USD

Review of national legislation and enforcement systems

This strategic action aims at water sector reform effectiveness. It involves reviewing existing structures in the water sector in Zimbabwe and Mozambique from an "effectiveness" perspective.

As described previously, some further consolidation of the legal and institutional framework is needed at national level. In Zimbabwe, the mandates overlap. The legal/institutional review would thus cover several ministry and administrative levels notably the Ministry of Water, ZINWA, EMA, Local Government Authorities, Department of Natural Resources. In Mozambique, the existing water legislation is not fully coordinated with existing environmental legislation. A review of the legal framework and statuary instruments related to those two sectors has therefore been proposed in the national IWRM strategy. A review and revisions of the internal regulatory frameworks of DNA and ARA-Centro has also been suggested in the proposed business plan for ARA-Centro especially including mandated functions for roles and responsibilities concerning shared river basins (Consultec, 2012). Expected results would be amendments where necessary in the legal framework.

Name of SAP	**SAP 4.1.4: Legal review and enforcement**
Location	Zimbabwe and Mozambique
Project components:	• Legal and institutional review to clarify roles and responsibilities
Time frame:	6 months. 2013-2015.
Cost:	100,000 USD

Component 4.2: Water resources management

Strategic objectives: The basin water institutions, ZINWA-Save in Zimbabwe and ARA-Centro in Mozambique, are fulfilling mandated functions and drive implementation. Notably, this component addresses the key functions of water use management, monitoring and information management, basin planning, economic and financial management.

User registry and permit system

Water resources allocation needs accurate data on water abstraction. It would be essential to further support the process of creating a water abstraction database in parallel with the establishment of a permit registry. Both in Zimbabwe and Mozambique there is a need to coordinate with the ministries responsible for irrigation and mining.

The objective is to establish a correct inventory and description of all water abstraction. The database would contain an inventory of abstractions subject to declaration as well as subject to authorization i.e. licensing or concession. It would contain abstraction information: location, characteristics of the source of water used, the volume abstracted, the owner and any other relevant information. It should be GIS (or Google) based with geo-referenced information. It is expected to be institutionalised as a permanent activity whereby the database is regularly updated.

This action is proposed to be an immediate activity, since it creates the basis for many of the mandated functions of a water authority. Updated data will feed the EKIS and will allow proper water allocation, water permit issuance and water resources planning.

The second objective is to advance the management of the permit system i.e. water use licensing and concession processes as well as tariffs setting for the main water users; and improve financial resources by improving invoicing, payment and penalty (for delayed and non-payment) procedures. The action would also include support to compliance monitoring.

To address the tariff and licensing is a process, and support will be needed in the beginning of the process for major field work and consultations with the water users, to explain processes and increase the willingness to pay, to institutionalise the internal procedures and for compliance monitoring.

Water allocation and demand management

Agricultural water demand is by far the most dominant water user and water demand management of this sector will be more and more important. Another area where the application of water demand management tools is a priority is urban water supply.

In Zimbabwe, maximum permit volume for each sector, within each sub-catchment has been determined. Still, specific action programmes may be needed to make the transition from strategies on paper to realisation on the ground.

Mozambique is introducing water demand management tools in the southern part of the country where water demand is high. Hence, the water tariffs for irrigation in the southern part of the country are already higher than in the northern basins such as in the Buzi and Ruvuma River Basins with less water use. Water allocation should be done based on models that check the existing and new water demand against water availability. In Mozambique this function is not undertaken at the moment. As a first step, it is important the ARA-Centro starts to make use the series of monthly flows and simple duration curves of the main rivers that have been produced during the Monograph phase for checking during authorisation processes. (Consultec, 2012).

One could argue that for Zimbabwe it is urgent to institutionalise WDM while Mozambique is at a stage of economic development when infrastructure investments will generally be more efficient in achieving water management objectives than focusing primarily on management improvements. However, once the basic stock of water infrastructure has been developed, the emphasis would undoubtedly have to shift to more water demand management oriented investments also in Mozambique.

Name of SAP	**SAP 4.2.1: Water use management system**
Location	Mozambique and Zimbabwe
Project components:	• Improve water abstraction database and permit registry; • Undertake basin related tariff study and develop a legally recognised document (Ministerial Diploma) that defines the tariffs for water use (Mozambique);

	• Institutionalise licensing and concession procedures in accordance with existing laws and regulations; • Institutionalise simple water assessment and balance modelling (Mozambique); • Provide technical assistance and consultancies to support tariff study; • Information packages and resources for stakeholder consultations and negotiations with major users; and • Support to compliance monitoring.
Time frame:	2 years. 2013-2015
Cost:	300,000

Pollution management system

Several steps need to be handled in order to achieve a future stable and healthy river:

- National monitoring programmes for the water quality are developed to facilitate pollution control;
- Joint monitoring programme of water quality at the borders and at agreed key locations e.g. Chicamba dam and the estuary;
- Polluter Pays Principle and the issuing of permits for effluent discharge together with monitoring of compliance needs to be put into practice;
- Implement water quality standards
- Clear division of responsibilities among the authorities needs to be set, both in each country and in the basin;
- Advance inter-ministerial coordination to abate pollution from urban areas, large scale agriculture and the mining sector.

On the Zimbabwean side the mandate and functions for pollution control presently rest with Environmental Management Agency (EMA) but the Ministry of Water has a responsibility to ensure the national obligations under the JWC and SADC Protocol.

In Mozambique, the main reason for the slow progress in the area of water quality monitoring and pollution control is the unclear roles and responsibilities. The first action would therefore be to make an overview of the legal framework with regards to the ministerial responsibilities. This proposed action is presented under the national level - review of legislation and enforcement systems. The proposed project on the development of a pollution control system is thus recommended as a medium-term action (2015-2020) to be commenced once the legal framework is clearly defined. It should also be noted that strategic actions related to water quality monitoring and to capacitate the regional water administrations with the equipment and expertise to undertake field monitoring of key water quality variables, are incorporated under the EKIS II component.

Since pollution control is a cumbersome task and a challenge for institutions with meagre resources, it is proposed that the feasibility of cooperative “pollution watch” mechanisms is investigated. This proposed action would entail exploring opportunities for involving and empowering local stakeholders to monitor and report on pollution problems, develop reporting mechanisms and chains of command through district authorities, basin committees, ARAs through to centralised pollution monitoring centre.

