

Policy, Legal and Institutional Development for Groundwater Management in the SADC Member States (GMI-PLI)



**Guidance Document: Development of a Groundwater
Policy, Legal & Institutional Roadmap**

September 2019

Report Number 3.1





This report emanates from the project Policy, Legal and Institutional Development for Groundwater Management in the SADC Member States (GMI-PLI) commissioned by the Southern African Development Community Groundwater Management Institute (SADC-GMI), and executed by Pegasys.

SADC GROUNDWATER MANAGEMENT INSTITUTE (SADC-GMI)

Dean Street, University of the Free State
205 Nelson Mandela Drive,
Bloemfontein, 9300

South Africa

E-mail info@sadc-gmi.org Website www.sadc-gmi.org

Project team:

Derek Weston (Project Lead), Pegasys
Traci Reddy (Project Manager), Pegasys
Kevin Pietersen (Groundwater Management Expert), Pegasys
Deepti Maharaj (Project Coordinator), Pegasys
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Citation: SADC-GMI, (2019). *Guidance Document: Development of a Groundwater Policy, Legal & Institutional Roadmap*. SADC GMI report: Bloemfontein, South Africa.

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FOREWORD

The Southern African Development Community (SADC) Member States, through the support of International Cooperating Partners have gone through a series of Water Sector Reforms which varied in terms of policy, legal and institutional development. The focus of the water sector reforms has been on Integrated Water Resources Management and aimed at achieving sustainable and equitable distribution of water resources in the respective Member States. To a large extent, the water sector reforms did not comprehensively address the sustainable management of groundwater resources, yet 70% of the population in the SADC region depend on it. Climate change continues to negatively affect the availability of surface water, placing significance reliance on the use of groundwater for both urban and rural supply throughout the region. Human wellbeing, livelihoods, food security, ecosystems, natural habitats, industries and urban centres growth throughout the SADC Region are increasingly becoming more reliant on groundwater. The SADC region in general has an abundance of groundwater resources. However, due to several factors which include the lack of an enabling policy, legal and institutional environment, only an estimated 1.5% of the available renewable groundwater resources are currently being utilised.

It is estimated that there are about 30 Transboundary Aquifers (TBAs) and 15 transboundary river systems and that these systems are central to the water security of the region. There is therefore a need for Members States to establish and strengthen existing policy, legal and institutional frameworks to achieve equitable and sustainable access to water resources through joint management of the transboundary resources. It is in view of the above and in response to the need to strengthen the sustainable use of groundwater resources conjunctively with surface water at both the national and regional level, that the Southern African Development Community – Groundwater Management Institute (SADC-GMI) was established by the SADC Secretariat, on behalf of the Member States.

The vision of the SADC-GMI is, “to be a Centre of Excellence in promoting equitable and sustainable groundwater management in the SADC region”. The key focus areas of SADC-GMI are to 1) advocate, raise awareness and provide technical support in SADC around sustainable management through the dissemination of information and knowledge; 2) create an enabling environment for groundwater management through policy, legal and regulatory frameworks; 3) promote action-oriented research; 4) promote impact-oriented capacity building and training for groundwater management in the region; 5) lead and promote regional coordination for groundwater management; and 6) support infrastructure development for groundwater management.

In pursuance of the focus area of creating an enabling environment, SADC-GMI implemented the project entitled “Policy, Legal and Institutional Development for Groundwater Management in the SADC Member States, (GMI-PLI)”. The methodology for said project included the development of the Desired Future State, conducting a baseline study of best practices, and description of policy, legal and institutional frameworks which promote sustainable groundwater management. Using an in-Country Experts model, a systematic analysis of the existing policy, legal and Institutional frameworks in comparison with the Desired Future State was conducted to identify gaps that required to be addressed in order to fulfil the SADC-GMI mandate – to achieve sustainable groundwater management in all 16 SADC Member States. The analytical assessment of the gaps identified at national level culminated in the production of 16 National Gap Analysis & Action Plan Reports and the higher-level Regional Gap Analysis Report. The latter summarises the findings across the SADC region.

This Guidance Document provides an overview of the processes followed for the GMI-PLI groundwater roadmap development as well as lessons learned during the process. It is designed to be a guideline for other Member States that wish to execute their own groundwater roadmap and will also support the upscaling to other parts of the world. It is hoped that this Guidance Document will aid the SADC Member States to develop their own Roadmap which will ultimately advance the groundwater narrative and bring it at par with surface water in terms of policy, legal and institutional frameworks which will no doubt enhance sustainable groundwater management at a national and regional level in the SADC Region.

James Sauramba
Executive Director

ACKNOWLEDGEMENTS

The following individuals and organisations are thanked for their contributions to the project:

SADC – Ground Water Management Institute

Mr James Sauramba	Executive Director
Ms Nyakallo Khoabane	Administration and Finance Assistance
Mr Brighton Munyai	Technical Advisor
Mr Micah Majiwa	Governance and Institutional Consultant
Ms Mampho Ntsekhe	Grant Officer
Mr Thokozani Dlamini	Communications and Knowledge Management Specialist

Project Team

Mr Derek Weston	Project Lead and Institutional Expert
Ms Traci Reddy	Project Manager
Ms Deepti Maharaj	Project Coordinator
Ms Barbara Schreiner	Policy Expert
Dr Amy Sullivan	Knowledge Management Expert
Ms Jessica Troell	Legal Expert
Dr Kevin Pietersen	Groundwater Management Expert
Dr Pinnie Sithole	Cluster Lead
Ms Susan Byakika	Cluster Lead
Ms Pretty Ntuli	Project Administrator

Stakeholders Engaged

The project team would like to thank all those stakeholders that contributed to the project from Government, Private Sector, Civil Society and Academia and Research.

The authors also like to express sincere appreciation to members of the **SADC Sub-Committee on Hydrogeology** for identifying the need for this project, following on the numerous challenges that they experience in their respective countries. Without the dedicated facilitation and support from the members of the SADC Sub-Committee on Hydrogeology, who also serve as focal points for groundwater development in their respective countries, this exercise would not have been accomplished.

In this regard, special thanks are given to:

Mr Manuel Quintino, Angola; Mr Kedumetse Keetile, Botswana; Mr Cyrille Masamba, Democratic Republic of Congo; Mr Trevor Shongwe, Kingdom of eSwatini, Ms Christinah Makoe, Lesotho; Mr Luciano Andriavelojaona, Madagascar; Ms Zion Uka, Malawi; Mr Pokhun Rajeshwar, Mauritius; Ms Ana Isabel Fotine, Mozambique; Ms Maria Amakali, Namibia; Mr Frankie Jose Dupres, Seychelles; Mr Zacharia Maswuma, South Africa; Ms Mwanamkuu Mwanyika, United Republic of Tanzania; Mr Frank Ngoma, Zambia; and Mr Robert Mutepe, Zimbabwe.

Additionally, the authors thank all other professionals from the Member States who contributed to the project by providing ideas and feedback, in particular, professionals from various organisations who contributed to the over-all project, and senior officials from the Member States. The contribution of all institutions and individuals who supported the project through ideas and comments and may not have been credited by name, is greatly appreciated.

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EXECUTIVE SUMMARY

From Gap Analysis to Implementation

The effects of climate change are being felt more strongly across the Southern African Development Community (SADC) region prompting the need for more effective groundwater development and management. The occurrence of floods and droughts have risen in recent years impacting food security and surface water resources resulting in greater reliance on groundwater as a means of climate change adaptation (Taylor, et al., 2012). Considering the strong dependence of the SADC population on groundwater, together with the increasing effects of climate change, the need for efficient and sustainable groundwater management in the SADC region has never been greater.

A guideline that details the process followed for the SADC Groundwater Management Institute Policy, Legal and Institutional (GMI-PLI) groundwater roadmap development as well as lessons learned is an essential tool for other Member States that wish to execute their own groundwater roadmap. This guideline will also support the upscaling to other parts of the world. Through the GMI-PLI project, a pilot Member State was selected for the groundwater roadmap phase and this process formed the basis for this guideline.

Process of development

- Establishment of a baseline through a Desired Future State (DFS): Prior to the development of the groundwater roadmap, a baseline of what a groundwater management framework should provide needs to be established. Such a document would need to detail the minimum requirements to support the delivery of national, regional and international developmental goals as well as incorporating the context of the SADC region.
- Gap Analysis: The DFS would then be used to inform the national gap analysis in order to determine the current state of groundwater management in the country, from a policy, legislative and institutional perspective as well as identifying key opportunities and challenges. The gap analysis can be strengthened through a literature review and the identification and engagement with key stakeholders. The latter allows for validation and verification of the findings. This could include government, private sector, research and/or civil society and it is essential for the gap analysis to be validated by all relevant groundwater players to ensure buy-in and support for the upcoming groundwater roadmap phase. One important product of the Gap Analysis is a rudimentary 'Action Plan' detailing the enablers, nice-to-have, can-do-without, etc. The gap analysis is the foundation on which the roadmap is developed.
- Vision, Goal and Objectives: A shared vision, goal and strategic objectives for the groundwater roadmap within the context of the Member State will need to be established in a participatory manner with all relevant stakeholders. This would provide the framework within which the groundwater roadmap will operate and provide guidance for the direction that the roadmap will take. These will need to be rooted in the frameworks within the country, such as the

National Development Plans and water resources framework and it is founded on the prioritised items from the Gap Analysis.

- **Strategic Actions:** Aligned to the Strategic Objectives, a suite of Strategic Actions should be developed that align with the Vision and Goal for groundwater development and management. These actions breakdown the objectives in achieving incremental development.
- **Implementation of Prioritised Actions:** Noting the limitations in human and financial resources, engagement with relevant stakeholders to co-develop a prioritised list of actions to take forward is important to allow for ownership and championing of the roadmap by groundwater players within the Member State. The prioritisation ensures the effective and efficient use of resources of critical elements that will yield results. For instance, tackling those actions that are low-hanging fruit, may be one approach. Detailing the timeframes, budgets, roles and responsibilities, targets, reporting criteria and identifying champions to these actions forward is critical to effective implementation.

Lessons from Pilot Roadmap Development

Throughout the pilot Member State roadmap process, the importance of clear communication was highlighted together with the need for practical and implementable solutions, noting that groundwater management in each country is different and that there is no 'one size fits all' scenario. Any roadmap would need to align to the country's goals and agendas coupled with the regional and international agendas. Furthermore, any future upscaling of the groundwater roadmap would need to be cemented in the existing framework of the country with a clear understanding of current groundwater management initiatives that can be built on. The role of stakeholders was also emphasised throughout the process to solicit meaningful contributions as well as championing and leading aspects of the roadmap. The co-development of the groundwater roadmap also allowed for key groundwater players to take ownership of the roadmap, an element that is crucial for the successful implementation of the groundwater roadmap. Like surface water, groundwater also demands the involvement of stakeholders from across sectors.

