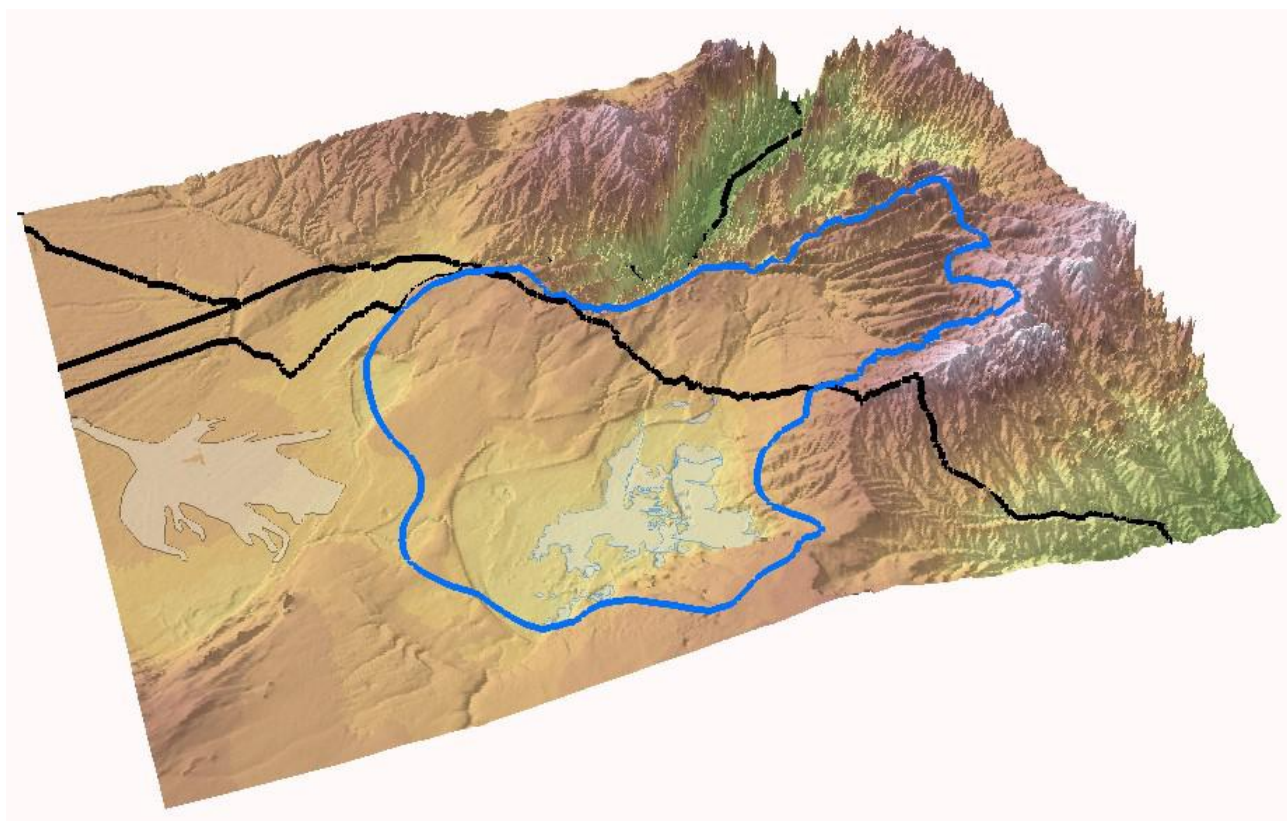




Strategic Action Plan of the Eastern Kalahari-Karoo Basin Aquifer system



**Water Resources Management Research in the Eastern Kalahari
Karoo Basin Transboundary Aquifer (EKK-TBA)
ZA-SADC-GMI-114839-CS-QCBS**

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EXECUTIVE SUMMARY

Introduction

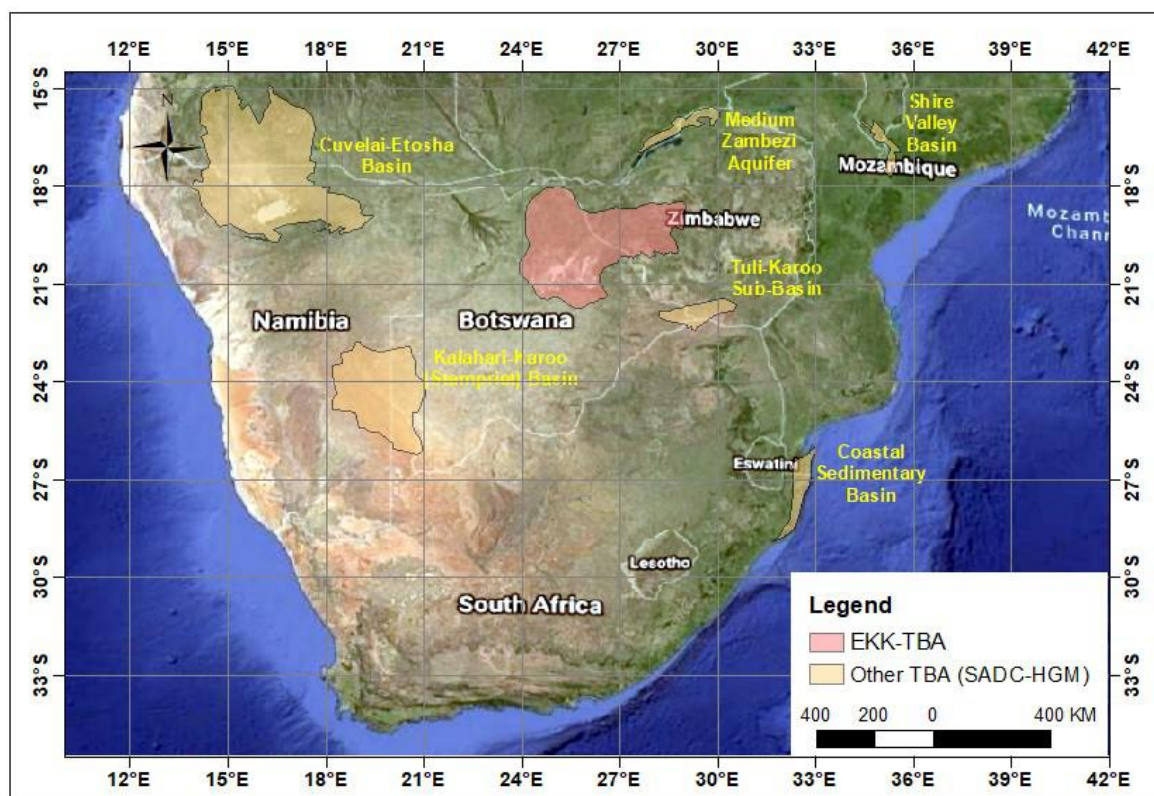
Most of the population in Southern Africa is reliant on groundwater for basic needs among other needs. Many aquifers from which groundwater is abstracted in the region constitute transboundary aquifers. The Eastern Kalahari Karoo Transboundary Basin Area (EKK-TBA) is one of more than 30 transboundary aquifers delineated in the Southern Africa Development Community (SADC). The EKK-TBA shared between Botswana and Zimbabwe is a key source of groundwater. Known to support key economic activities such as mining, tourism and farming, the EKK-TBA is significant in anchoring GDP growth and development in both Botswana and Zimbabwe. Notably, the EKK-TBA basin relies heavily on groundwater to anchor such growth and development. Growing demand across sectors increases pressure on freshwater resources in the region which is further exacerbated by climate change and climate variability. This increases the potential risk of water insecurity in the transboundary basin, requiring that action for sustainable management of the freshwater resources be taken to ensure that current and future needs are adequately met/planned for, while simultaneously helping to avert potential conflict between users in the two riparian countries. However, actual cooperation on the ground on SADC's shared aquifers is currently low (Lautze and Giordano, 2005; Saruchera and Lautze, 2016), despite the seemingly prolific activity in transboundary water cooperation and River Basin Organisation (RBO) development in Africa in general and SADC in particular.

The SADC GMI EKK-TBA Research

As part of the project "Sustainable Groundwater Management in SADC Member States" funded by the Global Environment Facility (GEF) and the Multi Donor Trust Fund Corporation in International Waters in Africa (CIWA) through the World Bank, the SADC Groundwater Management Institute (SADC-GMI) commissioned research on the management of water resources in the EKK-TBA. The Strategic Action Plan (SAP) forms a specific output of the research aimed at setting out the strategic roadmap with action areas towards addressing key issues and challenges to water security identified through the research (specifically the Transboundary Diagnostic Analysis-TDA and Hydrogeological Reports).

A key principle governing the development of the SAP is that Optimal transboundary water management results from taking integrated and conjunctive approaches that optimize water use across a diversity of water resources and scales. Incorporating diverse water sources into transboundary water management frameworks can expand the range of cost-effective and sustainable solutions for the riparian states.

The EKK_TBA project aimed to provide a basis for enhancing and strengthening the understanding and the establishment of a platform for joint management of the EKK-TBA. The specific objective of the project was to enhance the capacity in SADC and its member states to collaboratively manage integrated groundwater and surface water resources. In particular, the project identified key issues and solutions towards the achievement of equitable and sustainable water use, and build upon lessons learned from the Shire (Malawi and Mozambique), Tuli Karoo (Botswana, South Africa and Zimbabwe) and Kalahari-Karoo or Stampriet (Botswana and Namibia) Transboundary Aquifer Systems.



The project ran from April 2020-November 2020. The approach to advancing joint management of the resource across the two countries was pursued through:

- a) Undertaking a Transboundary Diagnostic Analysis (TDA) – which helped to gather state of knowledge in the shared basin and identify priority issues
- b) Strategic Action Plan (SAP) – developed into this document, following a range of stakeholder engagements across relevant sectors and actors (government, civil society, private sector and academia/research)
- c) Knowledge management and research results – involving sharing or dissemination of research findings across various platforms including seminars and online platforms

The SAP report is a result of an inclusive stakeholder engagements throughout the study as various actors were reached for inputs during the research study, helping to validate the study while creating ownership and buy-in.

Key Issues: The Technical Diagnostic Analysis (TDA)

The TDA presented a scientific and technical assessment, through which water-related environmental issues and problems of the basin were identified and prioritised, their causes and impacts analyzed, both environmental and economic. The TDA provides a technical basis for the development of a Strategic Action Plan (SAP). The TDA formed part of a facilitative process that involved key stakeholder engagement and consultation from both Botswana and Zimbabwe.