In parallel, it would be essential to work with increasing awareness concerning water-related public health issues in order to ensure public awareness concerning water quality issues and the links with human health. Information packages could be developed for distribution to provincial and district

level health centres and stakeholder forums outlining water quality issues, indicators, and links to human and environmental health issues.

Name of SAP	**SAP 4.2.2: Pollution management system**
Location	Mozambique and Zimbabwe
Project components:	• Improve effluent discharge database; • Introduce a licencing process and establish database of permit holders • Undertake basin related tariff study and develop a legally recognised document (Ministerial Diploma) that defines the tariffs for effluent discharge (Mozambique); • Establish baseline water quality conditions and determine deviation from natural conditions; • Develop water quality guidelines that take uses of water into account including human health, and maintenance of biodiversity and ecosystem integrity, and undertake appropriate modelling to define detailed, spatially-explicit water quality requirements (this is an aspect of environmental flow assessment); • Enforce water quality standards; • Develop participatory pollution watch mechanisms; • Devise a plan for compliance monitoring; and • Develop information packages outlining Buzi River Basin water quality issues, indicators, and links to human and environmental health issues.
Time frame:	2 years. 2015-2020
Cost:	300,000 USD

Enhanced Knowledge and Information Management System Phase II

Proposed future monitoring network and custom-developed data management tool

The objective of this strategic action is "to improve efficiency of the collection, management and exchange of information that is vital for transboundary water resources management."

Expanded monitoring network

The necessary basis for a functioning EKIS in the Buzi River Basin is an improved monitoring network. For both countries this means improved procedures for conducting regular current meter measurements for establishing rating curves and to extend the monitoring network. A dual system with both manual and automatic reading is essential to guarantee continuous records. The implementation of the monitoring programme should follow as stated earlier, a staged approach starting from the rehabilitating key hydrometric and climatological stations, then continuing to upgrade key stations to automatic and afterwards to transmission in real time. The identification of the key stations, to be part of an automatic telemetric system should be done considering the possibility to complement with data acquisition using weather radar as discussed in the Flood and Drought Management Strategy for the Pungwe River Basin (Sweco, 2012).

IT structure

Currently, the IT infrastructure is weak and vulnerable. As a result of this lack of IT maintenance much data and information is lost due to virus infections or by power failures (often due to lightning).

In Mozambique, there is moreover a lack of written agreements concerning the exchange of information between ARA-Centro and other actors involved in monitoring and also between ARA-Centro and ZINWA-Save. The Incomati River, the PRIMA project (Progressive Realization of the Inco-Maputo Agreement) has recently established an Information Data Exchange system for the

Incomati and Maputo Rivers. A similar system should be considered for the Pungwe, Buzi and Save shared water courses.

The final step for a comprehensive EKIS is thus the development of a custom-oriented data management tool. It is suggested to develop a similar tool as in the PRIMA project for Incomati and Maputo river basins. This tool is based on ArcGIS and Temporal Analyst and is linked to the web for easy access and dissemination of data. However, it is a prerequisite that the institutional capacity (and especially the human skills) be significantly improved before implementation.

Training

Standardized training programmes for staff on design, installation, operation and maintenance of the monitoring equipment, facilities and data acquisition methods, management information system and installed models is proposed to be an integral part in the action project.

Implementation approach

The building of a functioning EKIS is a process rather than a one-time effort. Since the EKIS requires that all components are functioning (monitoring, field work, GIS, IT, etc.) it is not possible to create a fully developed system in a short time period. Instead the key for development of a sustainable EKIS lies in step-wise building of the fundamental components at a rate that the institutional capacity allows.

Some selected stations are recommended as short term action, while the full network of secondary and tertiary stations and information management systems are proposed to be a medium term investment 2020-2025.

The key implementers would be DNA/ ARA-Centro, Mozambique and DWR/ZINWA-Save, Zimbabwe. However, close coordination with meteorological and environmental departments is essential.

Name of SAP	**SAP 4.2.3: EKIS II**
Location	Zimbabwe and Mozambique
Project components:	• Expand the monitoring systems for hydrometeorology, groundwater, water quality and sediment monitoring; • Development and installation a comprehensive basin-wide water information system to support integrated river basin management; and • Technical Assistance.
Time frame:	Establishment phase: 5 years. Medium term= 2015-2020 to long term 2020-2030
Cost:	Expansion of surface monitoring stations: 250,000 USD Expansion of ground water monitoring system 300,000 USD Office IT upgrading 130,000 USD Other mobile field equipment 470,000 USD Technical Assistance 350,000 USD Total: 1,500,000 USD

Sub-basin plans

The strategic objective is that national basin and sub-basin plans shall be prepared in conformity with the Buzi JIWRM Strategy taking into cognizance optimal and sustainable water requirements of all sectors.

Water resources planning must be integrated into national, provincial and local planning, and must be addressed in all growth and development strategies. This implies that the Buzi JIWRM Strategy

and Implementation Plan must be integrated with the national and regional plans of Zimbabwe and national and provincial plans of Mozambique.

Name of SAP	**SAP 4.2.4: Sub-basin plans**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	The main objectives of this proposed action are: • Undertake simple sub-basin water balance modelling • Identify key local potential and challenges • Prepare sub-basin plans with the active participation of the stakeholders • Integrate in regional (Tanzania) and provincial (Mozambique) planning documents • Integrate in RBWO and ARA-Norte business plans and annual work plans. • Update the basin plans regularly in intervals of 5 years
Time frame:	3 years. 2015-2020
Cost:	300,000 USD
Considerations:	**Local and Regional Relevance:** High regional (down-stream) relevance

Groundwater management

In compiling existent information for the groundwater assessment for the Monograph it was clearly revealed that the groundwater resources of the basin are not well documented in terms of availability, occurrence and spatial distribution. Historically, this "hidden" resource has not been given the same attention as surface water despite the fact that groundwater is the dominant source for domestic water supply within the rural communities. The merits of groundwater over surface water can be summarised as follows[1]:

- Relatively cheap to develop
- Resilient to drought through slow decline of water levels due to considerably lower evaporation rates and water volume stored as groundwater is much higher than water stored at surface. Groundwater has thus an increasing importance in adapting climate change, not only for water supply but also for food security through irrigation of crops. Groundwater is also closely linked to the maintenance of environmental flows.
- Generally of good quality and without need for treatment
- Less susceptible to pollution (difficult and expensive to remediate once polluted)

The groundwater assessment undertaken during the monograph phase, although rudimentary due to lack of information and data, clearly demonstrated that in terms of volume, groundwater is largely an untapped resource. However, for a major part of the basin the groundwater the groundwater exploitation potential is low which impedes large scale abstraction.

