

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

Gap Analysis and Action Plan – Scoping Report (Final)
February 2019
Zambia
Report Number 1.14





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
© SADC-GMI, 2019

Boxes, Tables, Figures, Maps, Photos and Illustrations as specified

This report is accessible online through SADC-GMI website: www.sadc-gmi.org

Citation: SADC-GMI, (2019). *Gap Analysis and Action Plan – Scoping Report: Zambia*. SADC GMI report: Bloemfontein, South Africa.

The designation of geographical entities, use of any name in this publication, and the presentation of the material do not imply the expression of any opinion whatsoever on the part of SADC-GMI or Pegasys concerning the legal status of any country or territory, or area of its authority, or concerning the delimitation of its frontiers or boundaries.

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 National Gap Analysis for Zambia provides an overview of the existing gaps in policy, legislation, strategy, guidelines and the institutional frameworks and further suggests enablers required to unlock the identified gaps/challenges. The report provides a clear guidance for Zambia to develop an implementation roadmap through a process of prioritising the Strategic Actions in close liaison and in consultations with all relevant stakeholders. It is hoped that these National/Regional Gap Analysis and Action Plan Reports will aid Zambia 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 Ntshekhe	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
Mr Oscar Silembo	In-Country Consultant: Zambia

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 Zione 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.

DOCUMENT INDEX

Presented in the table below is a list of products developed during the GMI-PLI Project:

Phase	Document	Report No.
Country Reports	Gap Analysis and Action Plan – Scoping Report: Angola	1.1
	Gap Analysis and Action Plan – Scoping Report: Botswana	1.2
	Gap Analysis and Action Plan – Scoping Report: Democratic Republic of Congo	1.3
	Gap Analysis and Action Plan – Scoping Report: Kingdom of Eswatini	1.4
	Gap Analysis and Action Plan – Scoping Report: Lesotho	1.5
	Gap Analysis and Action Plan – Scoping Report: Madagascar	1.6
	Gap Analysis and Action Plan – Scoping Report: Malawi	1.7
	Gap Analysis and Action Plan – Scoping Report: Mauritius	1.8
	Gap Analysis and Action Plan – Scoping Report: Mozambique	1.9
	Gap Analysis and Action Plan – Scoping Report: Namibia	1.10
	Gap Analysis and Action Plan – Scoping Report: Seychelles	1.11
	Gap Analysis and Action Plan – Scoping Report: South Africa	1.12
	Gap Analysis and Action Plan – Scoping Report: Tanzania	1.13
	Gap Analysis and Action Plan – Scoping Report: Zambia	1.14
	Gap Analysis and Action Plan – Scoping Report: Zimbabwe	1.15
	Gap Analysis and Action Plan – Scoping Report: Comoros	1.16
	Tanzania GW-PLI Roadmap	1.17
	Kingdom of Eswatini GW-PLI Roadmap	1.18
Regional Reports	Regional Gap Analysis and Action Plan	2
Groundwater Management Guidance Documents	Development of a Groundwater Policy, Legal and Institutional Roadmap	3.1
	Operation and Maintenance of Groundwater Schemes	3.2
	Building Groundwater Resilience	3.3.
	Institutionalisation of Groundwater Management	3.4
	Strategic Approach to Financing Groundwater Management	3.5

CONTENTS

FOREWORD.....	ii
ACKNOWLEDGEMENTS.....	iv
DOCUMENT INDEX	v
CONTENTS	vi
LIST OF FIGURES	viii
LIST OF TABLES.....	viii
LIST OF ACRONYMS	ix
1. INTRODUCTION	1
1.1. Background to the GMI-PLI Project.....	1
1.2. Socio-economic drivers for Zambia	1
1.3. Water resources	3
1.3.1. Status of water resources (surface water, groundwater and transboundary)	3
1.3.2. Groundwater environment and ecology	5
1.3.3. Status of groundwater infrastructure	6
1.3.4. Groundwater supply and Demand	6
2. METHODOLOGY.....	7
2.1. Overview.....	7
3. POLICY.....	11
3.1. Evolution.....	11
3.2. Policies to support groundwater management	11
3.3. Gaps and challenges identified	12
3.4. Enablers required to unblock these gaps/ challenges	13
4. LEGISLATION.....	16
4.1. Evolution.....	16
4.2. Legislation to support groundwater management	16
4.3. Gaps and challenges identified	17
4.4. Enablers required to unblock these gaps/ challenges	18
5. STRATEGY AND GUIDELINES.....	20
5.1. Evolution.....	20
5.2. Strategies and guidelines to support groundwater management	20
5.3. Gaps and challenges identified	22
5.4. Enablers required to unlock these gaps/challenges	23

6. INSTITUTIONAL FRAMEWORK	25
6.1. Evolution.....	25
6.2. Institutional arrangements to support groundwater management	25
6.3. Gaps and challenges identified	28
6.4. Enablers required to unlock these gaps/challenges	30
6.4.1. The Role of Groundwater Focal Point	32
6.4.2. Example of Best Practise	32
7. CHALLENGES TO IMPLEMENTATION	34
8. ACTION PLAN	36
9. REFERENCES.....	39
Appendix A: Literature Inventory List.....	40
Appendix B: Stakeholder List	43
Appendix C: Desired Future State	47

LIST OF FIGURES

Figure 1: Methodology Outline	7
Figure 2: Decentralised institutional arrangement for water management	27
Figure 3: Institutional structure for water resources management	27

LIST OF TABLES

Table 1: Specific groundwater provisions in national strategies and action plans	4
Table 2: Specific groundwater provisions in water regulations	5
Table 3: A summary description of policies currently in place as they relate to groundwater management in Zambia	11
Table 4: Enablers to address policy gap and challenges	13
Table 5: A summary description of legislation currently in place as they relate to groundwater management in Zambia	16
Table 6: Enablers to address legislative gap and challenges	18
Table 7: Enablers to address strategy and guideline gap and challenges	23
Table 8: Enablers to address institutional gaps and challenges	30
Table 9: Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia -Must Have.	36
Table 10: Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia - Should Have.	37
Table 11: Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia – Could Have	38
Table 12: Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia – Won't Have	38

LIST OF ACRONYMS

ACRONYM	DEFINITION
ARA-Zambeze	Administração Regional de Águas do Zambeze
CIWA	Cooperation in International Waters in Africa
CMP	Catchment Management Plan
CU	Commercial Utility
DPI	Department of Planning and Information
DFS	Desired Future State
DWRD	Department of Water Resources Development
DWSS	Department of Water Supply and Sanitation
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
GDE	Groundwater Dependant Ecosystems
GDP	Gross Domestic Product
GEF	Global Environment Facility
GESI	Gender, equity and social inclusion
GFP	Groundwater Focal Point
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit, GmbH
GMA	Game Management Area
GMI-PLI	Groundwater Management Institute – Policy, Legal and Institutional
GReSP	Groundwater Resources Management Project
GW	Groundwater
HCB	Hidroeléctrica de Cahora Bassa
HQ	Headquarters
IWRM	Integrated Water Resources Management