Keys issues that emanated from the TDA include (SADC-GMI, 2020):

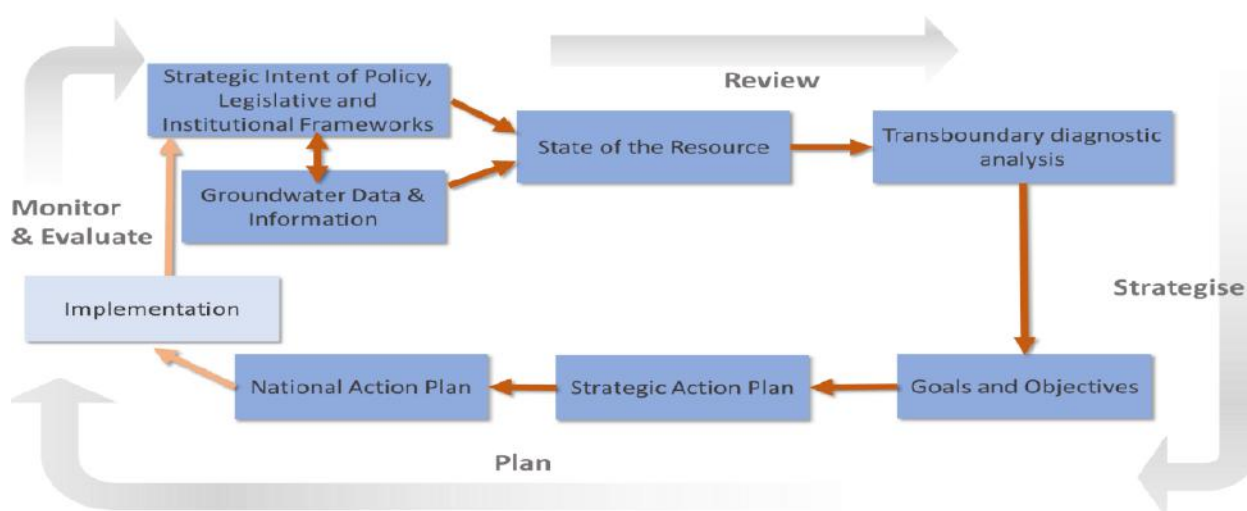
- Data and databases:
 - Data unavailability/scarcity and inaccessibility (especially from Zimbabwe) and poor quality (accuracy and gaps)
 - Lack of good quality hydro(geo)logical databases and limited standardisation of data and information
- Water insecurity:
 - Projected decline in rainfall, high interannual rainfall variability and increasing temperature
 - Upconing of saline groundwater and intrusion into shallower and lower salinity aquifers
 - Potential water related conflicts could ensue in the EKK-TBA between water users
- Groundwater management:
 - Lack of adequate resources to carry out effective and efficient groundwater management (e.g. monitoring, uncontrolled drilling, etc.)
 - Groundwater over-exploitation: water demand for domestic water use currently exceeds supply; water supply in mining is demand driven and negates sustainability of supply
 - Unregulated borehole drilling posing a risk to groundwater overexploitation and unwarranted competition of the groundwater resource.
 - Inadequate use of innovative technologies: remote sensing has been proven to be an alternative tool that can be used in the timely determination of

active crop areas and the crop water requirements in the EKK-TBA and consequently, the amount of groundwater used.

- Biodiversity: the EKK-TBA is endowed with a rich biodiversity which is critical to the countries' economies and the livelihoods of the basin communities and needs to be better protected
- Deforestation and poor agricultural practices are resulting in rapid land degradation
- The EKK-TBA boundary asymmetry adds additional complexity to the governance challenges (OKACOM and ZAMCOM)
- Lack of political will and improved regulation hampering enforcement of government laws, policies, and regulatory instruments
- The EKK-TBA population needs to be properly quantified in order to determine the risks and opportunities that arise from the available natural resources

The SAP Development Process

Developing the SAP for joint and sustainable water resources management in the EKK-TBA was achieved through stakeholder dialogue to forge consensus on prioritization of issues and actions.



The SAP preparation involved a consultative SWOT analysis of issues along with further national and regional workshops. The SAP process involved developing consensus on:

- a) Long-term vision, mission, along with objectives and actions for the shared EKK-TBA
- b) Setting sustainable GW management goals and criteria
- c) Assessing the acceptability and feasibility of the options against GW management goals and existing institutional frameworks

- d) Setting short-term targets and priority actions based on costs and feasibility
- e) Drafting the SAP in consultation with national and regional stakeholders

Underpinning the joint transboundary SAP were the respective National Action Planning sessions held in Botswana (virtually) and Zimbabwe (Bulawayo) to frame national inputs towards the joint SAP. A regional validation workshop helped to maximise joint participation and acceptance by both Botswana and Zimbabwe, while ensuring cooperation from the two River Basin Organisations (OKACOM and ZAMCOM) that traverse the TBA.

Vision, Mission, Objectives and Actions of the SAP

The core elements of the SAP for joint management of the basin include a shared vision and mission, four objectives, and 19 actions. These were generated by consensus from key informant interviews and validated through national and regional workshops. The figure below is a summary:

Vision

•Integrated and sustainable water resources management of the EKK-TBA for a secure and resilient water supply for the benefit of all

Mission

•Enhanced sustainable development, utilisation, and management of the transboundary aquifer through effective collaboration and equitable allocation

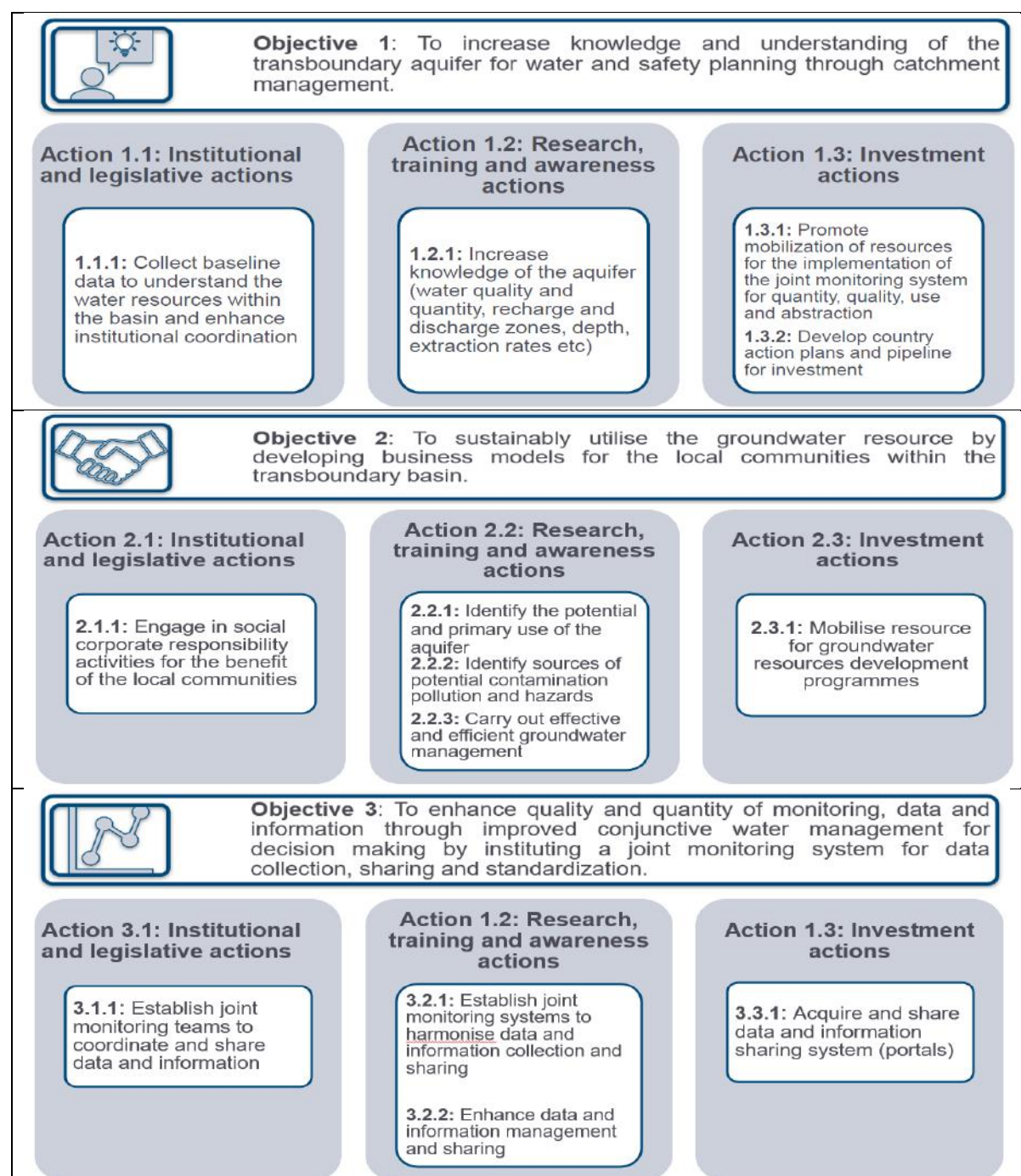
Objectives

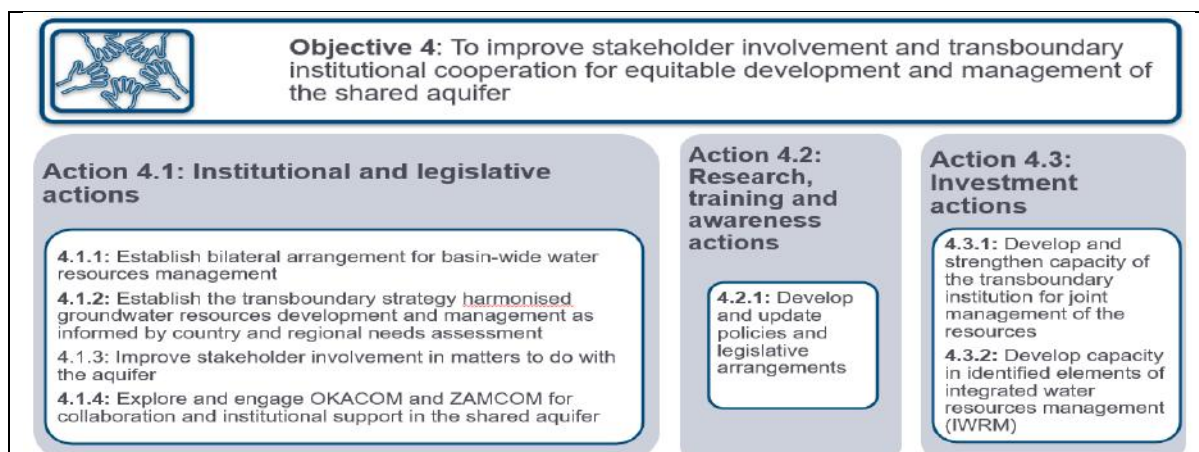
- Objective 1:** To increase knowledge and understanding of the transboundary aquifer for water and safety planning through catchment management.
- Objective 2:** To sustainably utilise the groundwater resource by developing business models for the local communities within the transboundary basin.
- Objective 3:** To enhance quality and quantity of monitoring, data and information through improved conjunctive water management for decision making by instituting a joint monitoring system for data collection, sharing and standardization.
- Objective 4:** To improve stakeholder involvement and transboundary institutional cooperation for equitable development and management of the shared aquifer

Strategic Actions. For each of the objectives, strategic actions were categorised into three namely:

- Institutional and legislative
- Research, training and awareness
- Investment

These are represented in summary figure below depicting how each of the objectives would be achieved. The SAP report goes on to detail these actions along with identifying indicators that will be used to measure progress.