Reliable and efficient groundwater supplies require a deeper understanding of the resource in terms of local availability and occurrence, and most importantly a good management of the groundwater resources. A sound management and a balanced use of the resource will contribute to solve water shortages as well as to meet future increase of demand. The most important aspect of groundwater management is monitoring of key parameters (groundwater levels, water quality, pumping rates,

[1] Groundwater Strategy 2010, Department of Water Affairs, South Africa.

etc.). Knowledge of these parameters in space and time is a prerequisite to assess groundwater systems and dynamics, resource assessment, surface-groundwater interactions, to enable informed planning decisions.

The following strategic actions are proposed:

- Expansion of groundwater monitoring networks as an integral component of EKIS Phase II (SAP 2.2.2)
- Development of an Integrated Catchment Groundwater Management Strategy (SAP 2.3.7)

Name of SAP	**SAP 4.2.5: Groundwater management strategy**
Location	Zimbabwe and Mozambique i.e. the Buzi and Save River basins
Project components:	• Existing groundwater use to be assessed, all larger groundwater users to be registered • Borehole data collection procedures to be established at basin level. Borehole data to be submitted to and maintained by ZINWA and DNA. • Support to ZINWA and DNA to update and maintain respective National Groundwater Data Archives. • Develop and implement a Groundwater Monitoring Strategy • Conduct groundwater resource assessment to a level comparable to surface water at high potential areas, including groundwater surface water interaction. • Develop a strategy to promote formal and prioritise conjunctive use of surface water/groundwater • Develop adequate institutional capacity to fulfil the mandatory groundwater management functions • Provision of strategic support to water service institutions in the development of plans for groundwater development, management and monitoring as well as for the operation and maintenance of groundwater infrastructure. Roles and responsibilities to be clearly defined and streamlined. • Promote groundwater management aspects to be incorporate as a natural component into all water plans. • Develop a communication strategy to promote groundwater management aspects among water users and managers
Time frame:	2 years. 2015-2020
Cost:	500,000 USD

Component 4.3 Promotion of Stakeholder Participation and Cross-sectoral Coordination

The general aim of this component is to create the conditions for effective, responsible users participation at all stages of IWRM.

The idea of effective user participation in the processes of decision-making, implementation and assessment of the actions carried out is a core element of Integrated Water Resources Management.

The strategic objectives are:

- Stakeholder participation is institutionalised.
- Effective cooperation between government agencies with responsibilities for water management or water use in the basin.

Key strategic measures are:

- Accelerate the establishment of stakeholder participation institutions and operation i.e. to provide them with adequate resources and communication tools to perform their roles.
- Facilitate cross-sector planning through establishing necessary partnerships, processes and protocols.
- Increase awareness among general public.

Like most of the institutional activities proposed this component includes actions that would need support for a longer time before these actions can be fully institutionalised/fully seen as permanent functions.

Strengthening effective water user participation

As seen during the strategy formulation process, the mechanisms for effective stakeholder participation would benefit further attention. This is valid both for Zimbabwe and Mozambique and to address this specific need two action projects are proposed, explicitly:

- Technical support to Save catchment and Budzi (and Odzi)sub-catchment councils and effective communication tools; and
- Technical support to Buzi Basin Committee and effective communication tools.

In Zimbabwe the priority actions would be to re-establish the operation of the sub-councils after 10 years of low activity. The Catchment Councils (CCs) in Zimbabwe are stakeholder bodies that lack technical skills. Often, they only employ an office manager and an extension officer. This is insufficient considering their responsibilities.

In Mozambique, the key priority is the formal establishment and approval of the internal regulations of Buzi basin committee.

Once (re-)established, there is a need to address the challenge of institutionalisation of effective stakeholder participation. History shows that the success of IWRM is highly dependent on the ability to effectively engage stakeholders in the key water management aspects. History also shows that stakeholder participation put high demand on the water authorities and that they struggle to institutionalise participatory processes.

A clear and focused approach to integrating specific stakeholders into the process of water resource management in the region is needed to keep the contact meaningful. For this purpose, a communication strategy- specifically targeting communication with local communities and water users- has been formulated for the ARA-Centro Business Plan. Many of the measures recommended are deemed of relevance also for ZINWA.-Save and its communication with the sub-catchment councils and local water users. The use of radio at both provincial and community level is suggested as the most cost effective way to ensure an extensive reach and coverage of the regional population for ARA-Centro's message.

Activities involved would be to: designate staff for stakeholder communication officers; develop internal procedures for defining current issues to be communicated e.g. policies, legislation, roles and mandates of water actors and thematic subjects; develop information package; training in communication skills and establish routine for time on-the-air with local radio stations. Moreover, the water user organisations need to be strengthened by giving them the information, tools and capacity for undertaking the functions according the internal regulations.

The expected results are: the effective operation of the establish stakeholder organisations in accordance with their respective internal regulations; and the proactive use of the water authorities of the various media to ensure effective dissemination of messages and results.

Name of SAP	**SAP 4.3.1: Technical support to stakeholder organisations**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	• Zimbabwe: Technical support to Save catchment and Budzi (and Odzi)sub-catchment councils and effective communication tools; and • Mozambique: Technical support to Buzi Basin Committee and effective communication tools
Time frame:	3 years. 2013-2020
Cost:	400,000 USD
Considerations:	**Local and Regional Relevance:** High local relevance

Community Basin Management Projects

The rationale for up-scaling the CBMP effort for the Buzi River Basin is to create awareness and support among the population residing in the basin for local and sustainable management of the Buzi River Basin. The purpose of the CBMPs would be to demonstrate early and direct benefits of sustainable local management of water catchments to the communities. Tangible results on poverty alleviation and the environmental health of the river are equally important factors of the CBMPs.

The implementation of these CBMPs has created stakeholder buy-in into the IWRM concept at a local level. Communities realise their dependence on sustainable water resource management by benefitting from these projects. This will result in improvement of their livelihoods. Some of the projects identified for implementation focus on soil erosion control whose impact on reduced siltation is expected to be significant in the long term. The "symbiotic" relationship being fostered through these projects is central to sustainable IWRM. The CBMP concept is thus a useful tool to be expanded on the basis of IWRM.