ACRONYM	DEFINITION
IWRM/WE	Integrated Water Resources Management/ Water Use Efficiency
JICA	Japanese International Co-operation Agency
JTOC	Joint Technical Operations Committee
MEWD	Ministry of Energy and Water Development (currently called MWDSEP)
MLGH	Ministry of Local Government and Housing
MMEWD	Ministry of Mines, Energy and Water Development (currently called MWDSEP)
MoA	Memorandum of Agreement
MoU	Memorandum of Understanding
MW	Mega Watt
MWDSEP	Ministry of Water Development, Sanitation and Environmental Protection
NDP(s)	National Development Plan(s)
NPE	National Policy on Environment
NWASCO	National Water Supply and Sanitation Council
NWP	National Water Policy
PLI	Policy, Legal and Institutional
SI	Statutory Instrument
SADC	Southern African Development Community
SADC GMI	Southern African Development Community Groundwater Management Institute
UNICEF	United Nations Children's Fund
US	United States
USAID	United States Agency for International Development
WARMA	Water Resources Management Authority

ACRONYM	DEFINITION
WASAZA	Water and Sanitation Association of Zambia
WRM	Water Resources Management
WSS	Water Supply and Sanitation
WUA	Water User Association
ZAMCOM	Zambezi Watercourse Commission
ZAMTEC	Zambezi Technical Committee
ZAWAFE	Zambia Water Forum and Exhibition
ZEMA	Zambia Environmental Management Authority
ZINWA	Zimbabwe National Water Authority
ZPC	Zimbabwe Power Company
ZRA	Zambezi River Authority

1. INTRODUCTION

1.1. Background to the GMI-PLI Project

The critical role of groundwater in building the region's resilience to climate change and improving water security is reflected by the World Bank in their June 2017 online article: *People in Southern Africa are largely dependent on groundwater shared between countries and communities for health and well-being, food production, and economic growth*. As climate variability alters the amount of surface water that is available, people in the region are increasingly turning to groundwater, a resource that is already challenged by threats of depletion and pollution.

The sustainable management of groundwater is a key part of the broader water security for the region, especially in understanding transboundary aquifers. The Southern African Development Community (SADC) has established the Groundwater Management Institute (GMI) to better understand the region's needs and improve their groundwater management capabilities.

The SADC Groundwater Management Institute (SADC-GMI) is the implementing agency of the World Bank funded Sustainable Groundwater Management in SADC Member States Project. This funding is secured through the Global Environment Facility (GEF) and the Cooperation in International Waters in Africa (CIWA) trust. Part of this funding has been dedicated by the SADC-GMI to respond to gaps in the existing policy, legal and institutional (PLI) frameworks for groundwater management in the region towards fulfilling one of four main components of the project –“Enhancing institutional capacity of governments in SADC Member states and transboundary organisations”. The objective is to be met through a series of organised steps which broadly included the development of a benchmark document called the Desired Future State Document, a Gap Analysis and high-level Action plan for all SADC Member States and for the region, development of a suite of guidelines to strengthen groundwater management regionally. To inform the guideline on the development of a groundwater PLI Roadmap, Tanzania was selected as a pilot from which to draw lessons and develop the process.

This report presents the outcomes of the gap analysis for Zambia.

1.2. Socio-economic drivers for Zambia

Since independence in 1964, Zambia has prepared and implemented several medium-term national development plans, each with a theme and strategic focus, which primarily aimed to improve the social economic conditions of Zambia. However, the plans were not prepared within the context of achieving a long-term socio-economic impact. Hence, in 2005 the Government started the development of the Vision 2030 which is to be achieved through five-year rolling plans, namely, the Fifth National Development Plan or 5NDP (2006 to 2011); 6NDP (2011 to 2015); Revised 6NDP (2013 to 2016) and recently the 7NDP (2017 to 2021). During the period of implementing the plans (2005 to date), a number of achievements have been recorded in the water sector including:

- meeting the target for access to safe water under the Millennium Development Goals;

- alignment of the Integrated Water Resources (IWRM)/Water Use Efficiency (WE) Implementation Plan (2008) with the NDPs;
- relative improvement in water sector funding.

The 7NDP (2017-2021) aims to economic diversification and job creation through improved water resources development and management by enhancing rainwater harvesting and catchment protection; local and transboundary aquifer management; inter-basin water transfer schemes; and alternative financing for water resources development.

During the period 2006-2015, Gross Domestic Product (GDP) growth averaged 6.9 percent against a target of above 7 percent. However, declining commodity prices, low power generation and depreciation of the Kwacha against major convertibles (e.g., United States Dollar, Euro and British Pound) slowed down growth during the period 2011 to 2016. Despite increased government spending on infrastructure projects to stimulate broad-based and inclusive economic growth, GDP growth slowed down from 7.6 percent in 2012 to 2.9 percent in 2015. Zambia's population grew at a rate of 2.8 percent per annum in the 2000-2010 period. In 2016 it was projected to 15.9 million inhabitants with 45.1% of the population falling below the age of 15 years. The growth in population presents a high demand on water resources in the country.

Agriculture (in terms of crops, fisheries and livestock) is a major socio-economic driver, employing the largest number of workers (mainly informal). Zambia has abundant arable land, but the existing agricultural potential has not yet been fully exploited. The total contribution of agriculture to GDP averaged 9.8 percent in the period 2006 to 2015. Whilst agriculture is important to the rural economy and livelihoods, mining is the mainstay of the economy and the primary source of national income as well as foreign exchange earnings, and is therefore, a major driver of socio-economic development. Zambia's demand for electricity stood at 1,949 megawatts (MW) in 2015 while the sector was only able to produce 1,281 MW thus giving a deficit of 668 MW. Importantly, hydropower accounts for more than 90% of electricity produced in the country and therefore is a key consideration in the management of water resources.

Zambia has been categorised as one of the most urbanised sub-Saharan African countries, with 42.1 percent of the population living in urban areas. However, the majority of people in the urban areas live in informal and unplanned settlements where there is inadequate access to municipal services, quality education and employment opportunities. The major challenge lies in the ineffective urban planning and weak legal enforcement mechanisms. Despite high economic growth in the last 10 years in Zambia, poverty has remained persistently high at 76.6 percent in rural areas, compared to 23.4 percent in urban areas.