The SAP identifies 6 joint priority actions for the joint management of the EKK-TBA water resources as follows:

- **Action 1:** Establish bilateral institutional arrangements for coordination and cooperation on basin-wide water resources management
- **Action 2:** Identify areas for joint study and research to understand the water resources within the basin and increase knowledge of the aquifer
- **Action 3:** Develop data sharing arrangements between the two Member States considering the existing SADC and RBO relevant protocols on data sharing.
- **Action 4:** Establish joint monitoring systems to harmonise data and information collection and sharing
- **Action 5:** Promote joint proposals to mobilise funds for specific projects within the transboundary basin for activities related to sustainable resources management and livelihoods improvement.
- **Action 6:** Develop capacities of personnel involved in collecting and researching information related to conjunctive surface and ground water management including quality and quantity issues.

These priority actions are the basis for the roadmap for implementation of the SAP which has been described in detail in chapter 5 of this SAP report. It is envisaged that once actors in the basin take on the action as recommended, the EKK-TBA will be on its way to ensuring sustainable management of its freshwater resources for better water security and equitable development in both countries.

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ACRONYMS

EKK-TBA	Eastern Kalahari Karoo Transboundary Aquifer
MAR	Managed Aquifer Recharge
RBO	River Basin Organisation
SAP	Strategic Action Plan
SADC	Southern African Development Community
SADC-GMI	SADC Groundwater Management Institute
TDA	Transboundary Diagnostic Analysis

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Cover: Digital Elevation Model of the Eastern Kalahari-Karoo Transboundary Aquifer system

1. INTRODUCTION

1.1. Background

Most of the population in Southern Africa relies on groundwater for basic needs, and several aquifers from which groundwater is abstracted constitute transboundary aquifers. A growing body of work has identified and delineated more than 30 transboundary aquifers (TBAs) in the Southern African Development Community (SADC) and many more in Africa as a whole (Altchenko and Villholth, 2013). As freshwater resources in the SADC region increasingly come under pressure from growing demand within the context of climate change and increased climate variability, the sustainable management of this important resource becomes critical in underpinning the equitable and inclusive development of the resource.

The need for cooperation through joint management of shared water resources is important in promoting harmonious utilization of the resource and helping to minimize the potential risk of conflict over resource use. The joint management of these aquifers holds the potential to foster progress towards regional socio-economic development goals including strengthening of resilience to climate change and variability, improving agricultural production, enhancing water security and achieving sustainable economic growth. One such aquifer in the SADC region is the Eastern Kalahari Karoo Transboundary Aquifer (EKK-TBA) - shared between Botswana and Zimbabwe. The EKK-TBA is significant in anchoring Gross Domestic Product growth and development in both countries (through sectors such as mining, tourism, agriculture, etc.) is heavily reliant on groundwater. However, despite the seemingly prolific activity in transboundary water cooperation and River Basin Organisation (RBO) development in SADC, actual cooperation regarding SADC's shared aquifers is currently limited (Lautze and Giordano, 2005; Saruchera and Lautze, 2016). This is also the case for the EKK-TBA.

Experience from SADC suggests that it is mostly advisable to scale up groundwater management in the context of a systems approach where multiple sources of water and ecosystems are considered and are holistically managed. For instance, harnessing subsurface capacities to store seasonal excess surface water resources (artificial recharge) or treated wastewater may provide hitherto un(der)explored solutions to increase resilience and water security. Further, failing to include groundwater in conjunctive surface water frameworks may undermine attempts to manage the surface water effectively and efficiently since surface water and groundwater are part of the same hydrologic cycle.

1.2. The EKK TBA WRM Research Project

The SADC Groundwater Management Institute (SADC-GMI) commissioned research on the management of water resources in the EKK-TBA. This research formed part the project “Sustainable Groundwater Management in SADC Member States” funded by the Global Environment Facility and the Multi Donor Trust Fund Corporation in International Waters in Africa through the World Bank. This report is the Strategic Action Plan which is a specific output of the project focused upon providing a suite of strategic actions to strengthen the management of the EKK-TBA.

Optimal transboundary water management results from taking integrated and conjunctive approaches that optimize water use across a diversity of water resources and scales. Incorporating diverse water sources into transboundary water management frameworks can expand the range of cost-effective and sustainable solutions for the riparian states. An example is where an aquifer is considered as a storage solution to enhance water security for both drinking water supply and small-scale crop cultivation during dry spells and drought periods. Another example is where shallow groundwater systems are used, through managed aquifer recharge (MAR), to store freshwater on top of saline groundwater for use at a later stage when needed, or where they support natural attenuation and purification of wastewater – at national and/or transboundary scales. Issues of pollution in MAR schemes, however, always requires expert consideration and specific management responses.

The Water Resources Management Research Project in the EKK-TBA aims to provide a basis for enhancing and strengthening the understanding and the establishment of a platform for joint management of the EKK-TBA. The specific objective of the project is to enhance the capacity in SADC and its member states to collaboratively manage integrated groundwater and surface water resources. In particular, the project identifies issues and solutions that support the achievement of equitable and sustainable water use, and will build upon lessons learned from the Shire (Malawi and Mozambique), Tuli Karoo (Botswana, South Africa and Zimbabwe) and Kalahari-Karoo or Stampriet (Botswana and Namibia) Transboundary Aquifer Systems (SADC-GMI, 2019a, 2019b; UNESCO, 2016) (**Error! Reference source not found.**).

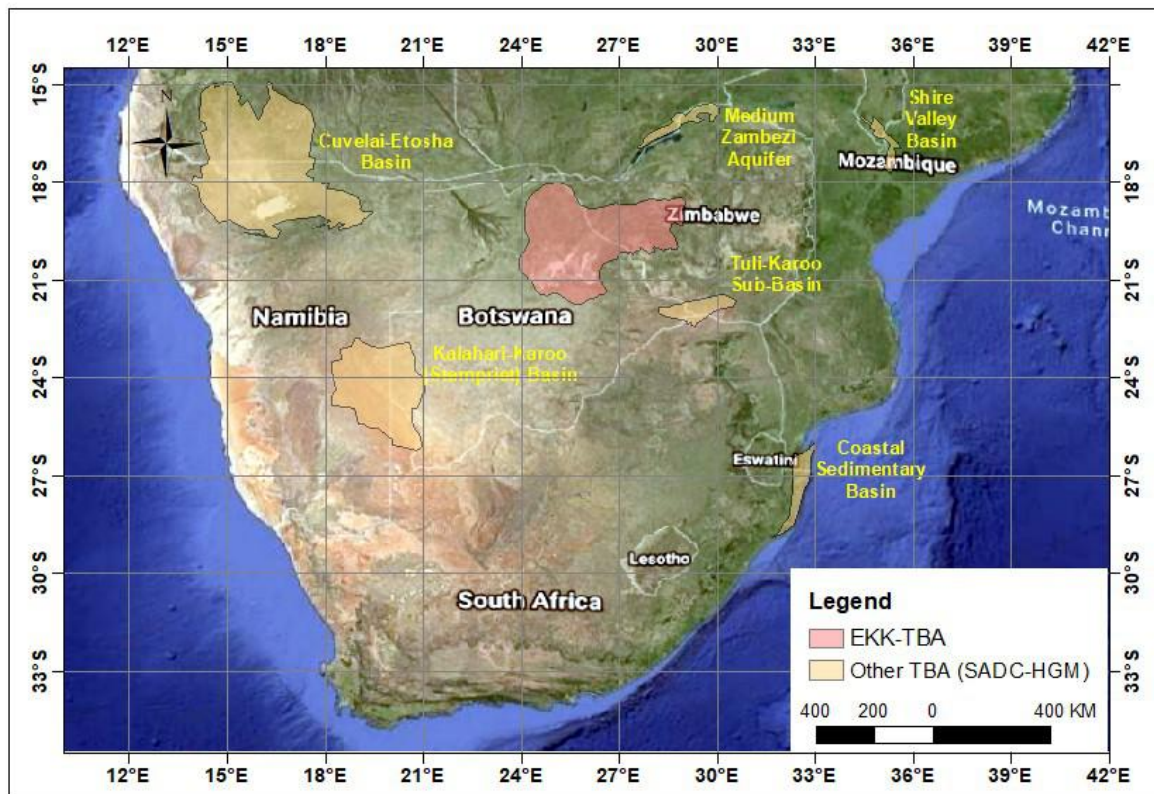


Figure 1: Transboundary Basin Aquifers in Southern Africa
Source: SADC, (2010)

Supporting cross-border water management in the EKK-TBA system has been pursued through a three-pronged approach in this research project involving:

- a) **Transboundary Diagnostic Analysis (TDA):** The TDA was conducted to gather the state of knowledge in the EKK-TBA to facilitate identification of priority issues and establish the way forward.
- b) **Strategic Action Plan (SAP):** The SAP, which is this document, is the result of stakeholder dialogues to understand relevant issues and forge consensus on the joint management of water resources in the TBA. This involved performing a joint (regional) Strategic Action Plan for enhanced national and transboundary water management of the EKK-TBA.
- c) **Knowledge Management and Research Results:** The resulting knowledge products from the research are to be made available on a range of platforms including the SADC-GMI website, as well as through online seminars to facilitate the sharing of experiences of the EKK-TBA as a case study.