Conclusion

SADC-GMI, through the GMI-PLI project, has paved the way by conducting national gap analyses for the 15 Member States and producing national and regional gap analyses reports that informed the elaboration of this guideline. These reports, together with this guideline, can be used to inform any future groundwater roadmaps that might be developed in other Member States.

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LIST OF ACRONYMS

Acronym	Definition
DFS	Desired Future State
DPSIR	Drivers, Pressures, State, Impact and Response
DRC	Democratic Republic of Congo
DWAF	Department of Water Affairs and Forestry
FAO	Food and Agriculture Organisation
GMI-PLI	Groundwater Management Institute – Policy, Legal and Institutional
GW	Groundwater
GW-PLI	Groundwater – Policy, Legal and Institutional
IWRM	Integrated Water Resources Management
MAR	Managed Aquifer Recharge
MoSCoW	Must Haves, Should Haves, Could Haves, Won't Haves
NGS	National Groundwater Strategy
PESTEL	Political, Economic, Social, Technological, Environmental, Legal
SADC	Southern African Development Community
SADC-GMI	Southern African Development Community – Groundwater Management Institute
SDG	Sustainable Development Goal
SWOT	Strengths, Weaknesses, Opportunities, Threats
TOC	Theory of Change
UN	United Nations
VRIO	Value, Rarity, Imitability, Organisation
WRMD	Water Resource Management and Development

1. INTRODUCTION

1.1. Background

The effects of climate change are fast becoming one of the top priorities in many countries with the increase occurrence of droughts and floods being felt in the Southern African Development Community (SADC) region. As such, effective groundwater management is becoming increasingly important as a means of climate change adaptation and ensuring ongoing climate resilience. Furthermore, the variability in available surface water across SADC has resulted in greater reliance on groundwater for both urban and rural supply. However, the shared as well as hidden nature of groundwater coupled with the pollution and depletion of groundwater resources, population growth and increasing demand have exacerbated the challenges associated with effective groundwater management.

The SADC region is predominantly arid to semi-arid with rainfall varying both spatially and temporally (Manatsa, et al., 2011; Jury & Mwafurirwa, 2002; Villholth, et al., 2013). In recent times, the impacts of climate change have seen an increase in the number of droughts and floods in the region. This has had a significant impact on the availability of surface water in SADC with more and more communities showing greater reliance on groundwater in response to changing conditions. It is estimated that approximately 70% of the SADC population are dependent on groundwater for health and well-being; food production and economic growth (SADC, 2012).

In addition, there are increasing concerns regarding the water quality of groundwater resources with the pollution of aquifers in many African cities and rural communities is occurring at an alarming rate (Xu & Usher, 2006). The lack of effective groundwater management has contributed to the contamination and overexploitation of many aquifers, further threatening the sustainability of groundwater resources. In many countries there is ineffective regulation of groundwater use resulting in significant depletion of these resources. The need for effective groundwater management is now more critical than ever, and an enabling environment that promotes sustainable and efficient groundwater management needs to be explored in the SADC region. This also needs to be considered in the broader context of IWRM and the need to promote conjunctive use in the Member States. The integrated nature of water resources cannot be ignored, and the way forward can no longer exclusively focus on surface water or groundwater but rather encourage conjunctive management and development.

1.2. SADC-GMI and the GMI-PLI Project

Based on the complex challenges for groundwater in the SADC region, the SADC Groundwater Management Institute (SADC-GMI) was established to strengthen the management and development of groundwater across the region. The rationale behind this is the high importance of groundwater in the region together with the need to establish a “Centre of Excellence” for groundwater management (SADC-GMI, 2018). SADC-GMI’s core mandate is to promote sustainable groundwater management and provide solutions to groundwater challenges across the SADC region through creation of an enabling policy, legal

and regulatory environment, capacity building, advancing research, supporting infrastructure development, and enabling dialogue and accessibility of groundwater information (SADC-GMI, 2018).

Part of this mandate includes the implementation of the World Bank-funded Sustainable Groundwater Management in SADC Member States Project by SADC-GMI. Through this project, SADC-GMI is leading an initiative to provide “Support to Policy, Legal and Institutional Development for groundwater management in the SADC Member States” (project acronym GMI-PLI). The project aims to respond to gaps in the existing policy, legal and institutional (PLI) framework for groundwater management in the SADC region and involved the:

- identification and analysis of gaps in the PLI framework at a national and regional level;
- development of an action plan to address the identified gaps;
- development of guidelines/tools/standard to address some of the identified challenges;
- targeted advocacy/training support to SADC-GMI; and the
- development of a groundwater roadmap for a pilot Member State that will address that gaps identified for that Member State during the gap analysis.

This guideline forms part of a series of documents produced to assist with effective groundwater management in SADC.

1.3. Purpose of this Document

Whilst most countries have a range of strategic instruments to guide the integrated management of water resources, not many countries across SADC have developed specific strategies and plans for the sustainable management of groundwater resources. Noting that there are quite specific dimensions to the business of groundwater management and the fact that groundwater management is becoming an increasingly important part of climate resilience, there is a recognised need to develop improved strategic instruments that guide sustainable groundwater management.

The nature and type of strategic instruments that countries develop would be in accordance with the needs of the country and be appropriate to the legislative and policy contexts. This document therefore provides ‘how-to’ guidance to support Member States to enhance groundwater management within the PLI framework by developing strategies and action plans that guide the progressive improvement of groundwater management.

The development of the strategies and action plans requires stakeholder engagement with key groundwater actors noting that there can be international, national and local level actions. The nature and format for this engagement needs to be in accordance with national engagement processes and so guidance in this regard is provided whilst noting that each country has its own approaches to these interventions.

2. RATIONALE FOR DEVELOPING A ROADMAP

2.1. Background

In recent years, SADC Member States have endeavoured to strengthen their policy, legislative and institutional regimes with regards to water resource management and development. This has been driven by the need to update policy and legal instruments to incorporate the precepts of Integrated Water Resource Management, to align with the SADC Regional Water Policy (SADC, 2005) and the SADC Regional Water Strategy (SADC, 2006), but also to strengthen these frameworks so as to underpin sustainable water resource management and development, and improve climate resilience.

Whilst nearly all SADC Member States have recognised the importance of groundwater management through their policy and legal instruments, there is often only limited specific reference to groundwater with this being subsumed into the broader “water resource”. Whilst understanding the integrated nature of the hydrological cycle is important, there is still a need for key groundwater focused interventions. In general, and amongst other issues, policy instruments across SADC tend to provide insufficient recognition of the importance of the linkages between groundwater and surface water, the linkage between groundwater and ecological infrastructure, and the importance of trans-boundary aquifers.

Box 1: **Policy - Good Practise**

Both **Namibia and South Africa** are in the process of developing **national wetland policies**. These are important in recognising the importance of groundwater in maintaining wetlands that place a crucial role in regulating surface water hydrology as well as in supporting rural livelihoods.

South Africa has introduced a **mine-water management policy** that recognises the importance of managing the impacts of mining both on surface and groundwaters, particularly with regards to the impacts upon water quality.

Likewise, from a legal perspective there is largely a recognition of the status of groundwater in national legislative instruments as well as through regulatory instruments, however, there are issues that would strengthen this legislative environment in many of the Member States. This would include such aspects as providing improved legal recognition of the human right to water, legal tools that would facilitate access to groundwater for livelihoods and small-scale productive uses, legal provisions to strengthen groundwater monitoring as well as improved regulatory instruments that enable improved management of non-point source pollution.

Looking to the strategy environment, most SADC countries have national strategies focused on the management and development of water resources, with groundwater being recognised in alignment to policy and legislation. However, only in a few instances have Member States developed targeted strategies focused on groundwater management. Most significantly, there is a general need across the region to strengthen these strategies in terms of the approaches towards ensuring effective conjunctive use of both surface and groundwater, as well as a range of activities that support groundwater recharge and the management of groundwater quality.

Box 2:

Strategy and Guidelines - Good Practise

South Africa is the only example of a country that has developed an explicit **National Groundwater Strategy (NGS)** in 2010 and updated in 2016 (Department of Water Affairs, 2010; Department of Water and Sanitation, 2016). The NGS 2016 update has a number of strategic themes of which each one has been developed in terms of Objectives, Principles, Situation Assessment, Current challenges, and Strategic Actions for the following themes:

An **Artificial Recharge Strategy (or MAR) for South Africa** was developed in 2007 (Department of Water Affairs and Forestry, 2007). The strategy identified the following themes to support implementation: (a) Knowledge (b) Legislation and Regulation (c) Planning (d) Implementation (e) Management (f) Research Theme, and (g) Strategy Implementation. The DWAF, at the time, intended to incorporate artificial recharge as part of water resource planning - both at the Water Resource Level and at the Water Services Level (Department of Water Affairs and Forestry, 2007). The City of Windhoek has taken this concept to application as discussed in section

Malawi has developed **water resource regulations** which amongst others deal with groundwater management, development and administration (Government of Malawi, 2018). The regulations require a drilling permit to be obtained by a person who wishes to engage a driller to construct a borehole on his land for the purpose of using water; recharging an aquifer; or monitoring and research; fitting a motorised pump to a borehole, and exploration. Regulation of groundwater development requires an allocation plan and test pumping. The following standards, known as **ZWS 678:2013 standards** have been developed and are currently in use in **Zimbabwe**.

The dependence of **Windhoek, Namibia** on groundwater resources for its water security necessitated the Windhoek City Council to pass **new town-planning regulations** aimed at preventing over-abstraction and pollution of the Windhoek Aquifer. The regulations include prohibition of hazardous material and land use zoning to protect recharge areas of the aquifer. The **Zambian government** has introduced **fees on groundwater use** (Government of Zambia, 2018).

With regards to institutional arrangements, most Member States have undergone a range of policy and legislative reforms that address improvements to the institutional frameworks for water resource management and development. However, in many instances there have been many challenges realised in establishing these institutions. From a groundwater perspective, the importance of inter-governmental and inter-sectoral engagement is essential and often the institutional frameworks do not provide sufficient support, or the instruments, to ensure sufficient engagement. This is particularly the case with regards to enabling effective inter-sectoral planning. Provision in these institutional frameworks for joined-up research as well as for professional bodies for hydrogeology are often limited.

2.2. Strategic Focus of a Groundwater PLI Roadmap

Whilst SADC GMI is supporting the strengthening of the governance framework (policy, legislation and institutions) for groundwater management across the region, with a specific focus on improving the management of transboundary aquifers, there is recognition of the importance of developing strategic roadmaps to strengthen groundwater management on a national basis.

Roadmaps are in effect time-based plans that define where a 'business' is, where it wants to go, and how to get it there. It, therefore, must be understood in the current context, present an overarching goal and then provide the key actions to attain that goal.