Given the cross-cutting nature of water (being a key economic driver/enabler) and its continued recognition in the 7NDP, a significant increase in investment (including national budgetary allocations) is expected in order to improve water resources development and management. However, frequent droughts and floods, hydrological variability and seasonal water shortages, compounded by growing water

demand from the major sectors of the economy and limited water infrastructure impose a serious constraint on the medium and long-term growth prospects.

1.3. Water resources

Zambia receives moderate rainfall ranging from an annual average of approximately 600 mm in the south of the country to 1335.9 mm per year in the north and the country's annual average rainfall, based on a 30-year period from 1976 to 2006, is 967.3 mm (National Water Policy, 2010). Total renewable water resources in Zambia are estimated to be 100 km³ per year as surface water and an estimated annual renewable groundwater potential of 49.6 Km³ per year (YEC, 1995), more than 80% of which are produced internally and all of which contribute to internationally shared basins.

1.3.1. Status of water resources (surface water, groundwater and transboundary)

The surface water resource is poorly distributed while groundwater is fairly well distributed (NWP, 2010). The six river catchments in Zambia (Zambezi, Kafue, Luangwa, Chambeshi, Luapula and Tanganyika) belong to two major transboundary basins, namely, Zambezi Basin and Congo Basin.

Aquifers in Zambia are categorised for purposes of groundwater development by WARMA and BGR (2018) modified from MacDonald and Partners (1990) as follows: Aquifers in which intergranular flow is significant; Aquifers in which flow is in fissures, channels or discontinuities; and Aquifers of limited potential or regions without significant water. Unconsolidated inter-granular aquifers (alluvial sands and gravel, and Kalahari sands) present good groundwater development potential and are fairly well distributed countrywide, mostly so in the Zambezi River Basin in western Zambia, and also in the northern and eastern parts. YEC (1995b) stated that 70% of the Zambezi River Basin is covered by the Kalahari sands which form good aquifers. These aquifers are considered to be moderately productive yielding 0.1 to 15 litres/second (l/s).

Fissured and karst aquifers mainly occur and are highly developed in the Kafue River Basin which has over 40% of the country's population and is the most industrialised. Large amounts of groundwater on the Copperbelt and Lusaka are used for township water supply, beverage industry and irrigation. The water yields are in the range of 0.1-70 l/s for highly productive aquifers (mainly Kundelungu limestone and Upper Roan dolomite); 0.1-15 l/s for moderately productive, fissured aquifers (mainly Karoo sandstones); and 0.1-10 l/s for locally productive fissured aquifers (mainly undifferentiated Kundelungu, Lower Roan quartzites, Muva sediments and granites). The above-mentioned aquifers (high and moderately yielding aquifers) may permit withdrawals of regional importance such as supply to major towns or large-scale irrigation (DWA/BGR, 2007). For example, Shaft 5 borehole in Lusaka (drilled into the Lusaka Dolomite) is reported to yield up to 140 l/s (YEC, 1995b) accounting for about 30% of the groundwater supplied to the City.

The aquifers with limited potential consisting of low yielding formations of Karoo basalts, Mine Series shales, Basement Complex gneisses which yield 0-2 l/s; and unproductive formations of Karoo shales, metamorphic and igneous rocks, mainly lie in the northern, north-western, eastern and southern parts of

the country. The aquifers with limited potential could suffice for the supply of water to rural villages with a hand pump (DWA/BGR, 2007).

Zambia has two transboundary aquifers identified by the SADC Hydrogeological Mapping Project (Pietersen, Kellgren, Roos, and Chevallier, 2010). The "Medium Zambezi Aquifer" crosses the border with Zimbabwe, and the "Sands and gravel aquifer" crosses the border with Malawi.

The NWP (2010) states that Zambia has a good amount of well distributed groundwater resources and recognises the fact that the water resource exists in an environment which in turn it sustains. If the same environment is degraded it can negatively impact on the amount and quality of the water resource. The estimated annual groundwater potential (an estimate of annual recharge) shows very little variation from year to year. Currently there is inadequate data to make an accurate determination of all the groundwater available in the country. The quality of groundwater is relatively good. The tables 1 and 2 below highlight some specific groundwater provisions existing in Zambia's strategic documents, action plans and regulations

Table 1: Specific groundwater provisions in national strategies and action plans

Provision	Reference
<ul style="list-style-type: none"> It is envisaged that specific reference to considering ecosystem requirements of groundwater and impacts of various allocation scenarios on groundwater dependent ecosystems (GDEs) will be a critical component of allocation determinations and basin water balance assessments. This is currently being considered in the regulations awaiting issuance and in the implementation of the 7NDP (page 26 of 169) Bold steps need to be taken to avoid polluting groundwater sources (page 31 of 169). Inadequate collection and management of solid waste and inadequate sanitation facilities pose a threat to groundwater, particularly in peri-urban areas 	IWRM/WE Implementation Plan (2007 to 2030), page 26.
<ul style="list-style-type: none"> Groundwater resource assessment is recognised as a priority project in the long-term plan. This, among others, includes undertaking assessment of the impacts on the groundwater resources arising from climate change, water pollution, river bank cultivation, deforestation and destruction of catchment areas/headwaters and urban development; and Assessing the quantity, quality, distribution, and variation of the ground water resources 	IWRM/WE Implementation Plan (2007 to 2030)

Table 2: Specific groundwater provisions in water regulations

Provision	Reference
<p><i>Protection of groundwater:</i></p> <p>(1) The Authority shall protect groundwater, in collaboration with any appropriate or conservancy authority (by e.g., preventing the pollution of aquifers through the regulation of toxic substances that permeate the ground, and recommending to the Minister the declaration of water resource protection areas around groundwater, re-charge areas and abstraction sources; and</p> <p>(2) The Authority may, for any borehole that is registered under this Part, carry out periodic assessments of its characteristics.</p>	<p>Water Resources Management Act No.21 of 2011, Part X (Groundwater and Boreholes), Section 93</p>
<p>“Any borehole which encounters brackish water or other substances, as prescribed, shall be securely cased, plugged, or sealed off by the owner of the borehole so that the brackish water or other substance shall be confined to the strata in which it was found and the casing, plugging or sealing of the borehole shall be done in a manner that is effective to prevent the brackish water or other substance from escaping from the strata in which it was found into any other water bearing strata or to the surface of the ground”</p>	<p>Water Resources Management Act No.21 of 2011, Part X (Groundwater and Boreholes), Section 96. Also, Sections 97 & 98 provide for offences punishable by a fine or imprisonment</p>
<p>Defined as an “Emergency” implying that the groundwater resource can be protected through early warning system and declaration of emergency or national disaster situations</p> <p>(According to the WARMA Act No. 21 of 2011 “Emergency” means a disaster or incident connected with water, resulting suddenly, either from natural causes or from human conduct, and which causes or poses an imminent threat or causes serious harm or damage to a water resource, the people, property or to an area.</p>	<p>Water Resources Management Act No.21 of 2011, Sections 143, 144 & 145</p>
<p>Waste solidification/ fixation: Organic waste should not be used in disposing organic pesticides and toxic substances as these can easily leach into groundwater.</p>	<p>Environmental Management (Licencing) Regulations (Statutory Instrument No.112 of 2013), Section 6</p>
<p>ZEMA may order an operator or an owner of effluent generating entity to drill monitoring wells for the monitoring of contamination of groundwater</p>	<p>Environmental Management (Licencing) Regulations (Statutory Instrument No.112 of 2013), Section 9</p>