The project ran from April through November 2020 under the auspices of the SADC-Groundwater Management Institute (SADC-GMI). A wide range of organizations contributed to the project such as: the Department of Water and Sanitation, Botswana (DWS-BW), University of Botswana (UB), Ministry of Lands, Agriculture, Water and Rural Resettlement (MLAWRR), Zimbabwe, the Zimbabwe National Water Authority (ZINWA) and the River Basin Organisations Permanent Okavango River Basin Water Commission (OKACOM) and the Zambezi Watercourse Commission (ZAMCOM). SADC-GMI was the contracting partner and financier who played an important role in facilitating engagement with national partners, the organisation of virtual meetings and workshops (Annex 4) and review of project documents.

1.3. The SAP development process

This report aims to present the strategic course of actions to address key issues identified as challenges to water security in the basin, through the Transboundary Diagnostic Analysis (TDA) process. It draws from the understanding established through research on the current state of the surface and groundwater resources in the EKK-TBA System, their uses, spatial and temporal variability, interactions, and impacts as well as human benefits derived from various ecosystem services and existing infrastructure. The SAP report draws from issues and recommendations captured in the TDA report of the EKK-TBA (SADC-GMI, 2020) and the Hydrogeological Report of the EKK-TBA (SADC-GMI, 2020). Critical to the SAP development is the range of stakeholder consultations undertaken including key informant interviews, national workshops and the regional validation workshop. The SAP provides the roadmap for actioning the joint and sustainable management of surface and groundwater resources in the EKK-TBA basin -to be achieved through a common vision, objectives, and strategic actions and activities.

The SAP report is the result of an inclusive, joint effort among stakeholders of the EKK-TBA in Botswana and Zimbabwe. It draws from issues in the TDA and hydrogeological analyses/reports that focus on:

- a) The full EKK-TBA which is now a threefold expansion of the original area, including major wellfields in both Botswana and Zimbabwe for both domestic (urban and rural), agricultural and industrial water supply and mining activities
- b) Precious environmental assets such as water for wildlife and tourism including the Makgadikgadi Pans and Hwange National Park

c) Surface water and groundwater

There have been other research investigations on different aspects of water management in the EKK-TBA. In Botswana, the Department of Water and Sanitation (DWA, 2000) and Debswana (2015; 2020) carried out detailed studies of wellfields in the Orapa, Letlhakane, Dukwi, Chidumela and Maitengwe areas, whereas ZINWA (Beekman and Sunguro, 2015) studied in detail the Nyamandlovu area and wellfield in Zimbabwe along the south-eastern margin of the EKK-TBA. WWF (2019) recently concluded a hydrogeological study on the Hwange National Park. Research efforts in the past heavily focused on the margin of EKK-TBA. The added value of this current assessment linked to this EKK-TBA SAP is that it is water-source-inclusive and integrating knowledge on portions of the basin in both countries.

1.4. Structure of the SAP Report

The structure of the SAP Report contains the following chapters:

- a) **Introduction:** Provides the broader project context and outlines the purpose of the project and this report.
- b) **Key issues from the TDA:** Highlights the central challenges that threaten the status of the EKK-TBA and the ability of the Member States and other institutions to ensure sustainable groundwater management.
- c) **Methods of SAP Development:** Outlines the process to develop the SAP.
- d) **SAP Vision, Mission, Objectives and Actions:** Provides the strategic results framework for the SAP.
- e) **Roadmap for Implementation:** Describes the next steps that underpin the implementation of the SAP.

2. KEY ISSUES FROM THE TRANSBOUNDARY DIAGNOSTIC ANALYSIS

The TDA presented a scientific and technical assessment, through which water-related environmental issues and problems of the basin were identified and prioritised, their causes and impacts analyzed, both environmental and economic. The TDA provides a technical basis for the development of a Strategic Action Plan (SAP). The TDA formed part of a facilitative process that involved key stakeholder engagement and consultation from both Botswana and Zimbabwe.

The EKK-TBA extends from eastern Botswana into western Zimbabwe, is mainly located between latitudes 17° S and 22° S and longitudes 23° E and 29° E and covers approximately 127 000 km², of which 65% is in Botswana and 35% is in Zimbabwe. The EKK-TBA system was redefined from an original size of 34 000 km² and now straddles two river basins: Okavango and Zambezi, which calls for joint governance and management efforts (**Error! Reference source not found.**). The topography of the EKK-TBA is generally flat and ranges between 750 and 1 300 m amsl. The climate is semi-arid with rainfall occurring between October and April, and July and August being the driest months. Low temperatures occur in July while high temperatures are in October. Surface water drainage is through the ephemeral Boteti and Nata Rivers in Botswana and Zimbabwe respectively towards the Makgadikgadi Pans and through the Gwayi River in the eastern part of the EKK-TBA in Zimbabwe towards the Zambezi River.

The basin's population stands at about 523 000 (Botswana: 83 062 and Zimbabwe: 439 796), revised from an original estimated population of 240 000. Close to 50% of the Botswana's EKK-TBA population is accounted for by the villages of Letlhakane and Tutume whilst close to 85% of the Zimbabwe's EKK-TBA population is from Matabeleland North Province. The literacy rates for Botswana and Zimbabwe are 90% and over 95% respectively. Unemployment rates were estimated at about 50% for Botswana and 20% for Zimbabwe. Apart from few wards from the northern outskirts of Bulawayo City, there are no major cities within the basin except for the towns of Nata, Sowa and Orapa (Botswana) and Tsholotsho, Kusile and Nkayi (Zimbabwe). The basin's economy is mostly driven by diamond mining (Botswana), ecotourism and agriculture (Botswana and Zimbabwe). Agriculture in the form of livestock ranching and cropping is important to the communities' livelihoods, with irrigated agriculture taking place in the Pandamatenga area in Botswana and the Nyamandlovu area in Zimbabwe.

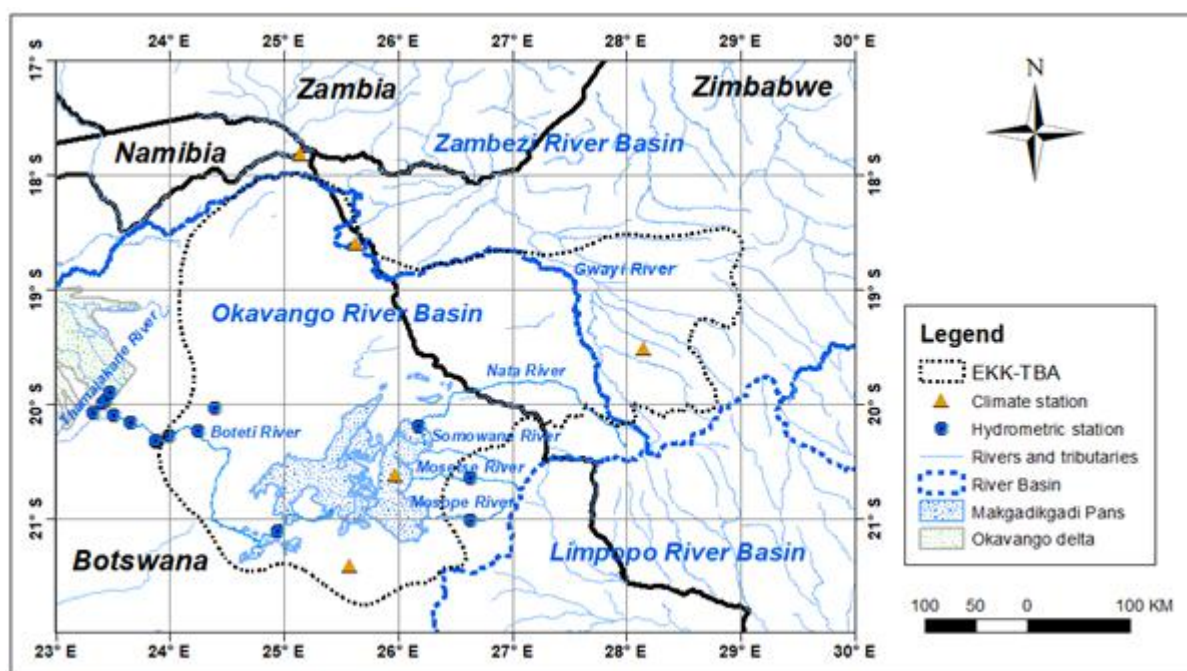


Figure 2: Surface water drainage in the EKK-TBA

The EKK-TBA is endowed with a rich biodiversity represented by the Hwange, Makgadikgadi and Chobe National Parks and several wildlife management areas and forests. The basin is home to around 400 bird species, more than 100 animal types and is habitat to one of the world's largest population of elephants, estimated at around 50 000. The basin's population relies on wood for fuel and this is causing massive deforestation and land degradation. The situation is exacerbated by an over-population of elephants.

Groundwater forms the main source of potable water supply within the basin for both humans and animals. Shallow aquifers are constituted by the Kalahari Sand whereas the main aquifers are the deep Ntane/Forest Sandstone and the Mea Arkosic Sandstone. Wellfields (e.g. Dukwi, Letlhakane, Maitengwe, Nyamandlovu and Orapa) have been developed along the fringes of the basin where the sandstone aquifers outcrop and are recharged from rainfall, with the groundwater being generally fresh (**Error! Reference source not found.**). The groundwater becomes highly saline with increasing depth and movement towards the central portions of the basin. The groundwater flows southwest and southwards and is discharged in the Makgadikgadi Pans in Botswana. The Ntane/Forest Sandstone is overlain by a thick Karoo basalt which makes drilling into the underlying sandstone very difficult and costly, hence most rural water supply boreholes are drilled into the Kalahari Sand which overlies the basalt. Water availability is a major challenge in the basin and the demand is outstripping the supply for both human and wildlife. The water supply for mining operations within the Botswana side of the EKK-TBA is demand driven and pays little to no attention to the sustainability of the resource.