Community Basin Management Projects (CBMPs) are defined as: Small water management related investment projects that are identified, selected, executed, managed, and maintained by communities with support from the designated river basin offices. Examples of type of projects that could be suitable are:

- Community water supply and sanitation
- River and water source protection
- Small holder irrigation development and improvements
- Pollution control such as tailing dams
- Small dams development
- The key selection criteria for identification and screening process are twofold i.e.:
- Sustainable use of water resources
- Tangible poverty reduction benefits

Name of SAP	**SAP 4.3.2: Community Basin Management Projects**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	The main purposes of the CBMP interventions under the SWCSP fall within two areas. Enhance capacities of river basin organizations to: • River basin organizations promoting community-based IWRM. • Basin stakeholder institutions familiar with conducting community project appraisals. • Community projects being financed from earmarked CBMP funds. • District Offices providing on-going monitoring & support to communities in O&M and related extension services. Construction of IWRM facilities for visibility and awareness creation: • Improved knowledge, attitudes and practices in relation to local IWRM/basin management • Increased access to water supply services.
Time frame:	10 years. 2015-2025
Cost:	10 MUSD (3 million every 3 years)
Considerations:	**Local and Regional Relevance:** High local relevance

Creation and running of Pungwe, Buzi and Save River Basins Awareness Kit

The aim is to create and keep alive a website to inform national and international audiences about basin characteristics, opportunities and challenges and key management issues. The website would be a dynamic tool, convenient for providing information, and also for the participation of the general public.

As previously stated communication messages and tools should be adapted to the target group. In this regard, it should be noted that web-based communication is suitable means of communication to target water sector professionals (national and international) and potential investors.

The development and implementation of a website will provide the water authorities with a key tool for disseminating its role and mandate, information such as hydrometric data as well as on-going projects or studies. The primary objective of the website is to provide a service to business, finance, technical and research oriented stakeholders in the country, regionally and internationally.

Expected results:

- An operational website;
- Better information for involvement of the general public in the sustainable management and development of the basin;
- Improved marketing information;
- The information about Buzi and neighbouring river basins centralised; and
- The water authorities make proactive use of available communication channels and tools.

Name of SAP	**SAP 4.3.3: River awareness kit**
Location	Zimbabwe and Mozambique
River basin:	Basin wide
Main Purpose:	The actions involved are: • Creation of a map tool summarizing all the knowledge on the river basin(s); • Running of a website for increasing awareness , information exchange and promotion of investment opportunities for the general public; and • Producing bibliographic reference lists about the sub-basins and about current issues for planning and research officers
Time frame:	Establishment phase: 1 year. 2015-2020
Cost:	100,000 USD
Considerations:	**Local and Regional Relevance:** High local relevance

Appendix II: Monitoring and Evaluation Indicators

Buzi Objectives and Outcome Indicators

Table 1: Specific Objectives and Outcome Indicators for Buzi River Basin Water Resources Management.

Buzi River Basin Objectives and Indictors

OBJECTIVE	INDICATOR	BUZI BASE-LINE	TARGET
Optimal, sustainable and equitable water use including transboundary use	▪ Proportion of total water resources used ▪ Water efficiency index for hydroelectricity, agriculture and livestock ▪ Balance of use between riparian states	▪ 5.5 % of MAR ▪ Urban Water Supply losses approximately 20-30% ; Water Pricing to promotes WDM exist in Zimbabwe ▪ Moz to Zim ratio about 15%. ▪ Zimbabwean part generates 21% of MAR	Water use allocation between riparian states to be regulated Comprehensive Agreement on the Buzi River Basin.
Reduction of vulnerability of climate change and extreme events i.e. floods and droughts	▪ Number of people and economic activities at risk (e.g. from flood inundation maps) ▪ Economic impact of flooding and drought (humans, environment and economic values) ▪ System for Early Warning (EWS) in place (yes/no) ▪ Storage and Regulating infrastructure in place (yes/no)	▪ Lower basin frequently affected by floods, cyclones and to a less degree by droughts. Flood prone areas are: Buzi town and district, the estuary, Estaquinha and Goonda near the confluence of the Buzi and Revue Rivers and Sussundenga District below the Chicamba Dam. ▪ Economic centres are in flood prone areas resulting in economic losses ▪ EWS in place ▪ Chicamba and Mavuzi dams	Restrict people and economic activities within flood prone areas Early Warning Systems and Response System maintained. Increased coverage of storage and regulating infrastructure.
Water storage and supply infrastructure satisfactory for social and economic development	▪ Volume of storage capacity and distribution ▪ Water supply infrastructure ▪ % of time social reserve is maintained during dry spells	▪ Chicamba dam (Hydropower, water supply and recreation) –storage volume 2000Mm^3 ▪ Mavuzi dam (hydropower)- storage volume 1.8Mm^3	Increased development of small and medium dams as specified in future basin plans. Increased security of supply of safe water to people and economic activities
Surface water quantity and quality satisfactory to sustain environmental river health (fish and plant life biodiversity and eco-services)	▪ % of time environmental flow requirements is maintained during dry spells. ▪ % of water bodies with improved environmental quality.	▪ Estimated EFR at estuary 29%. ▪ Dissolved oxygen, Phosphate, Conductivity, Turbidity, pH- locally not within acceptable range locally ▪ Polluting activities and areas of concern have been mapped.	100% 100% of WQ samples fall within national WQ standards Sensitive water bodies designated and protected

Source: Adapted from "Development of IWRM key performance indicators for African Transboundary Basins management", International Network of Basin Organisation (INBO), draft 2010