1.3.2. Groundwater environment and ecology

As with other countries the importance of groundwater-surface water interactions is important to the maintenance of wetlands and the baseflow of rivers and streams during dry periods. It has been estimated

that wetlands cover some 19% of Zambia's total area. There are eight wetlands that have been designated as wetlands of international importance since Zambia ratified the Ramsar Convention in 1991. These include the Kafue Flats Wetland, Bangweulu Swamps, Barotse (Zambezi) Floodplains, Luangwa Floodplains, Busanga Swamps, Lukanga Swamps, Lake Mweru-wa-Ntipa and Lake Tanganyika. Groundwater resources play a critical role in maintaining the functioning of these wetlands and the goods and services that are accrued. Of these wetlands, the Kafue Flats is significant in that this region provides 50% of the country's hydropower, supports 20% of the national herd, supports 7% of the national fisheries and provides for 25% of the country's maize production (WWF, 2016).

However, there is a need for improved understanding of the groundwater-surface water interaction in order to understand how groundwater discharge sustains flows in many perennial rivers and streams and wetlands during the dry seasons. Noting the importance of these systems, this knowledge is important for optimising conjunctive use of surface water and groundwater resources.

The country's biodiversity is maintained through 19 national parks, 35 Game Management Areas (GMAs) and 488 national and local forest reserves. All of these have many groundwater dependent ecosystems.

1.3.3. Status of groundwater infrastructure

Groundwater infrastructure in Zambia is mainly in form of borehole (deep wells); protected and unprotected shallow well; and protected and unprotected springs. Currently the database (GeODin) kept by the Water Resources Management Authority has 17,000 boreholes countrywide. It is unclear as to how many of these are functional at any given time. There is also significant infrastructure for dewatering purposes at several mines on the Copperbelt and North-Western provinces.

1.3.4. Groundwater supply and Demand

Groundwater is the major source of water supply for rural households and for urban areas such as major cities and towns (for example, Lusaka, Ndola, Kabwe) where 60 -70% of water supplied by water utility companies is groundwater. According to Aurecon (2018), raw groundwater abstraction rates by Commercial Utilities (CU) and Private Schemes (which are the two main types of providers supplying water and sanitation services in urban areas) in 2012 were in the order of 1.24 million m³/d of which 30% was ground water and 70% was surface water. The population in the CUs' service areas was 5.62 million of which 1% was serviced by seven private schemes. Aurecon (2018) further stated that about 26 districts in Zambia depend completely or partly on groundwater.

2. METHODOLOGY

2.1. Overview

The methodology for the gap analysis included conducting a desktop review of available literature. This was coupled with the development of a desired future state to provide a baseline for groundwater management and is discussed in more detail below. Key stakeholders were also identified during the early stages of the gap analysis and multiple engagements were held whereby a questionnaire was administered to evaluate the current state of groundwater management in the country. Based on the desktop review, stakeholder engagements and results from the questionnaire, a draft gap analysis report and action plan was developed which was then validated at Validation Workshops. These workshops involved key groundwater actors from the Member State and provided an opportunity to obtain buy-in and support for the gap analysis reports as well as obtaining further inputs. The draft report was also circulated to broader stakeholders i.e. Water User Associations, Water Service Providers etc. whereby written comment was received. The draft gap analysis report was then finalised based on the comments received from the Validation Workshops and broader stakeholders. The methodology outline is illustrated in the figure below.



Figure 1: Methodology Outline

The literature obtained includes national and international policy and legal documents, institutional reports, project development reports, research documents, presentations and media statements. A literature inventory list is included in **Appendix A**.

The stakeholders engaged were mainly from the government, quasi-government and academic/research institutions. Though contacted and given the questionnaire, at the time of reporting, no feedback had been received from the private sector and civil society practitioners; as well as from the Water Resources

Management Authority (WARMA). **Appendix B** provides a full list of groundwater stakeholders, as well as a summary of stakeholders actually engaged.

Stakeholders were engaged for data collection using the structured questionnaire, based on the Desired Future State (DFS), elaborated on below.

The desired future state has been contextualised for the SADC region, taking into account:

- 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.

It sets out the **minimum** requirements that support the delivery of national, regional and international developmental goals, including the Sustainable Development Goals, meeting basic human needs to water, energy and food (the WEF nexus), and the protection of ecosystems that are dependent on groundwater.

The sections below describe, at a high level, what is considered to be the minimum best practice for policy, legislation and subsidiary legislation, regulations and standards for effective groundwater management. For a more detailed description of the desired future state, see **Appendix C**.

The **minimum policy requirements** that should be in place are:

- A long-term policy to protect groundwater by preventing pollution and overuse.
- The social, economic and environmental values of groundwater are all recognised.
- The human right to water is recognized and a rights-based approach to groundwater management is taken.
- 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.
- 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).
- The importance of the maintenance of the ecological integrity of wetlands in groundwater management is recognised (recharge zones).
- Intersectoral collaboration is promoted and facilitated.
- The need for adaptive management is recognised.
- The roles of various stakeholders and water users in groundwater management is recognised and participation of stakeholders is promoted and facilitated.
- An apex body that is responsible explicitly for GW management and playing the role of custodian/trustee on the part of the state is clearly defined.
- Effective institutional arrangements are coordinated at transboundary, national and local levels.
- Public access to geohydrological data held by the state is promoted and facilitated.
- Additional environmental principles necessary to protect and sustain groundwater are mandated, including: the precautionary principle, the principle of gender equity and social inclusion (GESI), the principle of subsidiarity, and the principle of intergenerational equity.

The **minimum legislative requirements** that should be in place are those that explicitly address the use, management, and protection of groundwater and provides the necessary tools for the state to regulate, manage, control, protect and develop groundwater resources in conjunction with surface water resources.