Therefore, the focus here is on the support to improve the policy, legislative and institutional environment in order to create the basis for sustainable groundwater management. It is however, understood that a focus on this governance framework alone would be insufficient and would leave out key enabling and operational dimensions that do require attention (Figure 1). However, once the basis has been laid by addressing the foundational issues of policy, legislation and institutional arrangements, the Ministry with key stakeholders will then be better positioned to address the more enabling and operational aspects.

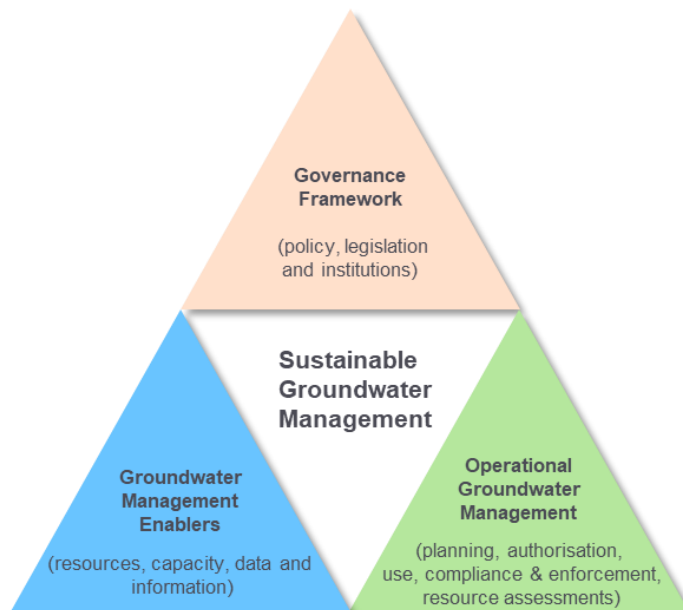


Figure 1: Elements of a framework for sustainable groundwater management

A roadmap is a strategic action plan that entails four core steps: A) Assessing the Situation; B) Developing the Strategy; C) Building the Plan and D) Monitoring Performance (Figure 2). Building the Plan and Monitoring the Performance are essentially the strategic responses to the strategy developed in B) Developing the Strategy. The ultimate aim of the roadmap is to develop a strategic action plan that further advances sustainable groundwater development and management and to address gaps and challenges in a participatory manner. The four key steps required are illustrated in the Figure below:

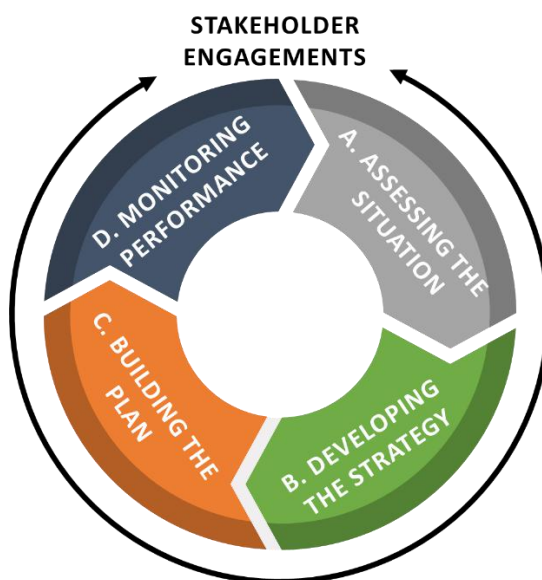


Figure 2: The planning cycle



This guideline is based on the groundwater roadmap process that was followed for the GMI-PLI project. A pilot Member State that was selected for the roadmap and this process formed the basis for the development of the guideline and provided useful opportunities and lessons learned to take forward to other Member States that might wish to upscale and initiate their own groundwater strategic action plan.

3. A) ASSESSING THE SITUATION

3.1. Developing a Desired Future State

National and regional contexts do vary considerably, and therefore the needs for actions to strengthen groundwater management equally vary. Noting the intention to improve the governance aspects of groundwater management, as a basis for improving the other enabling and operational aspects, one can develop an outline of a desired future state that enables effective, efficient and sustainable groundwater governance. This desired future state, provided here, is drawn from the Global Diagnostic on Groundwater Governance undertaken by the Food and Agriculture Organisation (FAO) in 2016. A number of findings from this study have resonance for the SADC region:



- **Groundwater governance** requires clearly defined objectives supported by policies, strategies, legal instruments and plans;
- **Governance gaps** often exist and vary with the levels of groundwater development and the specific conditions of aquifers;
- **Policies** are often incoherent and poorly integrated into broader water resource management;
- **Legal and regulatory frameworks** for groundwater have often been inadequate and their implementation has often been ineffective;
- **Emergent issues** continue to increase with the pressures being placed upon groundwater resources;
- **Cooperation is often limited** between well owners and stakeholders, but is improving; and
- **Information and knowledge exchange** on groundwater management is often not sufficient to support good governance and the lack of awareness about groundwater is significant (FAO, 2016).

With these findings in mind, a suite of minimum requirements for policy, legislation and subsidiary legislation and regulations have been developed. These are directional in their guidance and help states to target issues to address in these frameworks over time.

Table 1: Desired Future State

Issue	Description of Desired Future State
Policy	
Groundwater value	The social, economic and environmental values of groundwater are all recognised.
Resource protection	A long-term policy to protect groundwater by preventing pollution and overuse and is comprehensive, implemented at all appropriate levels, consistent with other water management policies and be taken into account in other sectoral policies.
Human rights	The human right to water is recognized and a rights-based approach to groundwater management is taken, <i>inter alia</i> , through: <ul style="list-style-type: none"> ▪ Prioritization of drinking water/basic human needs in water legislation;

Issue	Description of Desired Future State
	<ul style="list-style-type: none"> Ensuring that land-based rights cannot entitle unlimited access/use of freshwater, including groundwater; Ensuring groundwater is legally recognized as a public good; Recognising the role of groundwater in meeting basic human needs for food security; Legal recognition of customary rights to freshwater, including groundwater; Legal mechanisms to ensure gender equity in access, use and management of freshwater, including groundwater; Provision of pricing mechanisms that incentivize equitable distribution of rights to access and use of groundwater, as well as prioritization of small-scale users' livelihoods and food security needs, especially youth and women.
Socio-economic value	Groundwater is recognised as a highly important source of domestic and agricultural water supply and a key resource for poverty alleviation, food security, and the sustainable economic development of rural areas.
Ecological importance	The biophysical and ecological linkages between ground and surface water for their use, protection and management are recognised, including land use zoning for groundwater protection and recharge (conjunctive use) and the importance of the maintenance of ecological infrastructure is recognised (recharge zones).
Collaboration	Intersectoral collaboration is promoted and facilitated so that the needs and impacts of different sectors (e.g., land, agriculture, mining, municipal, and environment) are taken into account in groundwater management and the impacts of developments in those sectors on groundwater are accounted for.
Adaptive management	Adaptive management is recognised due to the inherent limitations in the nature of scientific information in conjunction with the widely occurring dynamic processes of climate, social and institutional change
Stakeholder engagement	Stakeholders and water users roles in groundwater management is recognised and participation of stakeholders in decision-making and groundwater management is promoted and facilitated
Institutions	An apex body that is responsible for GW management and playing the role of custodian/trustee on the part of the state is clearly defined and effective institutional arrangements are coordinated at transboundary, national and local levels.
Access to information	Public access to geohydrological data held by the state is promoted and facilitated.
Legislation	
Status of groundwater	<ul style="list-style-type: none"> All water has a consistent status in law, irrespective of where it occurs Explicit reference to groundwater and conjunctive use management in catchment/water management and development plans and drought/emergency management plans Human right to water recognized in groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users

Issue	Description of Desired Future State
Provide conditions for accessing groundwater	<ul style="list-style-type: none"> ▪ Enable the authorisation of groundwater use (with a system that does not discriminate, especially against the rural poor); ▪ Permitting of groundwater use should not be tied exclusively to land tenure; ▪ Allow for the categorisation of water users; ▪ Groundwater declared a public asset and/or authority vested in government to restrict, in the public interest, the rights accruing from its private ownership to prevent over-abstraction or inequitable access/use by landowners; ▪ Provide for changing ownership rights to use (usufruct) rights, subject to a government-controlled, permit system for large scale users with appropriate non-permit systems for addressing the needs of small-scale users ▪ Recognises and legalises affordable, small-scale and indigenous solutions; ▪ Enable the regulation of borehole drillers, regulation for drilling, control of drillers, information from drillers and standards for borehole drilling; ▪ Gives water inspectors the right to enter land with the offenses and associated penalties noted in the legislation (this includes appropriate fines and jail time that needs to be adjusted annually); ▪ Enable the regulation of exploration; ▪ Allow for zoning for overused/fragile aquifers; and ▪ Enable groundwater use organizations to integrate into existing institutional frameworks (e.g., catchment management, customary institutions).
Regulating Depletion	<ul style="list-style-type: none"> ▪ Provide for the regulation of abstraction and recharge (usually via permitting); ▪ Reflect the linkages to ecological infrastructure; ▪ Prohibition of abstraction in certain zones; cropping or irrigation practices; protection zones for recharge areas; no surfacing/drainage requirements; ▪ Provide for the mandatory installation of monitoring equipment of boreholes especially for large-scale users (the information must then be supplied to the state); and ▪ Provide powers of compliance monitoring and enforcement.
Regulating Pollution (Point source and non-point source)	<ul style="list-style-type: none"> ▪ Provide for reducing and regulating abstraction; ▪ Provide for water quality targets; ▪ Enable the regulation of emissions/wastewater discharge/waste storage including the impact of mines on groundwater quality with permits/ licenses taking into account the vulnerability of the aquifer concerned and the provisions necessary for its protection; ▪ Enable the classification of water bodies; and ▪ Provide powers of compliance monitoring and enforcement.
Planning	<ul style="list-style-type: none"> ▪ Specify the need for long term plans to ensure the sustainable use of groundwater, including drought management plans and cross-sectoral coordination; ▪ Provides for integration of groundwater into catchment level or basin level planning; ▪ Specify that groundwater management planning should take into account and be integrated into land use and environmental planning; and ▪ Planning should be cyclical and adaptive to respond to changing climatic, social, political and institutional contexts/drivers.