Table 2. Related MDG Benchmarking Objectives and Indicators for Buzi River Basin

Objective	Indicator	Buzi Base-line[2]	IWRM Contribution
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	Proportion of population below $1 per day	▪ Poverty incidence in Mozambique 2005: Sofala Province 42-44%; Manica Province 52%. ▪ Poverty incidence in Zimbabwe 2003: Chimanimani 64% ; Chipinge 53% Mutare Rural 62%	Water as a factor of production in agriculture, industry and other types of economic activity Investments in water infrastructure and services act as a catalyst for local and regional development
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Prevalence of underweight children under-five years of age	▪ Underweight at birth between 5-20% in Mozambique. Highest Buzi and Manica Districts.	Water as a direct input into irrigation, including supplementary irrigation, for expanded grain production Reliable water for subsistence agriculture, home gardens, livestock, tree crops. Sustainable production of fish, tree, crops and other foods gathered in common property resources
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	Proportion of land area covered by forest Proportion of total water resources used Designation and Proportion of terrestrial and marine areas protected	▪ 37% Forest ▪ 40% grass and shrubland ▪ 5.5 % of MAR ▪ Vumba Reserve (201 ha) ▪ Chimanimani Reserve (Size to be confirmed)	Improved water management including pollution control and sustainable levels of abstraction are key factors in maintaining ecosystem integrity
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	Proportion of population using an improved drinking water source Proportion of population using an improved sanitation facility	Access to safe potable water. Moz: 4-17%. Use of unprotected sources: 50% -70%. Zim: Mutare Rural 60% with 1km; Chimanimani and Chipinge 75% within 1km. Approximately 40% within 500m Zim: Manicaland province - 75% including unimproved latrines. Moz: Manica and Sofala Provinces- 50% including unimproved latrines.	Actions to ensure access to adequate and safe water for poor and poorly serviced communities

[2] Source: Buzi River Basin Monograph Reports

Transboundary IWRM Performance indicators

Table 3. Transboundary IWRM Performance Indicators.

IWRM objective	Outcome indicator	Baseline Buzi
Institutional and Legal Enabling Framework Objectives and Indicators[3]		
An institutional and legal framework and agreed regulations for optimal, sustainable and equitable utilization of shared river basins is in place	▪ Comprehensive agreement developed for shared river basin based on joint basin studies and following the orientations of the SADC Protocol; ▪ Information exchange mechanisms, compatibility of technologies and procedures for collection and management of information in place; ▪ Joint shared river basin management institution/mechanism established and operational. ▪ Harmonisation of national legislation in accordance with the terms in regional, bi-lateral or multi-lateral agreements signed and ratified by riparian states; ▪ International agreements transposed to national law. ▪ Mechanisms for joint development and implementation of joint initiatives.	▪ JWC agreement signed, ratified and transposed to national law in both countries committing the parties to the general principles of sustainable development and use, preventions of harm, equity and co-operation on shared water resources. ▪ Joint studies as basis for comprehensive agreement under implementation ▪ National processes for harmonisation of national laws are in progress at SADC level.
IWRM Performance Indicators Transboundary River Basin Organisations[4]		
Planning Indicators		
Clear planning processes	▪ There is a planning process with well-defined objectives, mutually beneficial goals and development priorities, all stated in a long-term integrated river basin management plan	▪ Buzi Basin Joint Integrated Water Resources Management Strategy under development and anticipated to be finalized and agreed in 2012
Recognition of development constraints	▪ Development options in basin management plans recognize resource development constraints	▪ Development scenarios to be studied 2011
Plan implementation and completion	▪ There is evidence that basin management plans are completed	▪ No plans developed as yet
Coordinating Indicators		
International coordination of water management	▪ Basin management programmes use coordination mechanisms between riparian to maximise the opportunity to share benefits of water use	▪ JWC meetings held annually. SADC protocol and SADC Regional Water Strategy provide general guidelines for bi-lateral information exchange ▪ At management level, information exchange is mainly focused on floods ▪ Both countries part of SADC HYCOS (Hydrological Cycle Observation System) programme which aims at providing water resources data for decision-making.

[3] Interpreted from the SADC Protocol and SADC Strategy

[4] Sources: "Development of IWRM performance indicators for African Transboundary Basins management", International Network of Basin Organisation (INBO)

IWRM objective	Outcome indicator	Baseline Buzi
Existence of overarching reporting mechanism	▪ An overarching body coordinates actions and reports to each riparian's high-level administrators	▪ JWC Secretariat
Consensus-based decision-making	▪ Water sharing uses a consensus approach to broker agreements on a basin basis	▪ Water sharing anticipated to be negotiated in a Comprehensive Agreement. The riparian countries have a history of joint agreements (e.g. Inco-Maputo Agreement)
Transparent monitoring	▪ Each riparian's water sharing procedures use transparent monitoring mechanisms to account for activities	▪ Capacity for monitoring is a challenge
Coordination with local action	▪ Transboundary basin management plans coordinate with the actions of small-scale local water institutions in each riparian e.g. local water management plans	▪ Transboundary IWRM Strategy for the Buzi will consider provincial development plans in Mozambique and Catchment Operation Plans in Zimbabwe
A range of coordination tools are used	▪ Dialogues, memoranda of understanding, or joint programs of action are used to manage water between countries	▪ Both countries participate in joint bi-lateral and SADC programmes on transboundary water management, ▪ JWC scheduled to meet annually
Business plan uses coordination mechanisms	▪ The river basin organization uses business plans which specify coordination mechanisms between riparian	▪ N/I
Funding indicators		
On-going funding for basin management	▪ Financing for river basin management exists and is on-going despite changes in the administration of each riparian	▪ State finance exists. However, management anticipated to be undertaken by financially autonomous offices.
Sufficient funding for basin management	▪ Funding for river basin management is adequate to address at least priority natural resources management issues	▪ Funding together with human resources is a major constrain. Fee water permits holders in Mozambique. Low current use of water in Zimbabwe. Both ARA-Centro and ZINWA-Save operate on scarce funds at the moment.
Investment guidelines	▪ Funding for river basin management operates within international investment guidelines which prescribe outcomes in transparency, accountability, benefit shares & sustainability (poverty reduction, economic development & environmental flows)	▪ To some extent. Depends on source of funding. Investments must undergo EIA.
Investment accountability	▪ There are explicit procedures in place which ensure transparent reporting of the results of investing in basin management programs	▪ N/I
Donor coordination	▪ Coordination between donor organizations exists to ensure programs and projects are linked, do not duplicate action an address common goals	▪ Yes (Pungwe Programme Phase II, SADC HYCOS and SWCSP)

Performance indicators for the Regional Water Administrations[5]

Table 4. Performance Indicators for the ARA-Centro in Mozambique.