At a minimum, legislation and/or subsidiary regulations should:

- Provide the status of groundwater noting that all water has a consistent status in law, irrespective of where it occurs, and there is explicit reference to groundwater and conjunctive use management; and recognise the human right to water recognized in groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users.
- Regulate groundwater quantity by providing conditions for accessing groundwater through water use authorisations system that does not discriminate (especially against the rural poor), is not tied exclusively to land tenure and enables effective compliance monitoring and enforcement.
- Provide groundwater protection mechanisms that includes regulating pollution (point source and non-point source), regulates depletion, regulates abstraction and recharge (usually via permitting) and provides for the sustaining wetlands;
- Enables integrated planning through specifying the need for long term plans (at catchment or basin level) to ensure the sustainable use of groundwater, including drought management plans and cross-sectoral coordination.
- Make provision for institutional arrangements including the mandate, competence and power of the relevant authorities, enabling the integrated management of groundwater and surface water resources, engaging in the arbitration of competing demands and diverging interests regarding groundwater abstraction and use, and support the collaborative engagement with other sector authorities, competent for public health, land-use planning, soils management, and waste management.
- Support effective stakeholder engagement through specifying when and how stakeholders, the public and/or other water users are to be engaged in the development of laws and regulations, planning, decision making and self-management regarding groundwater and should specifically address the issue of the involvement of women and youth in decision-making and the implementation of groundwater supply schemes.
- Provide for Monitoring and data collection to support regulation including protocols for data collection, management, exchange and dissemination, including standardization and harmonization of data, as well as national monitoring and information systems for the management of data and information.
- Regulate to ensure water conservation and efficiency of use.
- Support compliance and enforcement through clear mechanisms for promoting compliance with groundwater regulations through enforcement provisions that enable inspections, the imposition of fines and/or additional administrative penalties and other instruments to address failure to comply with the law.
- Conflict resolution mechanisms and/or the right to appeal.
- Enable the development of regulations on any relevant matter in the legislation to regularise aspects of groundwater management and incentivise appropriate use of groundwater resources.

The actual **requirements for subsidiary regulation** will differ from country to country, according to their own National Legislation. However, it is important to understand the extent to which critical issues around groundwater management have been translated into regulations. Below are some examples of how this could look.

- Subsidiary legislation or regulations pertaining to use, protection including on-site sanitation, borehole drilling, and appropriate financial and economic regulatory tools e.g. water pricing.
- Clear protocols and standards on data collection and storage.
- Templates for municipal by-laws.
- Community management of groundwater and community participation in groundwater management.

From an **institutional perspective**, it is critical that countries have as a minimum, a dedicated Ministry for water resource management, which is also the custodian for ground water management. Noting that the groundwater is a localised resource, decentralised institutions at trans-boundary, catchment and local government-level are crucial, where groundwater management fits into overall mandate for water resource management.

Generally, Zambia has adequate policy and legal instruments in place for enabling the effective and sustainable management and development of water resources including groundwater. The water sector in Zambia has experienced a series of reforms which culminated in the Revised National Water Policy (2010) and enactment of the Water Resources Management Act (2011), along with the subsequent establishment of Water Resources Management Authority (WARMA). The NWP places stronger emphasis on surface water compared to groundwater. This lack of explicitness on groundwater can be a hindrance to planning for and investing in groundwater as a critical alternative resource to address water security risks in Zambia, in the context of climate change. Among the other challenges to effective groundwater management (as part of conjunctive use) is the lack of enforcement or a weak regulatory environment derailing effective GW management.

Until recently, Zambia had no dedicated institution to manage water resources alone, as the Ministry of Water and Energy had a divided mandate between water and energy. In 2012, the then Ministry of Water and Energy was merged with the Ministry of Mines to form the Ministry of Mines, Energy and Water Development. Today however, there is a dedicated Ministry of Water Development, Sanitation and Environment Protection which is responsible for the management of water resources in Zambia. While the sector has had some milestone achievements, groundwater management remains to be improved in-country and at transboundary level towards overall water security.

3. POLICY

3.1. Evolution

Recognising issues of localised, economic water scarcity highlighted by the governing legislation of 1949 (Water Act) and the colonial administration, the Government of the Republic of Zambia commenced the water sector reforms in the 1990s which culminated in the National Water Policy of 1994. The reforms were aimed at introducing a more efficient framework based on the principles of integrated water resources management (IWRM) that acknowledges the river basin as the primary unit for sustainable water management and development and recognises the value of water as an economic and social good. The 1994 National Water Policy provided a progressive policy framework for the sector that recognized the need for separation of water resources management (WRM) from that of water supply and sanitation (WSS). The National Water Policy was revised in 2010 to provide a contemporary vision and holistic direction for the water sector that aligns the institutional and legal framework with modern principles of water resources management.

3.2. Policies to support groundwater management

A description of policies that are currently in place and the key tenets of those policy instruments that impact or support groundwater management are shown in Table 3 below.

Table 3: A summary description of policies currently in place as they relate to groundwater management in Zambia.

Policy	Principles Relating to Groundwater Management
National Water Policy, 2010	<ul style="list-style-type: none"> Water is a basic human need; Government shall be the trustee of the nation's water resources; Water resources managed in an integrated manner; Domestic and non-commercial needs and the environment shall enjoy priority of use of water; Equitable access to water; Domestic and non-commercial use of water will not be required to obtain a water permit; Cost-recovery in the management and economic use of water; Gender equity in accessing water resources and, in particular, women empowered and fully participate in decision-making related to sustainable development of water resources and, specifically, in the use of water; Efforts to create wealth shall be reflected in all decisions made in relation to the use of water; Location of a water resource on land shall not itself confer preferential rights to its use; The basic management unit shall be the catchment in recognition of the unity of the hydrological cycle; and Zambia's water resources shall be managed to promote sustainable development.

Policy	Principles Relating to Groundwater Management
National Policy on Environment	<ul style="list-style-type: none"> ▪ The Polluter pays principle; ▪ Cost effectiveness and cost-benefit in terms of national and local priorities in development planning; ▪ Wise use of biotic resources to ensure the integrity of ecosystems and ecological processes; ▪ Maintenance of traditional Zambian values and to provide for future generations; ▪ Traditional knowledge and time-tested practices will be respected; ▪ Decentralisation of environmental management services through equitable distribution of government resources and cross-sectoral strategic planning; ▪ Sustainable development; ▪ Community participation; ▪ Integrated environmental management approach; and ▪ Strategic planning at all levels will incorporate Environmental Impact Assessment (EIA).
National Policy on Climate Change	<ul style="list-style-type: none"> ▪ The policy is set to have specific policy measures on groundwater resources

3.3. Gaps and challenges identified

- The National Water Policy (2010) recognises the cross-cutting nature of water and integrates sectors that are dependent on water including water supply and sanitation, environment, agriculture, hydropower, tourism, industry and navigation. However, not all the above-mentioned sectors have taken into account water resources or particularly groundwater into their sectoral policies and planning.
- There is insufficient scientific data to inform policy and appropriate policy adjustments. For example, effective accounting for environmental flow requirements and impacts of climate on groundwater systems.
- The social, economic and environmental values of groundwater are all recognised in a general way because the policy refers to both surface water and groundwater inclusively as 'water'. This means that the specific role that groundwater plays in socio-economic development is not as clear as needed to ensure effective management.
- 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, but its development is limited with only 51.6%¹ of rural population having access to safe drinking water. Noting this relative importance, the policy does not provide a specific approach to develop groundwater to support rural development.
- Generally, there is a lack of proper understanding of the linkage between surface and groundwater and the processes required to manage this conjunctively in order to inform improved policy formulation and implementation.