Issue	Description of Desired Future State
Institutional Arrangements	<ul style="list-style-type: none"> Provide for effective implementation, including the mandate, competence and power of the relevant authorities in accordance with uniform governance principles; Water authorities or coordinating bodies should have the competence to integrate all aspects of water management and should be rendered competent to arbitrate among various competing demands, and diverging interests regarding groundwater abstraction and use, both in the short-term and in the long-term; Enable intersectoral and institutional collaboration with other authorities, competent for public health, land-use planning, soils management, waste management; and Enable water user associations and other appropriate institutions and forums to strengthen the user advocacy role and achieve new partnerships and a joint management of the common resource.
Stakeholder engagement	<ul style="list-style-type: none"> Specify when and how stakeholders, the public and/or other water users are to be engaged in planning, decision making and self-management with regard to groundwater; Specify mechanisms for directly involving stakeholders in the development of laws and regulations related to groundwater and decisions that may impact the use or quality of groundwater on which they depend for drinking, livelihoods, food security, economic or cultural well-being; and Include the involvement of women and youth in decision-making and the implementation of groundwater supply schemes.
Monitoring and data collection to support regulation	<ul style="list-style-type: none"> Specify the need and parameters for a sustainable system for data collection, management and dissemination, including standardization and harmonization of data. Provide for a national monitoring and information system which captures quantity and quality data from key aquifers; Specify the need for drought monitoring systems which extend beyond rainfall, surface water and food security indicators to groundwater and groundwater supply status, including the appropriate prediction of future hydrogeological conditions; Address the need for standardization and exchange of data in transboundary contexts as well as the establishment of joint inventories; and Enable access by the public to geohydrological data held by the state.
Water conservation and efficiency of use	<ul style="list-style-type: none"> Enable regulation to ensure the efficient use of groundwater, such as the use of economic incentives and imposition of technologies.
Compliance and Enforcement	<ul style="list-style-type: none"> Provide mechanisms for promoting compliance with groundwater regulations should be included in the legislation; and Provide enforcement provisions including, inter alia, inspections authority for groundwater management institutions, the ability to impose fines and/or additional administrative penalties and adjust those as necessary, and enumerate criminal offenses associated with failure to comply with the law.
Regulatory measures	<ul style="list-style-type: none"> Enable the relevant authority (Minister) to make regulations on any relevant matter in the legislation; and

Issue	Description of Desired Future State
	<ul style="list-style-type: none"> Provide for the government to pass regulatory measures, such as abstraction fees and waste disposal charges, to provide revenue to water management institutions and to incentivise appropriate use of groundwater.

Before the roadmap can be developed, a baseline needs to be established that provides the minimum requirements for what an effective groundwater management framework should entail. This would be the Desired Future State (DFS) and would need to incorporate global, regional and national agendas to ensure that alignment and integration of groundwater management occurs.

In the context of SADC, the DFS will also need to be tailor-made by considering the following:

- The high levels of groundwater dependency in many SADC countries, in rural areas in particular;
- The variety of geohydrological contexts;
- High levels of poverty, gender disparities, social exclusion and pollution; and
- Relatively low levels of state capacity – skills, infrastructure and finance.

An ideal PLI framework for groundwater management would need to consider the basic human need to access water, energy and food, as well as incorporate the need to protect ecosystems that are dependent on groundwater while simultaneously promoting socio-economic growth. Developing adaptive processes and instruments to support climate resilience is equally important.

Box 3:
Legislation - Good Practise

Mauritius Groundwater Regulations (2011) requires every licensee to set up, at his/her own cost, a meter and use it to measure the volume of groundwater abstracted. The meter must be kept in good working order and a daily record of abstraction kept and reported monthly to the Water Authority. The regulations specify how and where the meter is to be installed and calibrated annually. Renewals of licenses depend on payment of outstanding fees, a certificate that the meter is in working order, and historical adherence to permit requirements.

Malawi's Water Resources Act (2013) provides a comprehensive set of considerations for the permitting authority to consider when issuing a groundwater use or abstraction permit, including **consistency with policy and the national water resource management plan**;

Zambia's Water Resources Title on Management (Groundwater and Boreholes) Regulations (2018) requires notice of intention to drill a borehole; an application and payment of prescribed fee; technical specifications to ensure safety and sanitary standards are met; and specific distances that must be met between boreholes and between boreholes and various types of pollution sources.

In considering the DFS, it will be necessary to develop a progressive approach noting that certain aspects of the DFS require time consuming administrative and political processes.

3.2. Conducting a Gap Analysis for PLI in SADC Member States

Across the Member States, water resource management and development (WRMD) has taken great strides towards efficiency and promotion of socio-economic development through effective and sustainable WRMD. The adoption of IWRM by most of the Member States re-emphasises the interconnected nature of surface water and groundwater, with groundwater beginning to be recognised as a crucial tool for poverty reduction; drought alleviation; and promotion of socio-economic growth.

Nevertheless, there are improvements that could be made to strengthen these frameworks, which at a national level can be driven through the process of developing a strategic roadmap. Regional gaps and challenges within SADC are listed in the figures below:

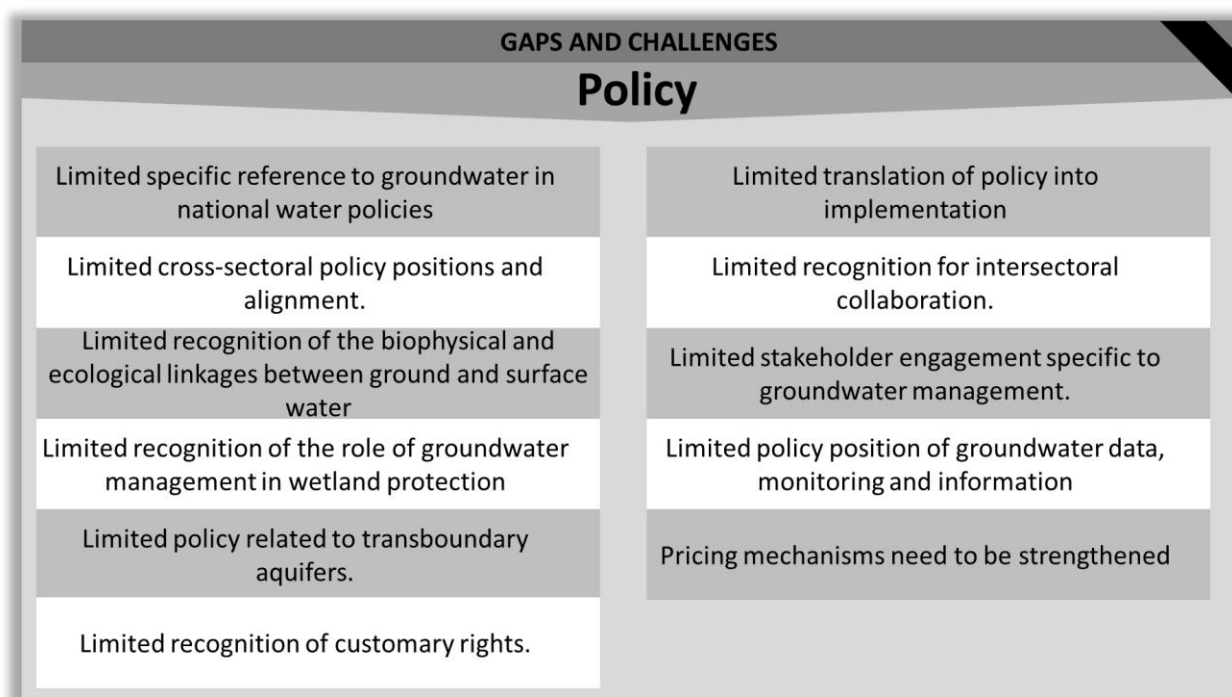


Figure 3: Regional policy gaps and challenges in SADC.