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
WATER ALLOCATION Allocating water to major water users and uses, maintaining minimum levels for social and environmental use while addressing equity and development needs of society.	Major water users are known and are managed through a licensing (or permit) system.	Number of surface and groundwater users licensed according to the regulations.	Number. Number of licenses issued. May be further subdivided by use.	40 are licensed (7 in Buzi basin for surface water)	
	Water allocation is in line with sustainable use, economic efficiency and social equity principles.	Water allocation criteria include use efficiency, economic benefit and social goals.	Review. Examine allocation criteria for compliance with IWRM principles.	No EFR is a criteria but in practical it is not evaluated as yet	Water licence is so far given without criteria
		% of time environmental and social reserve is maintained in major water courses.	%. Number of records from water resource monitoring stations with flows lower than the reserve divided by the total records x 100. A determination of the reserve is required.	No records	
POLLUTION CONTROL Managing pollution using polluter pays principles and appropriate incentives to reduce most important pollution problems and minimise environmental and social impact.	The extent of the pollution problem is known and progress being measured.	% of surface water quality samples complying with water quality objectives.	%. Number of samples below set standard.	Dissolved oxygen, Phosphate, Conductivity, Turbidity, pH- locally not within acceptable range.	No WQ monitoring programme in place. No regular monitoring is undertaken. WQ sampling undertaken by Consultant 2010.
		% of ground water quality samples complying with water quality objectives.	%. Number of samples below set standard.	No monitoring is undertaken	No groundwater monitoring programme in place.
	Major polluters are known and are managed through a licensing (or permit) system.	Number of polluters licensed according to the regulations.	Number. Number of licenses issued.	No registration of polluters as yet No licences issued	Known areas with visible bad WQ are Revue River from Penhalouge area and Lucite River from Chimanimani area in Mozambique.

[5] UNDP/CAP-NET

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
BASIN PLANNING Prepare and regularly update the Basin Plan incorporating stakeholder views on development and management priorities for the basin, and using it to inform the annual work plans of the RBO.	Basin planning synthesises technical and social priorities for the basin and acts as a basis for action and accountability to the stakeholders.	Water management activities driven by Basin plan.	Review. Examine the link between the basin plan and current water management activities.	Joint IWRM Strategy for Pungwe in place. No basin plans for Buzi and Save River Basins in place. A business plan needs to be developed to give strategic orientation to the daily management.	A transboundary IWRM strategy will be developed during 2012. Development of basin management plans are called for in Water Policy
		Stakeholder priorities reflected in the basin plan.	Review. Examine the basin plan for stakeholder consultation and content.	N/A	
MONITORING Implement effective monitoring systems that provide essential management information and identify and respond to infringements of laws, regulations and permits.	The water allocation system is effective and permits are being complied with.	Proportion of water allocation permit holders complying with permit conditions.	%. From monitoring visits the number not complying with conditions divided by the total number of visits.	No compliance monitoring undertaken	
	The Pollution control system is effective and permits are being complied with.	Proportion of water pollution permit holders complying with permit conditions.	%. From monitoring visits the number not complying with conditions divided by the total number of visits.	No pollution permit holders	
	Knowledge of water resource availability is a basis for management.	Number of water resource monitoring stations producing reliable data.	Number. Number of stations with reliable data records. Minimum required network	No ground water monitoring stations 1 functioning runoff station in Buzi at Chicamba dam (EDM station). 5 rainfall gauges in Buzi in operation. 14 water level measurement (hydrometric) stations in operation in Buzi. In total ARA-Centro operates 88 hydrometric stations.	Data reported to DNA on monthly basis. DNA process and analyse and package. 47 hydrometric stations have historical data for the Buzi River Basin. Major upgrading of monitoring network is required to comply with WMO's recommendations for "minimum required network". As a first step 5 primary gauging stations are proposed to be rehabilitated. 5 additional rainfall stations are proposed. In addition INAM and EDM operates rainfall stations

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
		Total water storage capacity.	M^3. The water storage capacity in artificial storage structures above a minimum size (5,000 M^3).	Chicamba dam (Hydropower, water supply and recreation) –storage volume 2000Mm^3 Mavuzi dam (hydropower)-storage volume 1.8Mm^3	
		% groundwater monitoring stations with declining water levels.	%. Comparison of water levels over a 5 year period.	No monitoring wells No data No area identified for placement of monitoring wells	Provincial directorate of housing and work have the borehole data base Number of borehole by district
ECONOMIC AND FINANCIAL MANAGEMENT Applying economic and financial tools for cost recovery and behaviour change to support the goals of equitable access and sustainable benefits to society from water use.	Water use efficiency improving through use of economic and financial instruments.	Charges and fees for water allocation favour the poor and efficient water use.	Review. Examine for the application of economic and financial tools in water allocation.	Yes, to some extent. Water use below a certain threshold is free	Differentiated pricing is practiced
		% revenue received.	%. Total revenue divided by the total amount billed.	Not 100 %	
	Pollution reducing through use of economic and financial instruments.	Pollution charges give incentive to reduce pollution.	Review. Examine for the application of economic and financial tools in water pollution.	No pollution permits have been issued	Although the water law and the statutes give the power to ARA Centro to issue licences for effluent discharge and to revoke licences, pollution control is regarded to be the responsibility of the Ministry of Environmental Coordination. Unclear roles and responsibilities
		% revenue received.	%. Total revenue divided by the total amount billed.	N/A	
INFORMATION MANAGEMENT Provide essential data necessary to make informed and transparent decisions for development and sustainable management of water resources in the basin.	Essential information is processed and packaged at the right level for specific managers and stakeholders to support transparent decision making and to gain commitment and political support for the decisions made.	Data base is established in formats compatible with other river basin organisations.	Review. Data base is transferable across basins in the country and for transboundary systems.	Raw data is stored at ARA-Centro. At national level HYDSTRA is used for data management. For GIS-based knowledge and information system only at national level. GIS tools are not in operation at ARA-Centro or at the Buzi branch office.	The management of geographically based data and information is today only available on the national level.
		Water management information is available to managers and other	Review. Examine availability of basin data and reports on water resource	Data and records are available but fragmented	A single data base for all data is planned under the SWCSP

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
		stakeholders as required.	management indicators.		
STAKEHOLDER PARTICIPATION Implement stakeholder participation as a basis for decision making that takes into account the best interests of society and the environment in the development and use of water resources in the basin.	Effective cooperation between government agencies with responsibilities for water management or water use in the basin.	Number of meetings of Government agencies with water interests to consult and collaborate on water management.	Number. Number of formal or ad hoc meetings at interagency level.	Buzi Basin Committee under establishment	Buzi Basin Committee will include representation of relevant Ministries but with no decision making power.
	Stakeholder participation is institutionalised in the management of the river basin.	Formal stakeholder structures established with clear roles and responsibilities in water resources management.	Review. Examine basin water management structure for stakeholder organisations and allocated management roles.	As above	Advisory role.
		Basin stakeholders (male and female) represented in decision making bodies at all levels.	Number. Representatives from stakeholders serving in government water management structures.	No specific quota for gender aspects Less than 50% in practice	

Table 5. Additional suggested indicators.