¹ Seventh National Development Plan (7NDP), 2017

- Policy does not provide sufficient approaches to ensure domestic groundwater users register their boreholes.
- The 2010 National Water Policy does not address issues of Transboundary Water management (including transboundary aquifers),
- The Policy places more emphasis on surface water other than groundwater. It does not cover important groundwater management aspects including Aquifer mapping and Exploration which can help the country's attainment of water security.
- The Policy does not address issues of management of Transboundary Water bodies (including groundwater) which component is critical consideration for regional cooperation on developments in shared water basins.
- There is inadequate groundwater information/data resulting from inadequate coverage on Groundwater Situation analysis and lack of policy measures specific to ground water

Challenges, which also broadly underpin gaps in water resources management and development (and also applicable to groundwater) in Zambia include:

- inadequate human and institutional capacity;
- weak inter-sectoral coordination/collaboration;
- inadequate financing;
- low infrastructure development; and
- low access to water and sanitation for various sectors and the ability to effectively manage droughts and floods due the high climate variability and effects of climate change.

3.4. Enablers required to unblock these gaps/ challenges

Whilst there are gaps and challenges that require redress to strengthen the management and development of groundwater resources, there are a number of steps that can be undertaken to unlock these. These actions are reflected in Table 4 below.

Table 4: Enablers to address policy gap and challenges

Groundwater gap/challenges	Enablers
The specific role that groundwater plays in socio-economic development is not sufficiently covered by the policy.	<ul style="list-style-type: none"> ▪ Initiate policy review & revision for effective groundwater management and development (being undertaken by Department of Planning and Information). ▪ Develop a standalone groundwater strategy. ▪ Support inter-sectoral planning and development to enable more effective linkages between sectors. ▪ Strengthen regulation and compliance monitoring with respect to commercial groundwater use (more training)
The cross- cutting nature of water and integrates sectors that are dependent on	<ul style="list-style-type: none"> ▪ Promote inter-sectoral collaboration (ongoing mainly at catchment level).

Groundwater gap/challenges	Enablers
water including water supply and sanitation, environment, agriculture, hydropower, tourism, industry and navigation. However, not all the above-mentioned sectors have taken into account water resources or particularly groundwater into their sectoral policies and planning.	<ul style="list-style-type: none"> ▪ Ensure inter-sectoral engagement in planning processes. ▪ Develop improved communication and information sharing materials.
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. Yet the policy does not provide a specific approach to develop groundwater to support rural development.	<ul style="list-style-type: none"> ▪ Prioritise groundwater management in water resource planning, particularly for rural water supply (being done by Department of Water Supply and Sanitation or DWSS). ▪ Enable improved inter-sectoral engagements and information sharing.
There is insufficient scientific data to inform policy and appropriate policy adjustments. For example, effective accounting for environmental flow requirements and impacts of climate on groundwater systems.	<ul style="list-style-type: none"> ▪ Commission special studies to inform decision-making and policy formulation (more funding)
Lack of proper understanding of the linkage between surface and groundwater and also the processes governing groundwater in order to inform policy formulation and implementation.	<ul style="list-style-type: none"> ▪ Commission special studies to inform decision-making and policy formulation (more funding) ▪ Develop and implement the national groundwater monitoring programme (more funding)
Policy does not provide sufficient approaches to ensure domestic groundwater users register their boreholes.	<ul style="list-style-type: none"> ▪ Development of operational policy that supports on-the-ground activities regarding groundwater management.

Further considerations of policies pertaining to groundwater are presented below.

- The principle of subsidiarity/decentralised groundwater management is captured in the policy. The principle covers groundwater as part of water resources management and is the basis for formation of catchment councils and water user associations (WUAs).
- The policy does not clearly recognise the need for catchment management boundaries to be shaped to address the cross-catchment nature of some aquifers but by allowing WUAs to propose boundaries of their areas of interest, coupled with a good understanding of the aquifer systems, the cross-catchment nature of some aquifers may be addressed.

- The policy provides for use of different approaches to groundwater management to be used in different contexts in the country. It recognises the variability of groundwater occurrence and promotes research in water resources (groundwater included).
- The policy recognises customary water law by requiring maintenance of traditional Zambian values and to provide for future generations; ensuring that traditional knowledge and time-tested practices will be respected; and promoting stakeholder and community participation.
- The policy explicitly addresses the need for addressing issues of gender in water resources management which includes groundwater management in relation to participation of women in water management structures, in relation to the need for women to have equitable access to groundwater, and to the resources needed to harness groundwater.
- Additional steps to address gaps in groundwater management in policy may include,
 - Reviewing the NWP 2010, enhancing subsidiary legislation on groundwater management to include siting of boreholes (in respect of quality issues and environmental sustainability concerns), as well as
 - Review of the National Policy on Climate Change to ensure it adequately reflects on groundwater as a viable water source better adapted to addressing key water security challenges in the context of climate change than surface water.

4. LEGISLATION

4.1. Evolution

Groundwater was not adequately covered by the Water Act of 1949. The Act mainly regulated surface water which was the focus of the legal framework. In 2011, 1949 Water Act was repealed and replaced by the Water Resources Management (WRM) Act No. 21 of 2011. The WRM Act 2011 translates the provisions of the National Water Policy (2010) into enforceable legal provisions that aim to maximise the economic beneficial use of Zambia's water resources in a more equitable and sustainable manner. The law introduces a modern approach to water resources management based the principles of Integrated Water Resources Management.

In March 2018, the Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP) through WARMA, issued the first set of three regulations pertaining mainly to groundwater management, namely, Statutory Instrument No. 18 of 2018 on (Charges and Fees); Statutory Instrument No. 19 of 2018 on (Licensing of Drillers and Constructors); and Statutory Instrument No. 20 of 2018 on (Groundwater and Boreholes)

4.2. Legislation to support groundwater management

A description of what legislation is currently in place and the key tenets of those instruments that impact/support groundwater management is provided in Table 5 below.