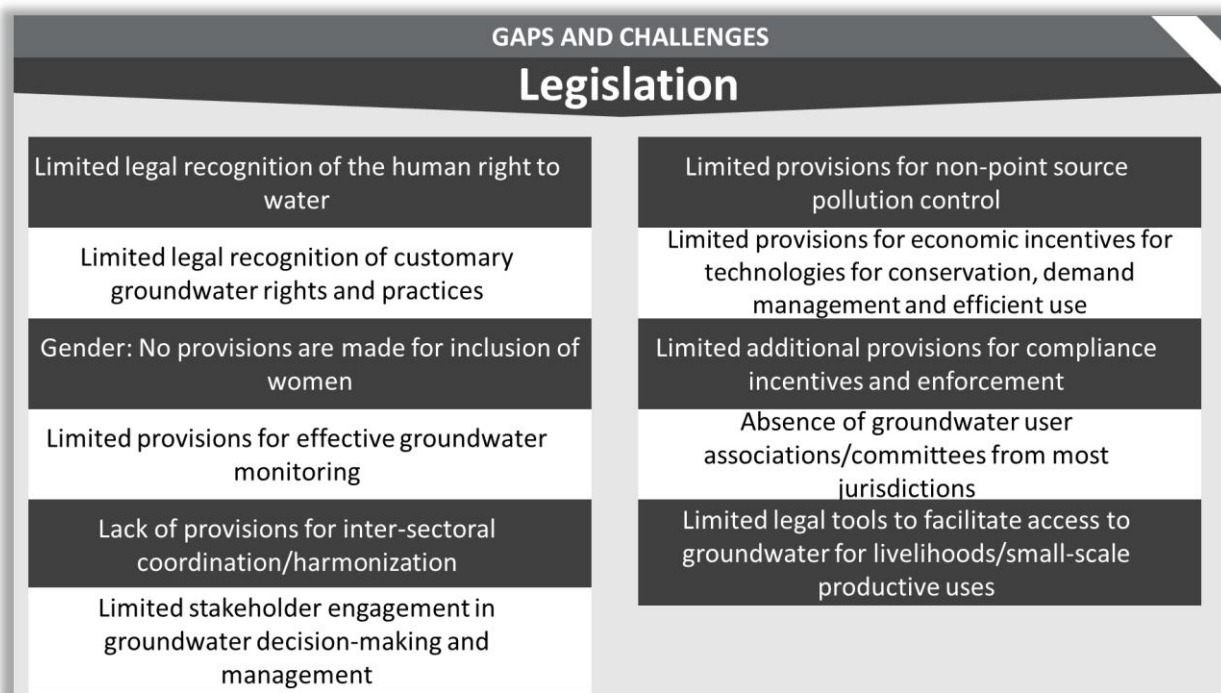


Figure 4: Regional legislation gaps and challenges in SADC

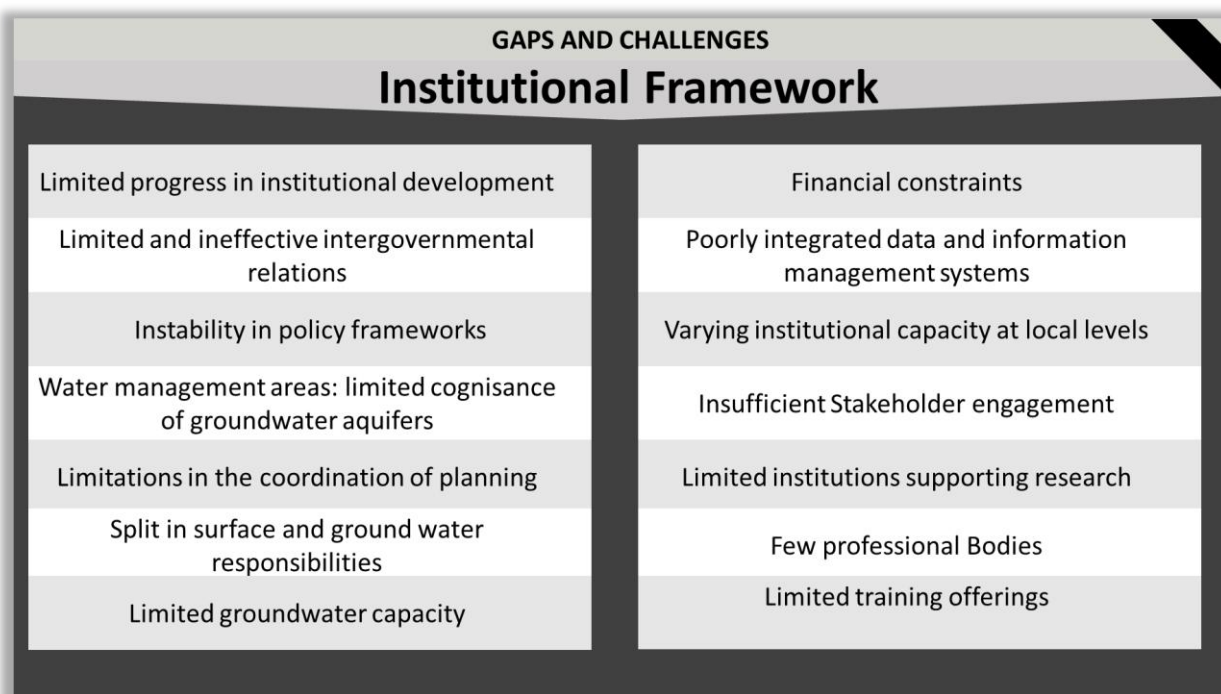


Figure 5: Regional institutional gaps and challenges in SADC

3.2.1. Gap Analysis

A national gap analysis is necessary to determine the current state of groundwater management in the country, incorporating the existing policy, legislation and institutional framework of the country. This

process should lead to the identification of gaps/challenges as well as the necessary actions/enablers needed to create an enabling environment for groundwater management. Key strengths and opportunities can also be identified to better highlight strong points that groundwater development can launch off.

Box 4:

Institutional Framework - Good Practise

Functional differentiation: There is a growing trend towards the establishment of more independent regulators (see **Zambia's NWASCO** for example), but more important is that there is a clear differentiation from those that are responsible for the setting of policy frameworks and those that develop resources.

Catchment-based institutions: The need to devolve the more operational management and catchment-based oversight to institutions within catchments is generally recognised as best practice as seen in **Tanzania with Basin Water Offices** and **Zimbabwe with Catchment Councils**.

Improved financing: Many policies allow for a range of financial instruments to support ongoing water resource management. The **South African Waste Discharge Charge System** development has taken this to implementation readiness and can provide a useful platform for catchment-based institutions to engage with issues of water quality in surface and ground water.

Research institutions: The need for improved research is recognised as a key issue for strengthening ongoing management of groundwater resources, but also, in so doing, to train and develop our skills and capacity. The establishment of the **Water Research Commission in South Africa** has to be seen as best practice in terms of supporting and coordinating integrated water research.

The assessment of the PLI landscape in a Member State will be based on the DFS which should be developed earlier to establish a baseline for effective groundwater management. The gap analysis process can be supported by extensive literature reviews, desktop studies and stakeholder engagements. Stakeholder engagements are essential during this step to ensure that the current groundwater management framework is correctly captured based on feedback from all levels (government, research, civil society and private sector). The identification and prioritisation of relevant stakeholders can ensure that all critical groundwater actors are consulted during the gap analysis. To aid in this process, the administration of a questionnaire during the initial stakeholder engagements will allow for easy collection of data. The questionnaire would need to be designed in such a manner that all groundwater-related policy, legislation, strategy and institutional arrangements are incorporated. The questionnaire will also need to be easy to read and complete allowing for stakeholders to fill in the questionnaire while also adding comments themselves based on individual experience and knowledge. The initial stakeholder engagements will also assist with the validation of the gap analysis, a crucial task to ensure that there is buy-in and support from all essential groundwater players for the gap analysis and roadmap development. The validation can take the form of a workshop whereby government, research/academia, civil society and private sector representatives are invited to attend; and validate and engage with the gap analysis. The gap analysis can also be distributed to WUAs, water service providers and other extended stakeholders for their input.

During the gap analysis phases, a large number of challenges and gaps will be identified through the literature review and stakeholder engagements. It is important to group/bucket these gaps as sheer

number of identified gaps can be overwhelming and difficult to address going forward. By grouping gaps based on similarities e.g. according to categories such as capacity building, implementation, data monitoring and sharing etc. future analysis will be easier to conduct and the results easier to present to stakeholders. This method can include grouping the challenges/gaps and the associated enablers into ‘must haves’, ‘should haves’, ‘could haves’ and ‘won’t haves’. This will also present the existing challenges in the country in a manner that is less daunting with low-lying fruits and simple solutions being easier to achieve.

The gap analysis process will also ensure that a thorough understanding of groundwater in the country is established prior to the development of the roadmap, as well as the identification of gaps and strengths that can feed into the upcoming steps. The gap analysis will form the foundation on which the roadmap will be based on.

Tools and/or processes to assist with the development of the gap analysis is explained in the table below.

Table 2: Tools / Processes to Support Gap Analysis

Tools / Processes to Support Gap Analysis	
SWOT Analysis	This analysis focuses on identifying strengths, weaknesses, opportunities and threats (SWOT). Strengths and opportunities primarily involve the internal environment while opportunities and threats look at the external environment. SWOT analyses also entails prioritising the identified SWOTs with the highest priority at the top and lowest priority at the bottom.
PESTEL	This analysis expands on the SWOT approach by including political and regulatory issues as well as economic factors, social norms, demographics, technological developments and attitudes. The acronym stands for Political, Economic, Social, Technological, Environmental and Legal (PESTEL).
Fishbone Diagram	This is also known as the “Cause and Effect” or “Ishikawa” diagram and is used to identify the root cause. It is based on 6 groupings: Measurement, Material, Machine, Mother Nature, Manpower and Method (6 Ms), that once identified, help to understand how each relates to the problem.
McKinsey 7S	McKinsey 7S looks at seven interrelated elements: strategy, systems, skills, staff, style, structure and shared value which are further divided into hard elements (tangible and controllable) and soft elements (tangible and uncontrollable). Strategy, structure and systems are categorised as hard elements and shared values, style, staff and skills as soft elements.
Nadler-Tushman’s Congruence Model	This congruence model aims to identify performance gaps based on the fact that a business’s performance is a result of 4 elements: work, people, culture and structure. The more compatibility these elements, the greater the performance of the organisation.
Burke-Litwin Causal Model	This model looks at the different components in an organisation and how they relate to each other when undergoing change. The 12

Tools / Processes to Support Gap Analysis	
	components are: external environment, mission and strategy, leadership, organisational culture, organisational structure, management practices, system and policies, work unit climate, tasks and skills, motivation, individual needs and values and individual and organisational performance.
Root Cause Analysis	This analysis looks to determine the origin of the problem using certain steps with associated tools. It aims to identify what happened, why it happened, and what to do to reduce the likelihood of it happening again. The cause is often divided into 3 categories: physical, human and organisational.
5 Whys	The 5 Whys asks the question 'Why?' a number of times (with 5 being the general rule of thumb). By continuing to ask why, the true root cause of the problem can be identified by cutting through the outward symptoms of the problem.
DPSIR	The Drivers, Pressures, States, Impacts and Responses (DPSIR) analysis analyses the interconnected relationships between social and environmental factors and is often applied to water-related issues owing to the strong linkages between ecosystems and populations in water resource management and development.

4. B) DEVELOPING THE STRATEGY

4.1. Towards a Theory of Change

It is understood that processes to strengthen PLI frameworks take time and require complex processes. In support of these longer-term objectives, a Theory of Change (TOC) describes the intervention logic that will be utilised towards that longer-term intent. As such, the TOC reflects the end goal or impact desired, and the outcomes, outputs, and inputs viewed as necessary for this impact to be achieved.

The development of a TOC can provide the basis for better planning, in that activities are linked to a detailed understanding of the change process. It also leads to better programmatic evaluation, as this enables the detailed measurement of progress towards the achievement of longer-term goals.

A TOC is best used when there is need to:

- Undertake a complex suite of initiatives and, therefore, require a rigorous plan to realise the outcomes;
- Provide transparency regarding the various initiatives and their sequencing, enabling agreement among stakeholders about process and success;
- Evaluate the various outcomes at the right time and the right sequence; and
- Explain why initiatives have or have not worked and explore reasons for this.

It is of importance to note that a TOC can provide a valuable unifying framework for strategic decision-making, communicating and reporting. This can also provide significant value in attaining alignment where there has been process and progress difficulties.

A TOC for improved groundwater management is provided in Figure 6.