Function	SUGGESTED WMO	SUGGESTED PROGRESS INDICATOR	SUGGESTED UNIT	VALUE
FLOOD AND DROUGHT MANAGEMENT Operating floods and droughts to mitigate and minimise harm to humans, environment and economic values.	Knowledge of inundation areas for different flood magnitudes	Length of river analysed for flood inundation (flood frequency, hydraulic studies and topographical surveys)	Number Kilometres analysed river	Yes there is satisfactory knowledge on inundation curves gathered from empirical data.
	Functioning flood warning system	Number of forecasts or warnings issued for floods	Number Sent bulletins to stakeholders per year	Early warning system in place There is a specific national disaster response centre (INGC) which is responsible for outreach in the case of floods. ARA-Centro provides the INGC with forecasts.
	Functioning drought warning system	Number of forecasts or warnings issued for low flows	Number Sent bulletins to stakeholders per year	There is a specific national disaster response centre (INGC) which is responsible for outreach in the case of suspected droughts. ARA Centro has contact with dam operators to plan accordingly
WATER INFRASTRUCTURE DEVELOPMENT Design, construction and maintenance of works	Increase storage volume and regulatory functions of the river	Number of Project Feasibility studies Funds raised Number of Projects implemented Operation and maintenance	Review of evidence	On-going water resources development projects relevant to the Buzi are the rehabilitation of the Chicamba and Mavuzi hydropower schemes and the development of a new intake tower and water treatment plant for Chimoio water supply at Chicamba Dam O&M not undertaken at an adequate level at the moment due to lack of operational funds.
GENDER MAINSTREAMING Women involvement in decision making and water management	Women shall be fully involved in the development and implementation of policies, processes and management of development programs at all levels	% participation of women in water affairs at all levels; % of involvement of women in the provision of water and sanitation services	**%** of professional staff and technicians that are women % of women representation in stakeholder organisations	7 out of 34 staff members are women. One woman in the technical department and two women in the admin./fin.departments out of 20 staff in technical/financial departments. Buzi basin committee not yet established.
HIV/AIDS MAINSTREAMING National policies on HIV/AIDS response institutionalised	HIV/AIDS policy in place and implemented Staff trained and familiar of HIV/AIDS policies , rights and obligation as well as access to prevention and counselling procedures	Policy in place; % of staff trained; % of staff with access to prevention and counselling procedures as provided for in policy	Yes or No %	Yes. One staff member designated HIV/AIDS focal point Degree of practical implementation uncertain.

Table 6. Performance Indicators for the ZINWA-Save in Zimbabwe.

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
WATER ALLOCATION Allocating water to major water users and uses, maintaining minimum levels for social and environmental use while addressing equity and development needs of society.	Major water users are known and are managed through a licensing (or permit) system.	Number of surface and groundwater users licensed according to the regulations.	Number. Number of licenses issued. May be further subdivided by use.	In Save catchment there are a total of 3,304 water permits of flow and storage permits. Approximately 800 in Buzi (sub zones FB, FUZ, FLS, FM1/2) Total of groundwater permits are 157 of which 79 in Odzi and 22 in Budzi.	Buzi, Lucite and Revue sub-basins constitute the Budzi sub-catchment. 3 304 water permits of which the flow permits have a combined entitlement of 628 173 ML and the storage permits have a combined entitlement of 1 126 427 ML.
	Water allocation is in line with sustainable use, economic efficiency and social equity principles.	Water allocation criteria include use efficiency, economic benefit and social goals.	Review. Examine allocation criteria for compliance with IWRM principles.	Water is allocated by catchment councils with full stakeholder representation. Allocation guidelines in place.	
		% of time environmental and social reserve is maintained in major water courses.	%. Number of records from water resource monitoring stations with flows lower than the reserve divided by the total records x 100. A determination of the reserve is required.	N/I	
POLLUTION CONTROL Managing pollution using polluter pays principles and appropriate incentives to reduce most important pollution problems and minimise environmental and social impact.	The extent of the pollution problem is known and progress being measured.	% of surface water quality samples complying with water quality objectives.	%. Number of samples below set standard. Simplest approach is to base the determination on measurements of a few key water quality parameters.	No monitoring points in the Revue Sub basin (Odzi) and four monitoring points in (Buzi and Lucite sub basins) Budzi sub catchment; Generally of good quality with the following exceptions: COD, TSS and BOD levels are high locally	Activities polluting the water: ▪ Gold panning from illegal miners ▪ Sewage and solid waste disposal ▪ Coffee pulp waste from coffee processing factories. There are no monitoring points along the Rusitu river. This is an area needing urgent action as there are gold panning activity in the areas surrounding this river (Ambient Water Quality monitoring program to be improved by EMA)

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
		% of ground water quality samples complying with water quality objectives.	%. Number of samples below set standard. Simplest approach is to base the determination on measurements of a few key water quality parameters.	N/I	EMA is still to establish a programme to monitor ground water
	Major polluters are known and are managed through a licensing (or permit) system.	Number of polluters licensed according to the regulations.	Number. Number of licenses issued.	Permit database with 203 permitted discharge facilities for the Save catchment.	The frequency of monitoring these facilities is variable depending on the class of the permit. The class of permit with the most environmentally hazardous effluent getting greater attention
BASIN PLANNING Prepare and regularly update the Basin Plan incorporating stakeholder views on development and management priorities for the basin, and using it to inform the annual work plans of the RBO.	Basin planning synthesises technical and social priorities for the basin and acts as a basis for action and accountability to the stakeholders.	Water management activities driven by Basin plan.	Review. Examine the link between the basin plan and current water management activities.	River Save Outline Plan (RSOP) in place.	Buzi, Lucite and Revue sub-basins constitute a small part of the). Joint IWRM strategies for the Buzi and Save River Basins will be developed during 2012.
		Stakeholder priorities reflected in the basin plan.	Review. Examine the basin plan for stakeholder consultation and content.	Save RSOP is based on the aspirations and plans of the sub-catchments councils	
MONITORING Implement effective monitoring systems that provide essential management information and identify and respond to infringements of laws, regulations and permits.	The water allocation system is effective and permits are being complied with.	Proportion of water allocation permit holders complying with permit conditions.	%. From monitoring visits the number not complying with conditions divided by the total number of visits.	N/I	All permit holders to have meters and submit monthly returns EMA reorganisation in progress to issue discharge permits
	The Pollution control system is effective and permits are being complied with.	Proportion of water pollution permit holders complying with permit conditions.	%. From monitoring visits the number not complying with conditions divided by the total number of visits.	N/I	System based on self-monitoring. Penalties are charged if monitoring reports are not submitted