Table 5: A summary description of legislation currently in place as they relate to groundwater management in Zambia

Legislation	Principles Relating to Groundwater Management
Water Resources Management Act, 2011 (e.g., Part X Licencing of Constructors and Drillers and Part XI Ground Water and Boreholes)	<p>Same principles under Policy hold here, and in addition the following:</p> <ul style="list-style-type: none"> Water resources shall be managed in such a manner as will help combat malaria and other waterborne diseases in order to ensure access to safe water; Water shall be used efficiently, sustainably and beneficially in the public interest; There shall be no private ownership of water and no authorisation for its use shall be in perpetuity. Water resources management and planning shall contribute to the eradication of hunger and poverty and this shall be reflected in all decisions made in relation to the use of water, in particular, the right to use water for domestic and non-commercial purposes shall not be under any permit or attract any charge for its use. Zambia's water resources shall be protected, used, developed, conserved, managed and controlled sustainably, beneficially, reasonably and equitably for the needs of the present and future generations. The management, development and utilisation of water resources shall take into account climate change adaptation.
Environment Management Act, 2011	<p>Same principles under Policy hold here, and in addition the following:</p> <ul style="list-style-type: none"> The environment is the common heritage of present and future generations. The precautionary principle.

Legislation	Principles Relating to Groundwater Management
	<ul style="list-style-type: none"> ▪ Equitable access to environmental resources shall be promoted and the functional integrity of ecosystems shall be taken into account to ensure the sustainability of the ecosystems and to prevent adverse effects. ▪ The people shall be involved in the development of policies, plans and programmes for environmental management. ▪ The citizen shall have access to environmental information to enable the citizen to make informed personal choices which encourages improved performance by industry and the Government. ▪ The environment is vital to people's livelihood and shall be used sustainably to achieve poverty reduction and socio-economic development. ▪ Renewable natural resources shall be used in a manner that is sustainable and does not prejudice their viability and integrity.

4.3. Gaps and challenges identified

There is a general observation that Zambia has enough policy and legal instruments for effective and sustainable water resources management and development and that the major problem is lack of enforcement or implementation. However, the following were the identified as gaps in the legislative environment:

- While the Water Resources Management Act of 2011, provides a section on groundwater protection which emphasises borehole drilling, it does not include lacks regulations specific to water surveys (siting of boreholes). This is specifically important for quality and environmental sustainability considerations in the management of groundwater.
- The law does not clearly recognise the need for catchment management boundaries to be shaped to address the cross-catchment nature of some aquifers, but it does provide for the delineation of the area of interest which may cover such aquifers as long as the requisite knowledge is available. With increasing knowledge of the groundwater situation, specific regulations or guidelines may be formulated.
- The Urban and Regional Planning Act, 2015 does not give clear provisions for water resources planning while the WRM Act does consider the role of planning authorities in the development of catchment management and water allocation plans.
- Groundwater use is subject to permit system for large scale (commercial) users but the demarcation between small and large in some instances is not clear.
- There is no regulation yet developed for groundwater protection areas such as recharge zones.
- Large scale groundwater users (e.g., water utility companies) are not compelled to have observation boreholes.
- Siting boreholes is often technically flawed resulting in contamination of some groundwater sources – this can be linked to the lack of subsidiary legislation regarding borehole siting.

4.4. Enablers required to unblock these gaps/ challenges

Recognising that adjustments and amendments to legislative instruments can be lengthy and administratively challenging, there are a number of actions that could be considered to address the various gaps and challenges, as indicated in Table 6 below.

Table 6: Enablers to address legislative gap and challenges

Groundwater gap/challenges	Enablers
The law does not clearly recognise the need for catchment management boundaries to be shaped to address the cross-catchment nature of some aquifers.	<ul style="list-style-type: none"> Amend Water Resources Management Act 2011 to be more specific about considering aquifer boundaries. Develop regulations for groundwater management that recognise aquifer boundaries.
The Urban and Regional Planning Act, 2015 does not give clear provisions for water resources planning while the WRM Act does consider the role of planning authorities in the development of catchment management and water allocation plans.	<ul style="list-style-type: none"> As a long-term measure, a revision of the Urban and Regional Act, 2015 to include specific provisions for groundwater considerations (more technical support). Strengthen collaboration with LAs (implementation capacity) and look to by-laws for improving local planning and regulation.
Groundwater use is subject to permit system for large scale (commercial) users but the demarcation between small and large in some instances is not clear.	<ul style="list-style-type: none"> Clarify through the development of a Statutory Instrument. Improve groundwater permitting system (GIZ support assured)
There is no regulation yet developed for groundwater protection areas such as recharge zones.	<ul style="list-style-type: none"> Develop and implement Statutory Instrument /regulations for groundwater protections areas (implementation support).
Large scale groundwater users (e.g., water utility companies) are not compelled to have observation boreholes.	<ul style="list-style-type: none"> Develop and implement Statutory Instrument/ regulations for groundwater. Strengthen regulation and compliance monitoring e.g., improve on tools for monitoring (more funding and training)
Siting boreholes is often technically flawed resulting in contamination of some groundwater sources – this can be linked to the lack of subsidiary legislation regarding borehole siting.	<ul style="list-style-type: none"> Need to enhance Subsidiary legislation on Groundwater management to include siting of boreholes

Further considerations of legislation pertaining to groundwater follow below.

- The national water laws or regulations do not exclusively provide for the creation of groundwater user organizations. It envisages that specific groundwater issues would be addressed within the water users associations (WUAs) that are looking at water resources in general.
- The legal system does provide for alignment between local rulemaking on groundwater (e.g., municipal bylaws or community-based bylaws) with national regulations through the WUA whose membership includes Local and Traditional Authorities. The WUAs are mandated to develop and implement local water management plans with guidance of WARMA.
- The national laws (e.g., WRM Act) recognize customary water law or practices. WARMA shall not allocate any water in a customary area without first consulting the traditional authority in that area and taking into consideration the local customs and practices which are beneficial to water resources management.
- The national laws provide regulation for both point and non-point source pollution that impacts aquifers.
- The law does explicitly address the need for addressing issues of gender in water resources management in general, but this also includes groundwater management in relation to participation of women in water management structures; the need for women to have equitable access to groundwater; and the resources needed to harness groundwater.