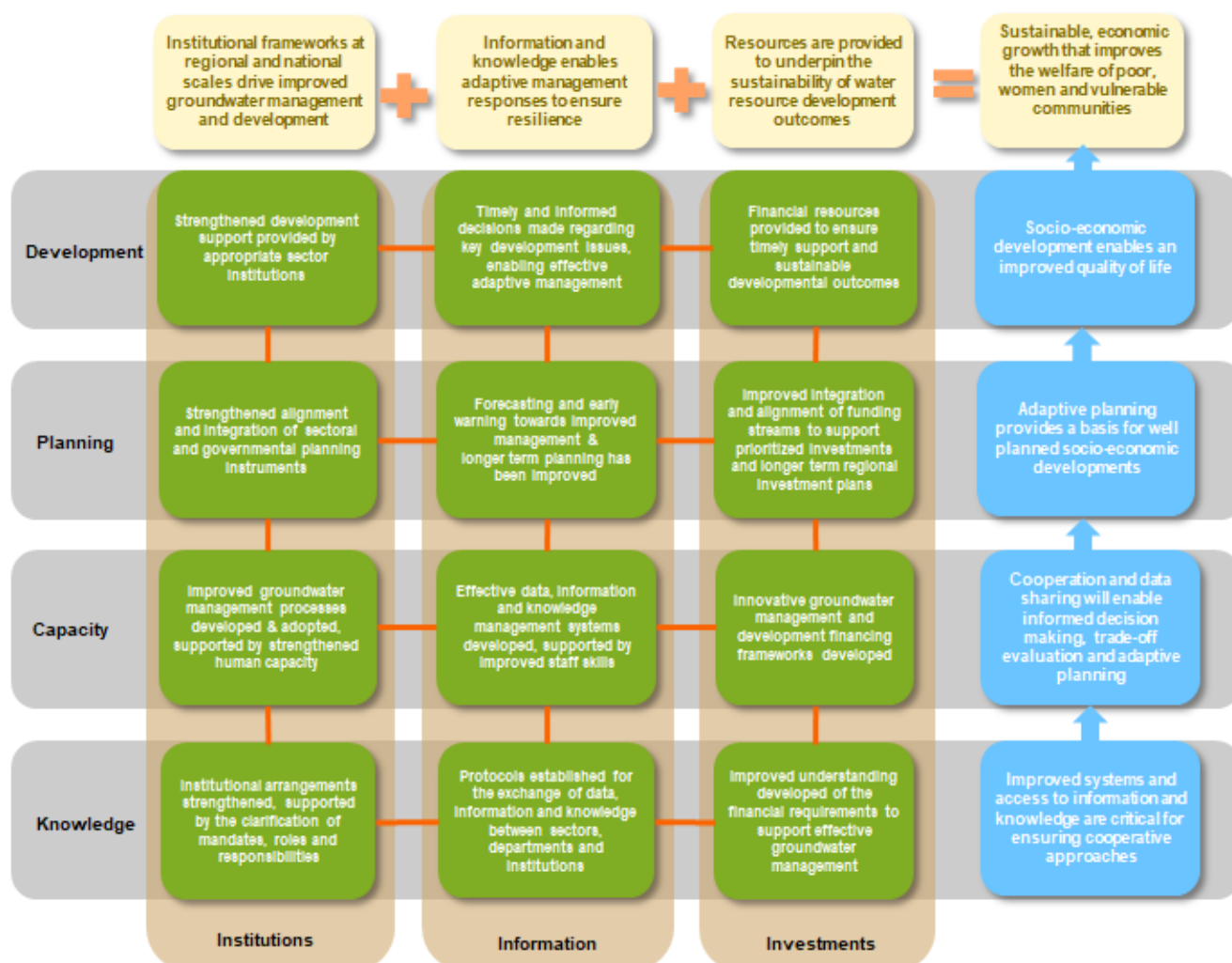


Figure 6: Theory of Change for improved groundwater management

4.2. Understanding the Context and Linkages to Global, Regional and National Agendas

Essentially, any groundwater initiative, regionally and/or nationally, would need to align to various agendas to ensure that groundwater resources are managed according to international goals. This would entail aligning to global, regional and national agenda as well as being cemented in the current framework of the country. Prior to the establishment of the vision, goal and objectives of the groundwater roadmap, an in-depth understanding of the global and regional context for water resources management is necessary to ensure that future groundwater management is in line with national and regional standards. In the same breath, the roadmap will require alignment with the national agenda and national development plans as groundwater can provide the means to achieve many of the national goals and objectives within a country.

4.2.1. Global Development Agenda

The 2030 Agenda for Sustainable Development provides the global framework towards peace and prosperity by ending poverty in all its forms by employing sustainable and resilient methods that ensure

that all are included (UN, 2018; UN-Water, 2018). The Agenda has been adopted by all United Nations Member States and consists of 17 Sustainable Development Goals (SDGs) with Goal 6 focusing on clean water and sanitation. Access to clean water and sanitation is a basic human need that is crucial for the eradication of poverty. Approximately 2 billion people are living with the risk of “reduced access to freshwater resources and by 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water” (United Nations, 2019). This is evident in many developing nations, particularly Sub-Saharan Africa, Central Asia, Southern Asia, Eastern Asia and South-Eastern Asia (United Nations, 2019). To achieve SDG Goal 6: Clean Water and Sanitation for All, a list of targets has been developed by the United Nations and are detailed below.



Figure 7: Targets for SDG 6: Ensure access to water and sanitation for all (United Nations, 2019)

Groundwater plays a key role in achieving Goal 6 and is relevant specifically to:

- *Goal 6.5: Implement integrated water resources management at all levels, including through trans-boundary cooperation as appropriate.*
- *Goal 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes*

However, the goals place strong emphasis on surface water and the absence of groundwater-specific goals/targets poses a risk to the sustainable use of groundwater. Hence, groundwater is often overlooked in the context of the broader SDGs. Whilst there is explicit linkages to Goal 6, sustainable groundwater management also lends itself to supporting and achieving poverty eradication (Goal 1); food security (Goal 2); gender equality (Goal 5); sustainability of cities and human settlement (Goal 11); combating climate change (Goal 13) and protecting terrestrial ecosystems (Goal 15) (UN-Water, 2018). This shows the criticality of sustainable groundwater management.

4.2.2. Regional Development Agenda

The African Union's Agenda 2063 is the strategic framework that aims to achieve inclusive and sustainable development over the next 50 years. The agenda looks to "accelerate the implementation of past and existing continental initiatives for growth and sustainable development" (African Union, 2019). Water plays a crucial role in achieving this aim through the inclusive access to water and sanitation and the equitable and sustainable management and use of water resources that promote socio-economic development, regional cooperation and sustainable use of the environment (African Union, 2015).

Practical and Implementable

Any groundwater initiative will need to be practical and implementable within the context of the country. Although this guideline does provide a platform upon which future groundwater projects can be based upon, it is important to note that each country is different and that there is no 'one size fits all' scenario. Any groundwater roadmap would need to align with the national agendas and national development plans of that country, alongside regional and international goals, while promoting effective and efficient groundwater management. This would also need to be cemented in the existing PLI framework of the country that will create an enabling environment for groundwater management.



However, similar to the SDGs, specific reference to groundwater is notably lacking in Agenda 2063. This is a significant oversight as groundwater has an important role in accessing water and sanitation as well as promoting socio-economic development.

Within the SADC region, the ultimate goal is to achieve economic development, peace and security, and growth, alleviate poverty, enhance the standard and quality of life of the peoples of Southern Africa, and support the socially disadvantaged through regional integration. The region's economic outlook faces major headwinds: high unemployment, weak commodity prices, fiscal strain, increasing debt, and high inflation (African Development

Bank, 2018). Water plays a significant role in the economy of the region and as with global trends, represents significant risk to ongoing economic development (World Economic Forum, 2018).

As discussed earlier, the regional framework of SADC consists of the SADC Regional Water Policy (2005), SADC Regional Water Strategy (2006), SADC Regional Strategic Action Plan (through various phases of development) and SADC Revised Protocol on the Shared Watercourses (2000). Although gaps are evident, it is imperative for groundwater programmes to align with SADC's policies, strategies and legislations to ensure that national and regional groundwater management is integrated.

4.2.3. National Agenda

Any groundwater initiative would need to be cemented within the Member State's framework aligning with the National Development Plans and other water resources framework. Most countries already have a national development plan in place that can be used as a basis for effective groundwater management.

Future groundwater project would need to align with the SDGs, Agenda 2063 and national agendas while still making provisions for groundwater, ensuring that this resource is not overlooked or combined with surface water issues. Groundwater poses unique challenges that are different to those associated with

surface water and need to be tackled with a thorough understanding of the distinctive nature of groundwater while still aligning with a holistic IWRM approach.

4.3. Visioning

The vision, goal and objectives form an important process in the roadmap that will aid in the development and achievement of short-term goals while keeping sight of the long-term vision.

- **Vision**

The **vision** forms the overarching goal for the groundwater roadmap and underscores the ultimate state that groundwater management needs to strive towards. The vision will need to be brief and concise in its core message around groundwater management and development; and broad enough to encompass the bigger picture. Alongside this, the vision needs to be clear and understandable to ensure that all groundwater actors easily understand the vision and is able to use the vision as guidance in their groundwater-related activities.

- **Goal**

The **goal** for the groundwater roadmap is the next step once the vision has been established. The goal essentially provides the 'what' and 'why' and is similar to the vision except that it is more specific in how it is going to address the identified gaps and challenges to achieve the vision. The goal will need to refer to the core problems in groundwater management as well as broadly including the means by which these problems will be addressed. It is important to note that the goal is concise and catchy to better ensure that it can be taken up by the groundwater community.

- **Objectives**

The **objectives** provide the details on how the goal and vision for effective groundwater management will be achieved and will include specific measurable results within the national PLI framework. These are essentially smaller steps that are required to achieve the goal. The objectives should be practical and implementable, noting the context of SADC and national issues.

The visioning process needs to be underpinned by the need for the conjunctive use of both surface water and groundwater. Although this guidance document places strong emphasis on groundwater management and development, it is crucial to remember that any groundwater initiative will need to part of the broader IWRM approach. Therefore, the eventual action plan that will come out of the process can be understood as a sub-strategy to broader water resource management and development instruments.

Tools and/or processes to assist with the visioning process are explained in the table below.

Existing Groundwater Initiatives

It is also important to have a clear understanding of any current groundwater initiatives taking place within the country to see if the groundwater roadmap can piggyback of certain projects. It would be useful to liaise with developmental partners within a country to gain an in-depth understanding of the groundwater situation and their programmes within the country and to see if potential alignment can occur.



Table 3: Tools / Processes to Support Visioning

Tools / Processes to Support Visioning	
VRIO Framework	The Value, Rarity, Imitability and Organisation (VRIO) framework helps to develop a vision statement by focusing on the VRIO.
What, How and Who	When undertaking the visioning process, it is important to ask what the organisation does, how does the organisation do it and who does the organisation do it for.
Consultation and Review	Engage and consult with interested parties including staff within the organisation to ensure that the vision and staff values align. The vision should also be reviewed on a regular basis so as to ascertain that the organisation is either still sticking to its vision or has evolved towards the need for a new vision.

5. C) BUILDING THE PLAN

5.1. Developing the Roadmap

Various steps are required to develop a comprehensive and practical groundwater roadmap. As with most planning cycles there is a need to understand the current context, to develop strategic objectives, develop an implementation plan to realise these objectives, and to undertake monitoring to

assess progress **(C) BUILDING**). This process forms the basis of this guideline and provides guidance on the approach to take when developing a strategic action plan for groundwater management and development.



5.2. Strategic Actions

Based on the vision, goal and objectives, strategic actions can be established that detail the steps on how the objectives will be met. These actions will be tailor-made within the context of the country's existing framework to ensure that the actions are achievable and pragmatic. The strategic actions will go into great detail on the specific activities that will be undertaken to achieve the vision for effective and efficient groundwater management. This procedure will require intersectoral coordination and collaboration as water resource management, despite being the responsibility of the national ministry/department of water, impacts all sectors, especially agriculture, mining, urban planning.