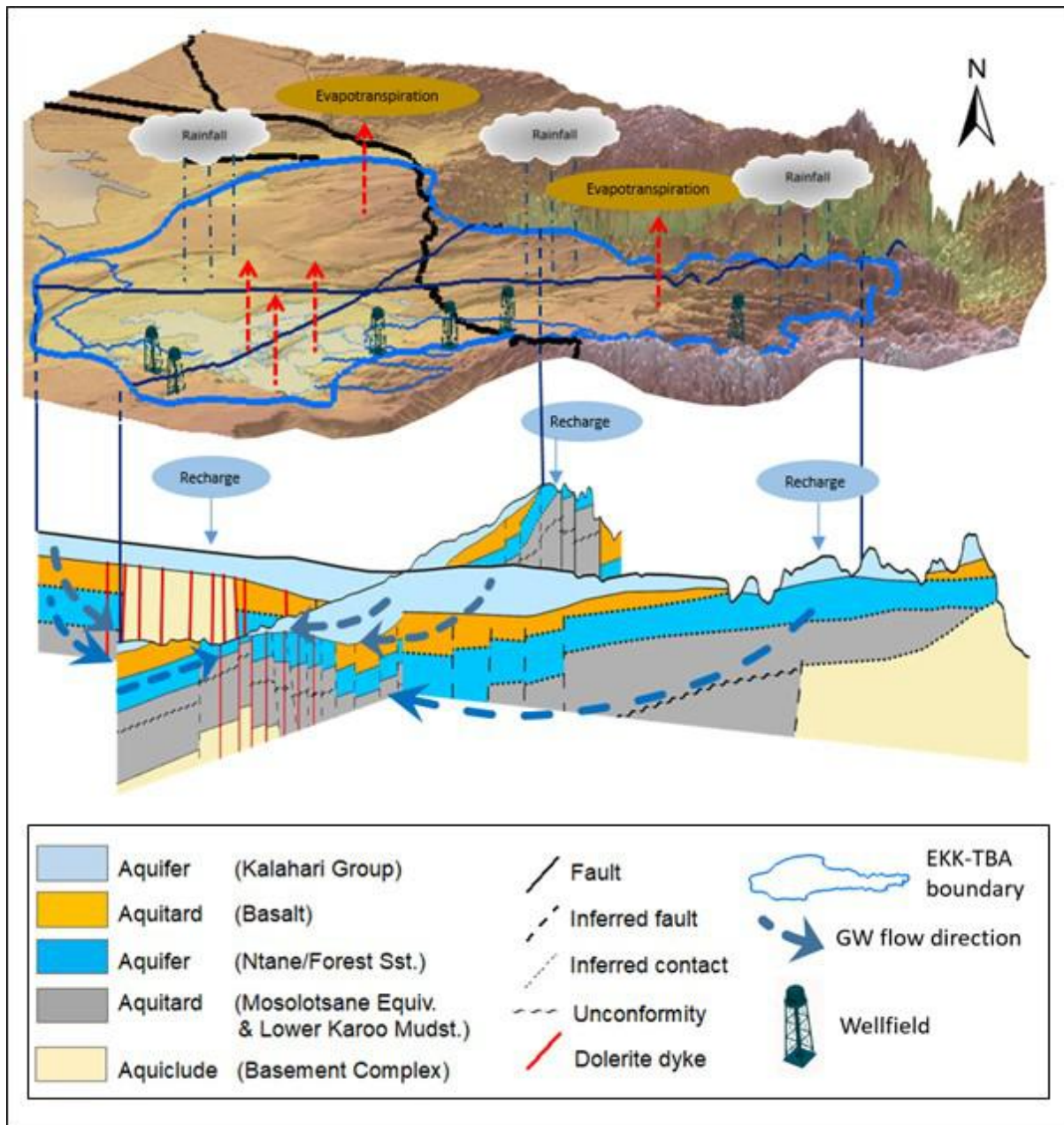


Figure 3: Conceptual hydrogeological model of the EKK-TBA (SADC-GMI, 2020)

Climate variability and change is affecting the EKK-TBA through increasing temperatures, decline in rainfall and high interannual rainfall variability and these trends will impact the availability of water resources, particularly surface water and shallow groundwater. Climate variability and change will exacerbate the harmful effects of poor land-use practices, notably deforestation and overgrazing. Hence the urgent need to establish resilient and adaptation strategies that combat the effects of climate variability and change. The applicability of remote sensing in estimating crop water use in the Nyamandlovu area of the EKK-TBA (where historic data for validation of the remote sensing simulations exists) was tested and established to be a promising tool in estimating the cropped land and the crop water use and can thus be incorporated in groundwater management strategies.

Keys issues that emanated from the TDA include (SADC-GMI, 2020):

- Data and databases:
 - Data unavailability/scarcity and inaccessibility (especially from Zimbabwe) and poor quality (accuracy and gaps)
 - Lack of good quality hydro(geo)logical databases and limited standardisation of data and information
- Water insecurity:
 - Projected decline in rainfall, high interannual rainfall variability and increasing temperature
 - Upconing of saline groundwater and intrusion into shallower and lower salinity aquifers
 - Potential water related conflicts could ensue in the EKK-TBA between water users
- Groundwater management:
 - Lack of adequate resources to carry out effective and efficient groundwater management (e.g. monitoring, uncontrolled drilling, etc.)
 - Groundwater over-exploitation: water demand for domestic water use currently exceeds supply; water supply in mining is demand driven and negates sustainability of supply
 - Unregulated borehole drilling posing a risk to groundwater overexploitation and unwarranted competition of the groundwater resource
 - Inadequate use of innovative technologies: remote sensing has been proven to be an alternative tool that can be used in the timely determination of active crop areas and the crop water requirements in the EKK-TBA and consequently, the amount of groundwater used
- Biodiversity: the EKK-TBA is endowed with a rich biodiversity which is critical to the countries' economies and the livelihoods of the basin communities and needs to be better protected
- Deforestation and poor agricultural practices are resulting in rapid land degradation
- The EKK-TBA boundary asymmetry adds additional complexity to the governance challenges (OKACOM and ZAMCOM)
- Lack of political will and improved regulation hampering enforcement of government laws, policies, and regulatory instruments
- The EKK-TBA population needs to be properly quantified in order to determine the risks and opportunities that arise from the available natural resources
-

3. SAP DEVELOPMENT PROCESS

The development of the SAP for joint and sustainable water resources management in the EKK-TBA was achieved through stakeholder dialogue to forge consensus on prioritization of issues emerging from the TDA. The methods deployed to develop the SAP involved dialogue with stakeholders in both countries, workshops at national level, a regional validation workshop, all aimed at gaining consensus on the agreed course of action for joint management of the shared basin. The tasks undertaken towards the SAP were as follows:

3.1. SWOT analysis, National Workshops and the SAP

The development of the SAP deployed a SWOT analysis for the EKK-TBA water resources management. This was achieved in consultation with government representatives and national experts with the aim to enhance national and transboundary water management of the EKK TBA. The SAP preparation involved:

- a) Developing a long-term vision, mission along with objectives and actions for the EKK TBA
- b) Setting sustainable groundwater management goals and criteria
- c) Assessing the acceptability of the options (both economic and political) against the groundwater management goals and existing institutional frameworks
- d) Setting short-term targets and priority actions based on costs and feasibility
- e) Drafting the SAP in consultation with national and regional stakeholders (**Figure 4**)

The final SAP was validated through stakeholder dialogues and consultations through national and regional workshops, as well as key informant interviews, following a co-production and co-decision stakeholder engagement process.



3.2. Regional validation workshop

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The section that follows discusses the detailed SAP following stakeholder dialogues to forge consensus on joint sustainable management of water resources in the EKK-TBA.

4. VISION, MISSION, OBJECTIVES AND ACTIONS

The core elements of the SAP include a shared vision, four objectives, and 19 actions. These actions were further contextualized by applying a set of categories to the actions for prioritisation. The prioritisation resulted in the refinement of the actions to six (6) priority actions. These actions will be further validated by the stakeholders at the regional validation workshop earmarked for 19th November 2020. A high-level graphical representation of the SAP is presented in Figure 5 in the form of a simplified theory of change. The goal, vision, mission, objectives and actions are illustrated.

4.1. Vision and Mission

Shared vision for the EKK-TBA: The shared vision for the EKK-TBA entails and covers the joint aspirations for the future of the shared water resources of stakeholders from Botswana and Zimbabwe. It highlights the importance of conjunctive water management through the mention of both surface water and groundwater and includes terms of “*integrated*”, “*sustainable*”, “*resilient*” and “*secure*” to promote sustainable development and integrated water resources management. Finally, the vision emphasizes the importance of the impact of transboundary cooperation on people living within the catchment by promoting the goals of improved livelihoods, and ultimately, socio-economic prosperity. The shared vision for the EKK-TBA is as follows:

Integrated and sustainable water resources management of the EKK-TBA for a secure and resilient water supply for the benefit of all

Mission statement for the EKK-TBA: The mission statement for the EKK-TBA entails collaborative and equitable allocation of the water resources for the benefit of the people and ecology of the transboundary aquifer. The shared mission statement for the EKK-TBA is as follows:

Enhanced sustainable development, utilisation, and management of the transboundary aquifer through effective collaboration and equitable allocation