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
	Knowledge of water resource availability is a basis for management.	Number of water resource monitoring stations producing reliable data.	Number. Number of stations with reliable data records. Minimum required network	Approximately 20 hydrometric of which 6 stations also produce run-off data estimated to be in operation in the Buzi River Basin. 4 rainfall stations 2 evaporation stations	A lot of data exists in hard copy, requires digitisation
		Total water storage capacity.	M^3. The water storage capacity in artificial storage structures above a minimum size (say 5,000 M^3).	No other major dams in Buzi (sub zones FB, FUZ, FLS, FM1/2)	Small dams in the Budzi system have a net capacity of about 3,126m^3 and include the Bangazaan dam on the Budzi and Chako dams on the Chinyika river.
		% groundwater monitoring stations with declining water levels.	%. Comparison of water levels over a 5 year period.	N/I	
ECONOMIC AND FINANCIAL MANAGEMENT Applying economic and financial tools for cost recovery and behaviour change to support the goals of equitable access and sustainable benefits to society from water use.	Water use efficiency improving through use of economic and financial instruments.	Charges and Tariffs for water allocation favour the poor and efficient water use.	Review. Examine for the application of economic and financial tools in water allocation.	Differentiated water pricing is practised. Raw Water use below a certain threshold is free	
		revenue received not less than cost of the water.	%.Cost recovery Total revenue divided by the total amount billed.	N/I	
	Pollution reducing through use of economic and financial instruments.	Pollution charges give incentive to reduce pollution.	Review. Examine for the application of economic and financial tools in water pollution.	A system of fees, penalties and spot fines is in place	
		% revenue received.	%. Total revenue divided by the total amount billed.	N/I	
INFORMATION MANAGEMENT Provide essential	Essential information is	Data base is established	Review.	Raw data archived at catchment office. Although some older software exists at	Data analysis and management only at national level at the ZINWA Data and Management Department.

Function	Water Management Objectives	Progress indicator	Unit/ definition	BASE LINE	COMMENT
data necessary to make informed and transparent decisions for development and sustainable management of water resources in the basin.	processed and packaged at the right level for managers and stakeholders to support transparent decision making and to gain political support for the decisions made.	in formats compatible with other river basin organisations.	Data base is transferable across basins in the country and for transboundary systems.	ZINWA Save the management of geographically based data and information is today only available on the national level.	GIS-based knowledge and information system exist at the central level. HYDSTRA not yet installed EKIS to improve water management when installed
		Water management information is available to managers and other stakeholders as required.	Review. Examine availability of basin data and reports on water resource management indicators.	Yes. Key data also compiled in the Save River Outline Plan	Water usage to be monitored against water availability by sub-zone
STAKEHOLDER PARTICIPATION Implement stakeholder participation as a basis for decision making that takes into account the best interests of society and the environment in the development and use of water resources in the basin.	Effective cooperation between government agencies with responsibilities for water management or water use in the basin.	Number of meetings of Government agencies with water interests to consult and collaborate on water management.	Number. Number of formal or ad hoc meetings at interagency level.	Formal meetings at interagency level through Save Catchment Council.	Practical problems still exist with adequate presence of the right representatives from other ministries.
	Stakeholder participation is institutionalised in the management of the river basin.	Formal stakeholder structures established with clear roles and responsibilities in water resources management.	Review. Examine basin water management structure for stakeholder organisations and allocated management roles.	Formal stakeholder structures established with clear mandate and decision making power i.e. Odzi and Budzi SCCs.	Recent economic challenges have affected effectiveness of stakeholder participation
		Basin stakeholders (male and female) represented in decision making bodies at all levels.	Number. Representatives from stakeholders serving in government water management structures.	Yes	

Table 7. Additional suggested indicators.

Function	SUGGESTED	SUGGESTED PROGRESS INDICATOR	SUGGESTED UNIT	VALUE
FLOOD AND DROUGHT MANAGEMENT Operating floods and droughts to mitigate and minimise harm to humans, environment and economic values.	Knowledge of inundation areas for different flood magnitudes	Length of river analysed for flood inundation (flood frequency, hydraulic studies and topographical surveys)	All flood prone areas mapped and analysed per river	Yes there is satisfactory knowledge on inundation curves gathered from empirical data.
	Real-time Functioning flood warning system	Number of forecasts or warnings issued for floods	Number Weekly publications in public media (daily during extreme conditions)	Early warning system in place
	Functioning drought warning system	Number of forecasts or warnings issued for low flows and Annual Hydrological Reports	Number Periodic electronic and print media reports	N/I
WATER INFRASTRUCTURE DEVELOPMENT Design, construction and maintenance of works	Increase storage volume and regulatory functions of the river	Number of Project Feasibility studies Funds raised Number of Projects implemented Operation and maintenance (O&M)	Review of evidence	No on-going investments. Mirror dam on the Budzi River planned for irrigation. O&M not undertaken at an adequate level at the moment due to lack of operational funds
GENDER MAINSTREAMING Women involvement in decision making and water management	Women shall be fully involved in the development and implementation of policies, processes and management of development programs at all levels	% participation of women in water affairs at all levels; % of involvement of women in the provision of water and sanitation services	**%** of professional staff and technicians that are women % of women representation in stakeholder organisations	35-40 of which approximately 28 in technical/financial departments. Two of the technical staff members are women
HIV/AIDS MAINSTREAMING National policies on HIV/AIDS response institutionalised	HIV/AIDS policy in place and implemented Staff trained and familiar of HIV/AIDS policies , rights and obligation as well as access to prevention and counselling procedures	Policy in place; % of staff trained; % of staff with access to prevention and counselling procedures as provided for in policy	Yes or No %	Human resources department responsible for HIV/AIDS training at ZINWA Save. Degree of practical implementation uncertain.