5.3. Prioritise Implementation

High-Level Decisionmakers

In order for the roadmap to be successfully implemented, the involvement of high-level decisionmakers needs to be emphasised, particularly during the final stages of the groundwater roadmap. During handover of the groundwater roadmap, representatives that have a strong influence on national policy and legislation should be involved to allow for championing of the roadmap implementation.



Based on the gap analysis of the existing groundwater PLI framework in a country, a significant number of gaps could have been identified that will require a comprehensive action plan with detailed activities. However, it is useful to prioritise implementation as many government departments throughout SADC lack sufficient human and financial capacity. Prioritisation will allow for the efficient use of resources to yield results with meaningful and measurable impact. To aid this prioritisation, the inclusion of timeframes, budgets, roles and responsibilities, targets and reporting criteria will provide a detailed overview of the strategic actions and allow for easy identification of priority areas. The splitting of activities into short-, medium- and long-term timeframes will allow for better framing of the actions and the identification of low-lying fruits. The identification of potential barriers that could prevent an action from being completed is also advisable to ensure that risks are averted and to allow for preparation, if such challenges are encountered. The identification of champions to lead a specific action will also assist with ownership, ensuring that the actions are taken forward towards successful implementation.

The successful achievement of the groundwater roadmap vision can take a significant amount of time and will require efficient and effective implementation by the various relevant stakeholders. Noting the long timeframes, there is a possibility that the strategic actions can change owing to change in policy, legislation or institutional arrangements within a country. It will be necessary to develop strategic actions that are robust enough to deal with these changes as well as being able to adapt to the changing landscape.

Engagements with relevant stakeholders throughout the visioning and strategic action phases are crucial for successful implementation of the groundwater roadmap. Meaningful participation with stakeholders will allow for ownership and championing of the roadmap as well as encouraging co-development of the strategic actions, once again noting that stakeholders from multiple departments should be involved to encourage multi-sector coordination and collaboration. The identification of stakeholders for this process can build upon the previous engagements conducted during the gap analysis as well as expanding the range of stakeholders to ensure that a more in-depth understanding of groundwater management is achieved. This should also include developmental partners within the country so as to see if any of the strategic actions can piggyback of existing groundwater initiatives.

Tools and/or processes to assist with the development of strategic actions is explained in the table below.

Table 4: Tools / Processes to Support Development of Strategic Actions

Tools / Processes to Support Development of Strategic Actions	
MoSCoW	The MoSCoW analysis is a prioritisation technique that is used to manage priorities. It groups priorities according to Must Have, Should Have, Could Have and Won't Have. This tool allows for organisations to identify what is important and includes aspects that must not be included in the strategic plan.
Balanced Scorecard	The Balanced Scorecard incorporates the objectives, measures and initiatives and can be developed on Microsoft Excel, PowerPoint or any other reporting software.
Strategy Map	This tool is more visual based but allows for easy communication of the strategic actions at a high-level.
OKR	The Objectives and Key Results (OKR) Framework is simple in that it looks at defining the objectives and key results. However, it uses reverse hierarchy so buy-in can be obtained from the bottom-up. The framework also allows for goals to be continually set, tracked and reevaluated.
Hoshin Planning	This technique aligns goals with projects/initiatives ensuring that all efforts are coordinated. This approach takes focus away from measures and rather on goals and initiatives. It involves identifying key goals, sharing goals from top to bottom to obtain buy-in, tracking progress of key goals, obtaining feedback from employees and making adjustments

Ultimately, the groundwater roadmap needs to be pragmatic and implementable, while still striving towards efficient and effective groundwater management. Limited capacity and financial resources in



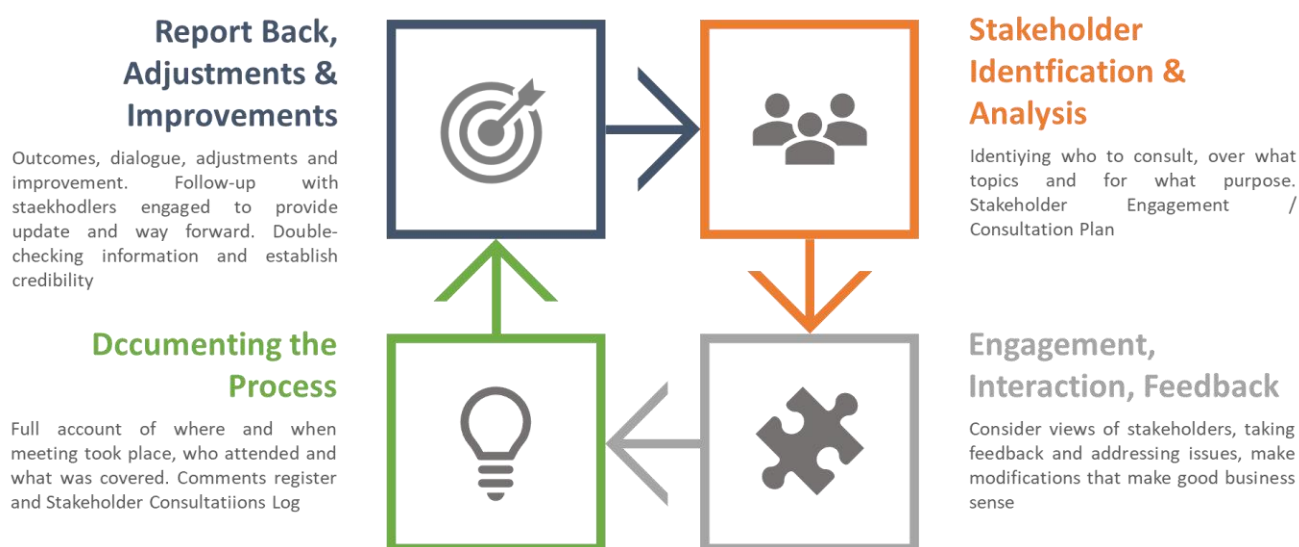
many of the SADC Member States require that a groundwater roadmap be practical and contextualised for each country.

6. STAKEHOLDER ENGAGEMENTS

Stakeholder engagements are crucial to the effective implementation of the roadmap. The consultation needs to be iterative with the basic steps in the process remaining the same. There are five basic steps that entail stakeholder consultation and engagement processes. These include identifying stakeholders, consulting using basic principles, incorporating feedback, documenting the process, and reporting back. These steps are critical and there should be consistency in how they are applied in this project. The figure below depicts the necessary steps required for strategic consultations with stakeholders.



Figure 8: Stakeholder Engagement Process



The first step entails identifying stakeholders. Before engagements can take place, it is useful to give due consideration to who needs to be consulted, in what form, over what topics and for what purpose. Getting clear responses for these questions up front can save time, reduce costs, and help keep expectations in check. If multiple stakeholder groups are involved, the development of a Stakeholder Engagement/Consultation Plan is advisable.

Stakeholder engagements come with the implicit promise that the views of stakeholders will be considered during the decision-making process. However, this does not mean that every issue or request needs to be acted upon. It is also good practise to take feedback received during the engagement processes seriously and address issues raised appropriately. Where possible, making modifications because of stakeholder feedback will make good business sense and contribute to local development. The modification can be done as a gesture of good faith and relationship-building with stakeholders in order to create ownership of both the process and outcomes.

Documenting the engagements and their outcomes is crucial for effective management of the process. This includes detailing when and where meetings/workshops take occur, who attended and what topics and themes were covered. Also, the results from the consultations needs to be documented including if any commitments to stakeholders were made. A comment register and stakeholder engagement log can assist in keeping track of engagements and feedback/inputs received that require follow-up. Such documentation can also provide the basis for reporting-back to stakeholders on how their views have been addressed.

It is also imperative to report back to stakeholders after an engagement has taken place as a common courtesy and good practise. It is unfortunately common for communities to express their anger when government or private companies consult with them and are not heard from again. It is good to keep the community updated on the process and what the next steps will be. The follow-ups can also aid in double checking information and refining ideas or proposals. Reporting back can also promote credibility and manage expectations.

Tools and/or processes to assist with stakeholder engagements is explained in the table below.

Clear Communication

The role of communication is vital in the development of the groundwater roadmap, noting that personal communication is preferred in many of the Member States over digital communications (email). Communication needs to be clear with all relevant parties throughout the process to ensure that all stakeholders are involved.



Table 5: Tools / Processes to Support Stakeholder Engagements

Tools / Processes to Support Development of Strategic Actions	
Stakeholder Engagement / Consultation Plan	A strategy to assist with stakeholder engagements and included details around frequency and type of engagement, types of media to be used, contact persons, and location of engagements. The plan should include a stakeholder list, project phase, contact names, areas of influence and engagement approach.
Comment Register	This document is useful in recording comments and inputs received during engagement. Unlike meeting minutes, this document will provide details only on comments/inputs that require follow up and action.
Stakeholder Engagement Log	This document is a summary of the engagements that have taken place as well as those that are planned. It assists with keeping track of engagements and assists with planning.

7. D) MONITORING PERFORMANCE

7.1. Monitoring, Reporting and Evaluation

Monitoring involves the ongoing observation of a range of criteria that provides data and information regarding progress in terms of policy and strategy implementation. It is a crucial aspect in the implementation of any project/initiative and helps to ascertain whether the plan is on the right track.

Monitoring, reporting and evaluation are critical for any project or programme and needs to be instilled at all levels and conducted on an ongoing basis. Needless to say, integrated planning across sectors can help to ensure that monitoring and evaluation is undertaken in a coordinated manner. This also applies to stakeholder engagements and implementation of the roadmap which will require action from different sectors.

Effective monitoring will determine whether the organisation is heading in the right direction towards achieving the objectives and overarching goals. Information gathered can be quantitative or qualitative and generated through formal or informal processes. The continuous measurement of progress against targets and expectations can allow for responsive adjustments and adaptive management of processes. It is important to note that monitoring is an ongoing activity that ensures that implementation is successful and aligned with the vision.

Monitoring entails two key aspects: reporting and evaluation. **Reporting** is the regular communication, often within defined intervals, of results and findings in predetermined and structured formats to ensure that the information gathered is easily collated and synthesised. However, this is not to say that irregular reporting does not have its place. In some instances, these informal avenues can provide an important source of data and anecdotal information. Although reporting is crucial for adaptive management, it is also critical for demonstrating commitment and accountability.

Evaluation is a periodic, systematic, and objective analysis to assess matters of relevance or appropriateness, performance in terms of efficiency or effectiveness, as well as value for money. Evaluations typically provide recommendations as to the way forward to address specific challenges and strengthen programme delivery.

In some instances, evaluation is understood to be the higher-end assessment of attainment of programmatic objectives and has resulted in the outcomes and impacts that are desired.



Stakeholder Engagements

Meaningful stakeholder engagements are a critical aspect throughout the roadmap with the role of stakeholders being emphasised during each phase of the roadmap. The inputs from stakeholders proved vital to developing and validating the gap analysis as well as encouraging co-development and ownership of the groundwater roadmap. Apart from ensuring that all levels of groundwater management are reflected in the roadmap, stakeholder engagements will also allow for the identification of champions within a country that can take the groundwater roadmap forward towards implementation.