Figure 5 below, provides a high-level visual representation of the EKK-TBA SAP

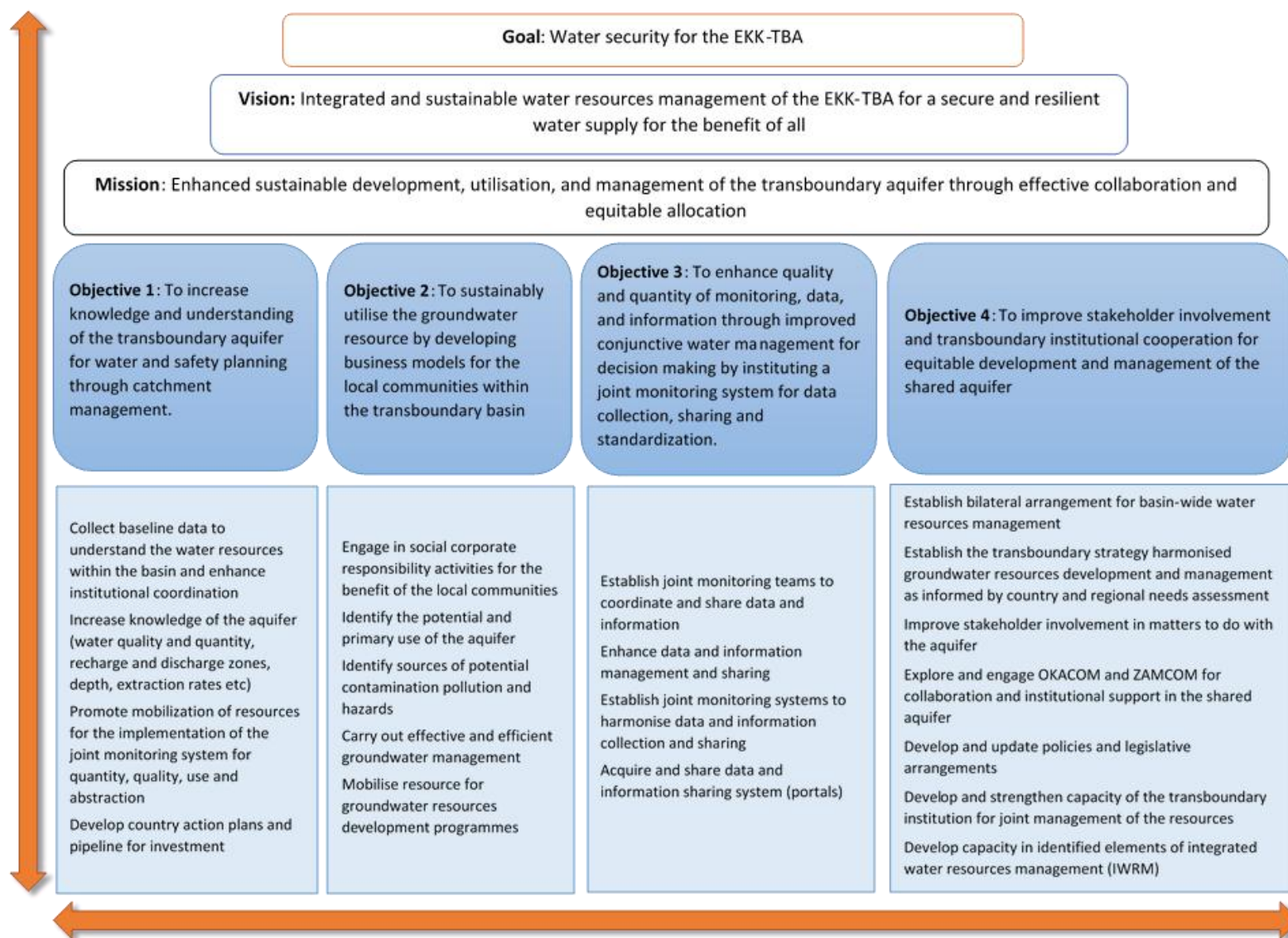


Figure 5: SAP overview

4.2. Objectives and Actions

OBJECTIVES

Objectives: The four objectives for the EKK-TBA cover a range of issues, highlighting a combination of knowledge, understanding, quality and quantity of joint data and information in objectives 1 and 3, to and improved institutional and international cooperation in objective 4, and sustainable utilisation of the resource for communities within the transboundary basin in objective 2. These four objectives cover a broad scope for action where the achievement of these objectives would contribute significantly to the principles of conjunctive water management. The process for generating and synthesizing objectives was iterative, as summarized in the methodology section and as appended in Annexure A. The resultant final four objectives are:

- Objective 1:** To increase knowledge and understanding of the transboundary aquifer for water and safety planning through catchment management.
- Objective 2:** To sustainably utilise the groundwater resource by developing business models for the local communities within the transboundary basin.
- Objective 3:** To enhance quality and quantity of monitoring, data and information through improved conjunctive water management for decision making by instituting a joint monitoring system for data collection, sharing and standardization.
- Objective 4:** To improve stakeholder involvement and transboundary institutional cooperation for equitable development and management of the shared aquifer

ACTIONS

Overview: Actions identified through the consultative process for the EKK-TBA SAP cover a broad scope of activities for improved water resources development and management. The key actions range from those aiming to address transboundary issues with joint actions to improvement in data and information sharing systems and teams, while others focus on the establishment of bilateral arrangements, improvements that should enhance current water resources development and management efforts, and mobilisation of resources. The full suite of actions for each of the objectives is presented in Table 1 whilst summaries narratives for each key objective are presented herein.

4.2.1. Actions for Objective 1

Actions for objective 1 are meant to improve knowledge and better understanding of the transboundary shared resource. The actions focus on collecting baseline data, increasing knowledge about the aquifer, promoting the mobilisation of resources for implementation of joint monitoring systems, and development of country action plans and project pipeline.

Objective 1: To increase knowledge and understanding of the transboundary aquifer for water and safety planning through catchment management

4.2.2. Actions for Objective 2

The actions for objective 2 shifts focus to the identification of sources of potential contamination, quantify and qualify potential and primary use, invest in corporate social responsibility, carrying out effective resource management, and mobilisation of resources for development programmes.

Objective 2: To sustainably utilise the groundwater resource by developing business models for the local communities within the transboundary basin.

4.2.3. Actions for Objective 3

Actions for objective 3 are meant to enhance the quality and quantity of data for improved conjunctive water resources management decision making. Many of the actions address the need to develop data sharing protocols and a portal to house the data while others focus on joint monitoring teams, and acquisition of data.

Objective 3: To enhance quality and quantity of monitoring, data and information through improved conjunctive water management for decision making by instituting a joint monitoring system for data collection, sharing and standardization.

4.2.4. Actions for Objective 4

Actions for objective 4 are meant to strengthen national and transboundary institutional cooperation and joint management of the aquifer. Most actions relate to the practical efforts

towards establishing bilateral arrangements, institutional collaboration, development, and harmonisation of relevant policies. The other actions aim to develop and strengthen capacity of transboundary institutions for joint management of the resources. This focus on institutional arrangements and joint planning is heavily supported by capacity building actions, including training in Integrated Water Resources Management (IWRM).

Objective 4: To improve stakeholder involvement and transboundary institutional cooperation for equitable development and management of the shared aquifer

The objectives and actions are summarised in Table 1, below.

Table 1: Summary of Actions and Indicators for the Objectives

OBJECTIVE	ACTIONS	INDICATORS
OBJECTIVE 1	1.1 Institutional and legislative actions	<ul style="list-style-type: none"> Establishment of water use stress levels and efficiency Assessment of water resource quality and quantity in the EKK-TBA completed. Establishment and utilisation of joint catchment management plan and guidelines created for the shared aquifer
	1.1.1 Collect baseline data to understand the water resources within the basin and enhance institutional coordination	
	1.2 Research, training and awareness actions	
	1.2.1 Increase knowledge of the aquifer (water quality and quantity, recharge and discharge zones, depth, extraction rates etc)	
	1.3 Investment actions	
	1.3.1 Promote mobilization of resources for the implementation of the joint monitoring system for quantity, quality, use and abstraction	
	1.3.2 Develop country action plans and pipeline for investment	
OBJECTIVE 2	2.1 Institutional and legislative actions	<ul style="list-style-type: none"> Number of interventions for livelihood improvements implemented by local committees at country level. Reduction in number of households affected by water-related scarcity and stresses in the basin. Reduction in water resource degradation and pollution Resources for improved management of the shared aquifer
	2.1.1 Engage in social corporate responsibility activities for the benefit of the local communities	
	2.2 Research, training and awareness actions	
	2.2.1 Identify the potential and primary use of the aquifer	
	2.2.2	
	2.2.3 Identify sources of potential contamination pollution and hazards	

		mobilised
	2.2.4 Carry out effective and efficient groundwater management	
	2.3 Investment actions	
	2.3.1 Mobilise resource for groundwater resources development programmes	
OBJECTIVE 3	3.1 Institutional and legislative actions	<ul style="list-style-type: none"> Signed Memorandum of Understanding on data sharing between the two Member States, Botswana and Zimbabwe. Number of exchange visits conducted to countries or shared watercourses that have successfully implemented data sharing programmes. Number of new monitoring stations established or existing ones improved to enable generation of weather and climate data. Development and utilisation of a data sharing portal between the two countries.
	3.1.1 Establish joint monitoring teams to coordinate and share data and information	
	3.2 Research, training and awareness actions	
	3.2.1 Enhance data and information management and sharing	
	3.2.2 Establish joint monitoring systems to harmonise data and information collection and sharing	
	3.3 Investment actions	
	3.3.1 Acquire and share data and information sharing system (portals)	
OBJECTIVE 4	4.1 Institutional and legislative actions	<ul style="list-style-type: none"> Establishment and activity of committees or institution established and operationalised for decision making responsibility at local, national and transboundary levels. Number of laws, policies, and regulations harmonized and/or developed on topics related to joint water resources management. Structures in place for ongoing analysis of investments plans between the two countries that apply to the EKK-TBA shared aquifers. Training conducted to improve capacity of officials within the two countries for managing the shared aquifer
	4.1.1 Establish bilateral arrangement for basin-wide water resources management	
	4.1.2 Establish the transboundary strategy harmonised groundwater resources development and management as informed by country and regional needs assessment	
	4.1.3 Improve stakeholder involvement in matters to do with the aquifer	
	4.1.4 Explore and engage OKACOM and ZAMCOM for collaboration and institutional support in the shared aquifer	
	4.2 Research, training and awareness actions	
	4.2.1 Develop and update policies and legislative arrangements	
	4.3 Investment actions	
	4.3.1 Develop and strengthen capacity of the transboundary institution for joint management of the resources	

	4.3.2 Develop capacity in identified elements of integrated water resources management (IWRM)	
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4.3. Priority Actions

The priority actions were validated at regional validation workshop held virtually on the 19th of November 2020. These actions are either stand out actions from the action list or an amalgamation of more than one action to form a single complete and improved action statement. For this reason, the numbering of the actions does not necessarily align directly with the previous action linked to it. The priority actions include:

- Action 1:** Establish bilateral institutional arrangements for coordination and cooperation on basin-wide water resources management
- Action 2:** Identify areas for joint study and research to understand the water resources within the basin and increase knowledge of the aquifer
- Action 3:** Develop data sharing arrangements between the two Member States considering the existing SADC and RBO relevant protocols on data sharing.
- Action 4:** Establish joint monitoring systems to harmonise data and information collection and sharing
- Action 5:** Promote joint proposals to mobilise funds for specific projects within the transboundary basin for activities related to sustainable resources management and livelihoods improvement.
- Action 6:** Develop capacities of personnel involved in collecting and researching information related to conjunctive surface and ground water management including quality and quantity issues.

5. ROAD MAP FOR IMPLEMENTAION

5.1. Action 1: Establish bilateral institutional arrangements for coordination and cooperation on basin-wide water resources management

The establishment of appropriate institutional arrangements to support the effective management of the EKK-TBA are not necessarily straight forward. This TBA not only transects two Member States but equally cuts across two transboundary surface water basins that have shared watercourse commissions (OKACOM and ZAMCOM) established. The institutional mantra of “form follows function” is important and looking to such arrangements would need to carefully consider the various functions required to enable improved management of the TBA. In this regard, it is important to note that:

- Member States: Whilst both Botswana and Zimbabwe are Members states to the Zambesi basins (but not Okavango-Cubango basin) and therefore participate in the processes and activities coordinated by the watercourse commissions, these member states have sovereign responsibility to manage water resources within their countries at more local levels. In this regard, the national ministries have a responsibility to manage national level interventions and oversee developments by local water utilities.
- Shared watercourse commissions: OKACOM and ZAMCOM play a key advisory and knowledge management role within their basins. The mandates of these commissions have been developing over time and are increasingly supporting the member states with water resource developmental imperatives, facilitating infrastructural solutions, and assisting with finding financing solutions to support these developments. As such the commissions can provide important support to the TBA.

Noting the complexity of the EKK-TBA the initial institutional response could potentially be the development of a bilateral agreement between Botswana and Zimbabwe for cooperation and coordination to support the management of the TBA. This agreement would seek to establish a Joint Permanent Technical Committee (JPTC) that would also co-opt in members from the two shared watercourse commissions (**Figure 6**). Such a JPTC would enable improved coordination across the varying transboundary dimensions and would align with the precepts of the Revised Protocol on Shared Watercourses. This would include such principles including sustainable utilization, equitable and reasonable utilisation and

participation, prevention, and co-operation, as well as aspects of data and information exchange and prior notification.

In the first instance, the JPTC would undertake to drive and oversee the implementation of the SAP. The JPTC could also undertake a comparative analysis of relevant laws, policies and regulations for joint water resources management to develop recommendations for possible harmonization and better alignment in processes.

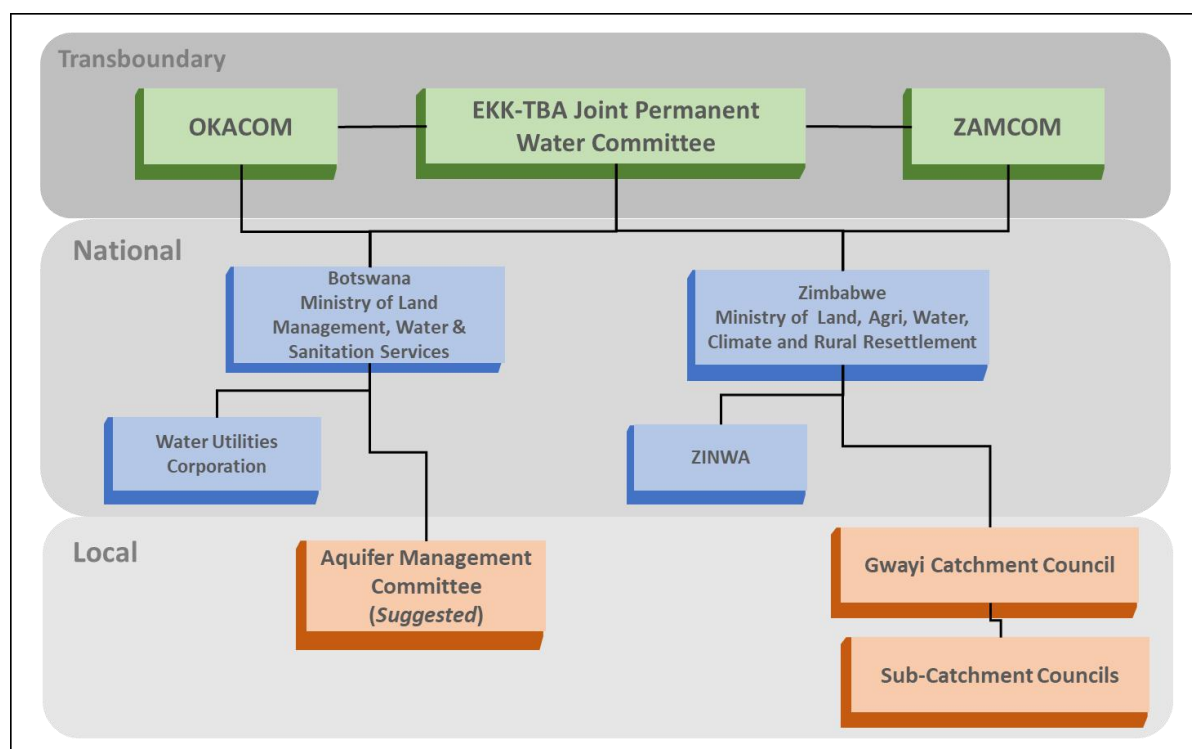


Figure 6: Potential institutional arrangements to support the management of the EKK-TBA

Table 2: Principles for advancing cooperative surface water/groundwater resources management in the Eastern Kalahari-Karoo Basin Aquifer system

Principle	Description
Sovereignty of Aquifer States	Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory and that it shall exercise its sovereignty in accordance with international law. In the SADC protocol this principle is enshrined in the SADC Protocol that <i>“the utilization of shared watercourses within the SADC Region shall be open to each Watercourse State, in respect of the watercourses within its territory and without prejudice to its sovereign rights, in accordance with the principles contained in this Protocol”</i> .
Equitable and Reasonable Utilization	Aquifer States shall utilize transboundary aquifers or aquifer systems according to the principle of equitable and reasonable utilization, as follows: a) they shall utilize transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of

Principle	Description
	benefits therefrom to the aquifer States concerned; b) they shall aim at maximizing the long-term benefits derived from the use of water contained therein; c) they shall establish individually or jointly a comprehensive utilization plan, taking into account present and future needs of, and alternative water sources for, the aquifer States; and (d) they shall not utilize a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning
No Significant Harm	This principle requires that significant harm be prevented, not only with respect to other states sharing a transboundary aquifer, but also with respect to those in whose territory a discharge zone is located (Quadri, 2019). The groundwater threats include pollution from mining activities and upconing of saline groundwater utilizing inappropriate pumping regimes (SADC-GMI, 2020b). The Protocol requires State Parties to take all appropriate measures to prevent the causing of significant harm to other Watercourse States. Where significant harm is nevertheless caused to another Watercourse State, the State whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation
Cooperation	Aquifer States shall cooperate on the basis of sovereign equality, territorial integrity, sustainable development, mutual benefit and good faith in order to attain equitable and reasonable utilization and appropriate protection of their transboundary aquifers or aquifer systems
Regular Exchange of Data and Information	Both the Draft Articles on the Law of Transboundary Aquifers and the SADC Revised Protocol on Shared Water calls for regular exchange of data and information. Where knowledge about the nature and extent of a transboundary aquifer or aquifer system is inadequate, aquifer States concerned shall employ their best efforts to collect and generate more complete data and information relating to such aquifer or aquifer system, taking into account current practices and standards. They shall take such action individually or jointly and, where appropriate, together with or through international organizations. Similarly, the Protocol calls on State Parties to exchange available information and data regarding the hydrological, hydrogeological, water quality, meteorological and environmental condition of shared watercourses
Bilateral and Regional Agreements and Arrangements	To manage a particular transboundary aquifer or aquifer system, aquifer States are encouraged to enter into bilateral or regional agreements or arrangements among themselves. Such agreements or arrangements may be entered into with respect to an entire aquifer or aquifer system or any part thereof or a particular project, programme or utilization except insofar as an agreement or arrangement adversely affects, to a significant extent, the utilization, by one or more other aquifer States of the water in that aquifer or aquifer system, without their express consent
Protection and Preservation of Ecosystems	Aquifer States shall take all appropriate measures to protect and preserve ecosystems within, or dependent upon, their transboundary aquifers or aquifer systems, including measures to ensure that the quality and

Principle	Description
	quantity of water retained in an aquifer or aquifer system, as well as that released through its discharge zones, are sufficient to protect and preserve such ecosystems
Recharge and discharge zones	Aquifer States shall identify the recharge and discharge zones of transboundary aquifers or aquifer systems that exist within their territory. They shall take appropriate measures to prevent and minimize detrimental impacts on the recharge and discharge processes. All States in whose territory a recharge or discharge zone is located, in whole or in part, and which are not aquifer States with regard to that aquifer or aquifer system, shall cooperate with the aquifer States to protect the aquifer or aquifer system and related ecosystems
Prevention, Reduction and Control of Pollution	Aquifer States shall, individually and, where appropriate, jointly, prevent, reduce and control pollution of their transboundary aquifers or aquifer systems, including through the recharge process, that may cause significant harm to other aquifer States. Aquifer States shall take a precautionary approach in view of uncertainty about the nature and extent of a transboundary aquifer or aquifer system and of its vulnerability to pollution. This principle relates to the Principle not to Cause Significant Harm.
Monitoring	Aquifer States shall monitor their transboundary aquifers or aquifer systems. They shall, wherever possible, carry out these monitoring activities jointly with other aquifer States concerned and, where appropriate, in collaboration with competent international organizations. Where monitoring activities cannot be carried out jointly, the aquifer States shall exchange the monitored data among themselves. Aquifer States shall use agreed or harmonized standards and methodology for monitoring their transboundary aquifers or aquifer systems.
Management	Aquifer States shall establish and implement plans for the proper management of their transboundary aquifers or aquifer systems. They shall, at the request of any of them, enter consultations concerning the management of a transboundary aquifer or aquifer system. A joint management mechanism shall be established, wherever appropriate

Source: (SADC, 2000; UNESCO, 2009)

This would be supported through the creation of a local committee in each country for coordinating efforts to manage the shared aquifer, ensuring that all stakeholders and communities are well presented. At the national level, this would be aligned with national legislation and the institutional frameworks that are in place. This will further help ensure that priority issues of transboundary surface water and groundwater management are clearly articulated and agreed upon by the key stakeholders at both country level and transboundary level. Building such consensus is a stepping-stone towards enhancing collaboration and cooperation by the two countries

5.2. Action 2: Identify areas for joint study and research to understand the water resources within the basin and increase knowledge of the aquifer

Undertake strategic research to improve GWM operations and understanding of the shared aquifer

The poor knowledge of the groundwater resources in the shared aquifer is a concern and might stem from low levels of research undertaken on the resource or the poor utilization of existing research and information in the water practice. Importantly, the lack of integration between research and water practitioners limits the extent to which research can become useful in practice. Going forward, an opportunity for advancing groundwater management through research exists in the EKK-TBA. This can be attained through developing strategic partnerships between government entities mandated with GWM and research institutions such as universities in both Botswana and Zimbabwe. Such partnerships would need to be supported by a structured research agenda as well as development of a clear capacity development programme to support innovation and advancement in sustainable GWM practices.