This then supports the notion of more regular monitoring as being the tool for day-to-day project assessments and adjustments.

Metrics need to be carefully considered with conducting monitoring. The strategic actions should detail metrics that need to be tracked and can include milestones and quantifiable performance measures. This can also be linked to key performance indicators that are aligned with the national agendas and plans. But it is important to choose the right ones that ultimately align with the overall objectives. In addition, the metrics used should be relatively simple and ensure that staff are adequately informed and trained to track metrics throughout implementation. Lack of training can result in actions not being updated or monitored correctly which can negatively impact implementation.

An effective monitoring system will need to include:

- Clear targets with indicators to measure performance;
- Schedule with guidelines detailing who reports to who; and
- Opportunities for staff and other relevant parties to regularly meet to coordinate activities and review performances.

Tools and/or processes to assist with the monitoring is explained in the table below.

Table 6: Tools / Processes to Support Monitoring

Tools / Processes to Support Development of Strategic Actions	
Dashboards	Performance dashboards can be an informative tool to track key performance indicators. The ease of having data located in one place with various ways to present said data can assist in reporting progress
Newsletter / Strategic Plan Implementation Report	Newsletters and reports provide an easy way to communicate progress to staff, but this needs to be produced regularly with easy-to-read information and appropriately presented data.
Follow-Up Meetings	These meetings are useful to review metrics and discuss the implementation of the actions. This also affords the opportunity to review the choice of measures and whether they provide useful information.

8. CONCLUSION

The need for effective and sustainable groundwater management is imperative for many countries as a response to climate change and increasing demand due to variable surface water availability. Many of the SADC Member States rely heavily on groundwater for urban and rural water supply, socioeconomic development and drought alleviation. However, lack of effective groundwater management has resulted in many instances of groundwater being depleted and contaminated, threatening the sustainability of this precious resource.

It is within this context that SADC-GMI implemented the GMI-PLI project to provide support to policy, legal and institutional development for groundwater management in the SADC Member States. Part of this project entailed developing a groundwater roadmap for a pilot Member State. The process followed to develop the roadmap forms the basis for this guideline, which is aimed at other countries that may wish to undertake their own groundwater roadmap as well as provide key lessons from the GMI-PLI project. The general approach taken is explained in Figure 9, noting that processes will vary according to context.

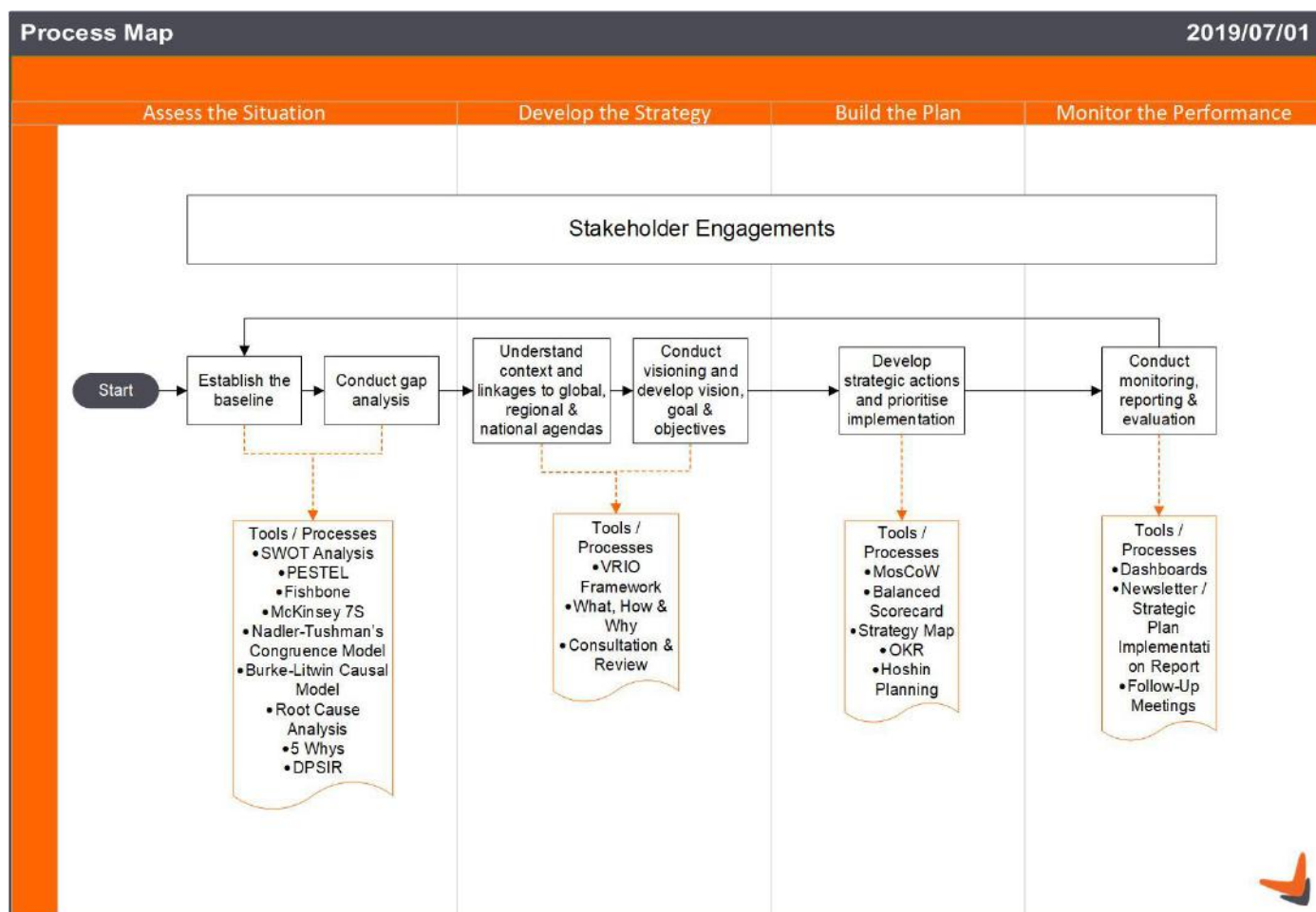


Figure 9: Approach to Developing Roadmap



SADC-GMI has undertaken the gap analysis of 15 Member States (South Africa, Botswana, Zimbabwe, Lesotho, Namibia, Kingdom of Eswatini, Seychelles, Mauritius, Madagascar, Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Angola and Zambia), thus paving the way for the other Member States to undertake their own groundwater roadmap. This guideline can be used as a platform to develop a national groundwater roadmap, providing guidance and direction while also being modified to better cater to each country's groundwater needs.

9. REFERENCES

African Development Bank, 2018. *Souther Africa Economic Outlook. Macroeconomic developments and poverty, inequality and employment. Competing in food value chains*, Addis Ababa, Ethiopia: African Development Bank Group.

African Union, 2015. *Agenda 2063 The Africa We Want*, Addis Ababa, Ethiopia: African Union Commission.

African Union, 2019. *Agenda 2063*. [Online] Available at: <https://au.int/agenda2063/about> [Accessed 15 February 2019].

Department of Water Affairs and Forestry, 2007. *Artificial Recharge Strategy*, Pretoria, South Africa: Department of Water Affairs and Forestry.

Department of Water Affairs, 2010. *Groundwater Strategy*, Pretoria, South Africa: Department of Water Affairs.

Department of Water and Sanitation, 2016. *National Groundwater Strategy*, Pretoria, South Africa: Department of Water and Sanitation.

DWAF, 2007. *Artificial Recharge Strategy*, Pretoria, South Africa: Department of Water Affairs and Forestry.

Government of Malawi, 2018. *Water Resource Regulations*, Lilongwe, Malwai: Government of Malawi.

Government of Malawi, 2018. *Water Resource Regulations*, Lilongwe, Malwai: Government of Malawi.

Government of Zambia, 2018. *The Water Resource Management (Groundwater and Boreholes) Regulations*, Lusaka, Zambia: Government of Zambia.

Jury, M. & Mwfulirwa, N., 2002. Climate variability in Malawi, part 1: dry summers, statistical associations and predictability. *International Journal of Climatology*, Volume 22, pp. 1289-1302.

Manatsa, D., Matarira, C. & Mukwada, G., 2011. Relative impacts of ENSO and Indian Ocean dipole/zonal mode on east SADC rainfall. *International Journal of Climatology*, Volume 31, pp. 558-577.

SADC, 2000. *SADC Revised Protocol on the Shared Watercourses*, Gaborone, Botswana: SADC.

SADC, 2006. *Regional Water Strategy*, Gaborone, Botswana: SADC.

SADC, 2012. *Groundwater and Drought Management Project*, Gaborone, Botswana: SADC.

SADC, 2016. *Regional Strategic Action Plan on Integrated Water Resources Development and Management Phase IV*, Gaborone, Botswana: Southern African Development Community.

SADC-GMI, 2018. *SADC-GMI Overview*. [Online] Available at: <https://sadc-gmi.org/about-sadc-gmi/sadc-gmi-overview/>

Taylor, R. et al., 2012. Ground water and climate change. *Nature Climate Change*, pp. 1-8.

UN, 2018. *Sustainable Development Goals*. [Online]
Available at: <https://sustainabledevelopment.un.org/?menu=1300>
[Accessed 16 May 2019].

United Nations, 2019. *Sustainable Development Goals. Goal 6: Ensure access to water and sanitation for all*. [Online]
Available at: <https://www.un.org/sustainabledevelopment/water-and-sanitation/>
[Accessed 15 February 2019].

UN-Water, 2018. *Groundwater Overview Making the Invisible Visible*, s.l.: IGRAC in cooperation with UNESCO-IHP, IAH, IWMI and with contributions of many UN Water Members and Partners.

UN-Water, 2018. *Sustainable Development Goal 6 Synthesis Report on Water and Sanitation*, Geneva, Switzerland: United Nations.

Villholth, K., Tøttrup, C., Stendel, M. & Maherry, A., 2013. Integrated mapping of groundwater drought risk in the Southern African Development Community (SADC) region. *Hydrogeology Journal*, Volume 21, p. 863–885.

World Economic Forum, 2018. *The Global Risks Report 2018, 13th Edition*, Geneva, Switzerland: World Economic Forum.

Xu, Y. & Usher, B., 2006. *Groundwater Pollution in Africa*. 1st ed. London: Taylor & Francis.



CONTACT DETAILS:

205 Nelson Mandela Drive
University of the Free State, Dean Street
Bloemfontein, South Africa

Tel: +27 51 401 7734
E-mail: info@sadc-gmi.org