Strategy to develop, improve and operationalise water use regulations and guidelines within the shared aquifer

Where regulations for groundwater exist, the limitation in knowledge on their existence or the implications for operations limits their use, slowing the attainment of groundwater management objectives. Developing and improving the operationalization of the regulations would require an approach that involves developing specific knowledge products within the basin to promote awareness and understanding of the regulations by the intended users or regulators. This needs to be anchored by a streamlined process of engaging stakeholders to promote awareness and create an understanding of the regulations. This will be crucial for endorsing and effecting the operationalization of the regulations. To this end, this might require a phased plan for improving existing regulations required to facilitate the operationalization of regulations for sustainable groundwater management within the EKK-TBA. This also entails developing a joint catchment management plan and supporting guidelines for the shared aquifer.

5.3. Action 3: Develop data sharing arrangements between the two Member States considering the existing SADC and RBO relevant protocols on data sharing.

Stakeholder engagement to support data exchange

The SADC protocol on shared watercourses and the ZAMCOM protocol on sharing data among other existing key instruments, provides a starting point from which the EKK-TBA can create data sharing arrangements. Understandably, the two Member States are committed to complying with implementing all water related international and regional conventions that they signed and ratified. Subsequently, information exchange comes as one of the requirements within the ratified instruments. It is therefore important for the two countries to be well capacitated including in the generation and sharing of information on internationally shared groundwater resources to be able to honour these commitments that serve to promote peace and co-operation at an international level. Developing a protocol to guide the exchange of data and information across institutions would be required to promote professionalism and ensure compliance with legal or other aspects relating to the business of data exchange across institutions and international boundaries.

One of the strategic ways to effective acquisition of data on groundwater is to transfer part of the responsibility to the users and stakeholders engaged in groundwater activities such as irrigators and borehole drillers. The role of stakeholders in this process cannot be over-emphasized.

5.4. Action 4: Establish joint monitoring systems to harmonise data and information collection and sharing

Develop a shared communication strategy and supporting knowledge products

Sustainable data and information management and exchange would need to be founded on a solid strategy for communication between stakeholders, which needs to be supported by a range of appropriately designed knowledge products to suit targeted stakeholders. This will entail an assessment of requirements for communication and knowledge exchange would have to be undertaken to inform the development of a communication strategy. The role of stakeholder engagement would be critical to ensure participation and ownership of the strategy helping to ease implementation. The performance of the strategy would have to be monitored continuously and assessed periodically to inform improvement of data and

information management and exchange. The anticipated timeframes for this action are spread between the short term to long term.

Strengthening compliance monitoring of groundwater resources

Effective permitting for groundwater can serve to inform groundwater monitoring helping to regulate the exploitation of groundwater resources. Compliance through permitting may be achieved by embedding compliance conditions on the permits. Undertaking permitting would require establishing the need for permitting of the groundwater resource through an assessment, to inform the development of an approach that would regularise permitting. A strategy and protocols for compliance monitoring and enforcement would guide implementation. It is imperative that compliance and enforcement officers receive adequate training and resources including the necessary logistics to undertake their operations. These efforts would be strengthened by having systems in place such as a central data base to which cases are recorded, tracked and closed, providing an opportunity for data analysis to promote informed decision making.

Permitting of water use is therefore one of the tools used in the management of water resources. The importance of permitting and keeping records of permits for groundwater with the intent to monitor the resource as well as advise users on the quality and sustainability of the resource is imperative.

5.5. Action 5: Promote joint proposals to mobilise funds for specific projects within the transboundary basin for activities related to sustainable resources management and livelihoods improvement.

This action call for the promotion of public-private partnerships investment in the EKK-TBA including consideration of special arrangements such as wildlife protection and communal beneficiation schemes such as CAMPFIRE and payment for environmental services (PES) schemes. Apart from these arrangements, there is a need to develop tangible livelihoods project that will directly and indirectly impact and improve livelihoods of the communities living in the basin. There are already commercial activities in both the tourism, mining, and agriculture sectors in and around Pandamatenga, Nyamandhlovu and Hwange where these initiatives can be pivoted to support and improve local economies and their contribution to the national development agendas. This requires promoting joint proposals to mobilise funds for specific projects within the EKK-TBA for activities related to sustainable basin and natural resources management.

This might also entail the promoting development of sustainable infrastructure in the basin to address effective management challenges in agriculture, water storage, wastewater, solid waste, and energy by adopting both grey and green solutions to support livelihoods and the environment. Doing so will further promote the utilisation of water resources for rural households and other uses in the shared aquifer.

5.6. Action 6: Develop capacities of personnel involved in collecting and researching information related to conjunctive surface and ground water management including quality and quantity issues

Realising this action requires enhancing capacity building and public awareness about the aquifer management, including addressing the links between student enrolment and education quality to the future health of the basin. There are already ongoing initiatives in the region that support capacity building such as the WATERNET regional integrated water resources management programme. This can be further supported by other programmes at local universities, professional membership bodies (engineering councils/associations etc), river basin commissions (e.g. ZAMCOM and OKACOM), and international cooperating partners such as GIZ, UKAID, SIDA, and the World Bank among others.

These capacity building initiatives will include training personnel involved in collecting and researching information related to surface water, groundwater, water quality and catchment management within the EKK-TBA. At the local level, this will translate into capacitating community level natural resource management through sub-catchment, catchment management, and water point committees by forming proper structures and training in Integrated Aquifer Management.

ANNEXURE A: INITIAL OBJECTIVES BY COUNTRY

Botswana

- a. Delineate EKK Aquifer Boundary
- b. Assess water demands and identify main users.
- c. Develop water conservation and demand management strategies for the TBA (Joint Management/Sustainable use of the TBA).
- d. Quantify the available resources (aquifer parameters, water quality, etc.).
- e. Assess surface and groundwater interaction (recharge rates).
- f. Delineate saline and freshwater groundwater boundaries.
- g. Advise on best land-use practices to prevent aquifer pollution.
- h. Identify key stakeholders and their responsibilities going forward.
- i. Delineate EKK Aquifer Boundary
- j. Assess water demands and identify main users.
- k. Develop water conservation and demand management strategies for the TBA (Joint Management/Sustainable use of the TBA).
- l. Quantify the available resources (aquifer parameters, water quality, etc.).
- m. Assess surface and groundwater interaction (recharge rates).
- n. Delineate saline and freshwater groundwater boundaries.
- o. Advise on best land-use practices to prevent aquifer pollution.
- p. Identify key stakeholders and their responsibilities going forward.

Zimbabwe

- i) Increase knowledge of the aquifer (water quality and quantity, recharge and discharge zones, depth, extraction rates etc).
- ii) Identify the potential and primary use of the aquifer, what is the extent and concentration of salinization.
- iii) Maximise utilisation of the aquifer by developing business models/strategies for the local communities.
- iv) Identify sources of potential contamination and hazards – as well as saline water there is an extensive methane field and salt pans within the aquifer, what is the effect on the aquifer
- v) Enhance data and information management and sharing.
- vi) Improve stakeholder involvement in matters to do with the aquifer.
- vii) Identify potential sources of pollution.
- viii) Engage in social corporate responsibility activities for the benefit of the local communities

ANNEXURE B: LIST OF STAKEHOLDERS CONSULTED

Botswana

BOTSWANA - GW EKK-TBA Stakeholders	Name
Department of Water Affairs	Saniso Sakuringwa
Department of Water Affairs	Keodumetse Keetile
Department of Water Affairs	Thato Setloboko
Department of Water Affairs	A Petros
Department of Water Affairs	David Rax Molefha
Department of Water Affairs	Thato Setloboko
Department of Water Affairs	Kelly Gapoiphiwe
Department of Water Affairs	Force Ramasuswana
Department of Environment	Kuda Mpolokang
Department of Energy	Keisha Senwelo
Department of Meteorological Services	Balasis Gopolang
Botswana Climate change Network	Tracy Sonny
University of Botswana	Dr Jeremy Perkins
University of Botswana	Dr Nelson Sello
Chamber of Mines	Charles Siwawa
Ministry of Agriculture	Tirelo Tshipidi
Private Groundwater Practitioners (Drillers, consultants)	Ms Sarah Mulwa
Forest Conservation Botswana	Gorata Ramokgothwane
Botswana Investment and Trade Centre	Kebaswele
Solar Association Botswana	Felix Chavaphi
Botswana Geoscience Institute	Edmore Keaitse
Department of Environmental Affairs	Tsalano Kedikilwe
Department of Environmental Affairs	Tswelelo Segosebe
Botswana Tourism Organisation (BTO)	Messiah Matolela
Kalahari Conservation Society	Thato Morule
Somarelang Tikologo	Ms Chesani Tamocha
University of Botswana	Dr Ditiro Moalafhi
Botswana International University of Science and Technology (BIUST)	Dr Loago Molwalefhe
University of Botswana	Dr Nata Tafesse
Vector Development (Pty) Ltd	Mookamedi Masie

Zimbabwe

Organisation	Type of Organisation	Name (s)
Government of Zim (GoZ)	Parent Ministry (Water)	Mr Mutazu, Mr Mutepfa, Mr Mugwangwavari, Zibusiso Mangwangwa
GoZ	Ministry of Environment; EMA	Mr S. Kangata and Mr Beavan Ngoshi
ZINWA and Gwayi Catchment Council	Parastatal	Mr Takudza Makwangudze, and Mr Tommy Rosen
GoZ	Ministry of Environment	Mr Samuriwo (Director)
Hwange National Park (Zimbabwe Parks and Wildlife Authority (ZimParks)	Parastatal	Mr F. U. Mangwanya (DG)
World Vision Zimbabwe	Civil Society with operations in EKK-TBA	Mr Morris Chidavaenzi (WASH Technical Manager)
Dabane Trust	Civil Society with operations in EKK-TBA	Louise Nkomo and S.W. Hussey
NUST and Independent researchers	Research and academia	Prof Richard Owen, Dr Innocent Muchingami, Mr
Borehole Drillers Association	Private	Eng. Munzverengi

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