5. STRATEGY AND GUIDELINES

5.1. Evolution

Implementation of groundwater management programmes had been taking place without strong legal support from the Water Act 1949. This was happening without comprehensive guidelines for groundwater management. Implementation was largely done through the Government Agency (Department of Water Affairs) under the Hydrogeological Section at Headquarters in Lusaka. It involved surveying for groundwater resources and collection of hydrogeological data. The work was done throughout the country with the help of provincial and district offices (where there was capacity). Data collection normally followed the drilling of boreholes and shallow wells which was done by DWA, other government agencies (e.g., Ministries of Local Government, Education and Health) Cooperating Partners (e.g., United Nations Children's Fund or UNICEF, Japanese International Co-operation Agency or JICA and German Development Cooperation). The groundwater monitoring network was designed and implemented but was not comprehensive and was only consistent in Lusaka and surrounding areas and a few places elsewhere, for example in Southern Province. The last comprehensive countrywide assessment and monitoring of groundwater was done in 1995/96. A database, hard copy and soft copy were kept but it was mainly after 2005 that hydrogeological data rescue was immensely commenced and has continued to date using state-of-the-art technology albeit requiring more investment to increase coverage.

The passing of legislation to regulate groundwater in 2011 enhanced the legal, institutional and regulatory framework for groundwater management. Later in March 2018, the issuing of three Statutory Instruments further enhanced the management of groundwater.

5.2. Strategies and guidelines to support groundwater management

The Water Resources Management Act (2011) provides the strategic framework for the management of all water resources within Zambia. As noted earlier, groundwater is understood in these instruments to be an integral part of the water resource. The Act provides for the development of a National Water Resources Strategy and plan that outlines the basis for groundwater management through:

- taking into account the resource quality objectives;
- setting out the principles, objectives, procedures and institutional arrangements of the Authority for the management, use, development, conservation, preservation, control and regulation of water resources within each catchment, including possible financing requirements;
- containing water allocation plans which set out the principles for allocating water, taking into account the reserve;
- providing mechanisms and facilities for enabling the public and communities, in particular women, to participate in managing the water resources within each catchment; and
- generally containing measures to avert environmental degradation, such as desertification, deforestation, erosion, sedimentation, toxic waste and the aftermath of the use of unsuitable agro-chemical products.

The national strategy is to be supported by the development of catchment management plan, which is to be prepared by the relevant Catchment Council, in collaboration with WARMA. This planning process shall:

- consult any appropriate authority, conservancy authority and any other stakeholders who are likely to be concerned with the development, conservation, preservation or protection of the catchment or sub-catchment and the utilisation of the water resources;
- take into account sub-catchment and local water management plans proposed by the sub-catchment councils and water user associations, respectively;
- draw up an inventory of the water resources of the catchment or sub-catchment; and
- have regard to any relevant plan prepared under the Urban and Regional Planning Act, 2015 and to such other matters as may be relevant.

In addition, to these strategic and planning instruments, the 2011 Water Resource Management Act recognises the importance of monitoring and the management of data and information. Hence, the Act also includes the development and maintenance of a gender sensitive integrated national management, monitoring and information system on water resources.

Importantly, the 2011 Act also requires the development of a pricing strategy to recover costs for the management of water resources and the associated administration, as well as ensure a reasonable rate of return on investments. Notably, from the perspective of groundwater the pricing strategy must consider the source from which the water has been used and reflect the purpose for which the water will be used.

There are a significant number of sub-strategies that support groundwater management as derived from the NWP (2010) and include:

- Ongoing strengthening of the regulatory framework based on an integrated water resource management (IWRM) system approach;
- Facilitation of public private participation in water development;
- Undertaking comprehensive water resources assessments for surface and groundwater sources;
- Identifying ecosystems at risk and recommending remedial measures;
- Strengthening the human, technical and financial capacity for addressing the water resources management needs in the water sector (e.g., training at the University of Zambia and on-the-job);
- Establish mechanism for collaboration, coordination and consultation in the water sector;
- Development of water allocation plans with the participation of local communities;
- Designation of protected areas in collaboration with line ministries and institutions;
- Declaration of water shortage areas;
- Develop and maintain a water quality assessment system;
- Develop plans for the exploitation of the potential from shared water courses in line with national priorities and the need for fostering regional cooperation;
- Promoting regional collaboration in areas of research, data collection and information exchange;
- Development of national capacity for negotiation and management of shared watercourses;
- Promoting preventive measures through community education and awareness;

- Ensuring that Zambia's water resources are effectively managed and contribute to wealth creation through increased access to safe drinking water, increased food production and food security;
- Promoting and facilitating development of groundwater resources to improve access;
- Issuing guidelines on the development of water resources;
- Registering and regulating groundwater resources development construction companies;
- Subjecting groundwater resources development programmes and projects in water well drilling, groundwater abstraction and use and inter-basin water transfer to strategic environmental assessment and environmental impact assessment;
- Regulation of groundwater infrastructure to ensure that the infrastructure benefits all sectors of society especially the disadvantaged and poor.

5.3. Gaps and challenges identified

The following gaps and challenges with regards to strategies and guidelines have been identified.

- Lack of a nationally managed groundwater strategy.
- Ineffective and disjointed implementation of groundwater management strategies due to different players in the sector working in an uncoordinated manner.
- Weak link between groundwater management and development, and land use planning.
- Not all the required guidelines for groundwater development and management are in place.
- Limited uptake of research outputs and recommendations by mandated institutions of government.
- Inadequate financing/ investment in water resource development.
- Economic water scarcity, low utilisation of available water resources to support development of key socio-economic sectors
- Methods for pricing of fees and charges on groundwater are unclear. Even with a pricing strategy, it appears to be subjective and clarification is required.
- Public access to geohydrological data held by the state is not adequately promoted and facilitated by WARMA and stakeholder institutions. Support needed for expansion of groundwater monitoring network, technical staff, training and equipment.
- Lack of a strategy to ensure implementation of the policy on requirements for drillers to be competent and use appropriate groundwater development methods is not supported by standards.
- Strategies are not addressing the weak inter-sectoral collaboration to address the needs and impacts of different sectors (e.g., land, agriculture, mining, municipal, and environment) so that they are taken into account in groundwater management and the impacts of developments in those sectors on groundwater are accounted for.

Further considerations of the strategies, guidelines and regulations pertaining to groundwater follow below.

- Groundwater can contribute to the minimization of the impact of water-related disasters such as droughts and floods through the provision of early warning systems, but this realisation is not well appreciated. No proper early warning system in place.
- Strategies and guidelines have been applied at the local level but have mainly focused on water use and protecting only the immediate surroundings of the water point rather than looking at watershed activities likely to negatively impact on the groundwater source. The regulations on groundwater are just beginning to be implemented and so are yet to be assessed.
- The strategies, guidelines and regulations for groundwater do recognise the importance of meaningful stakeholder participation, but whether the interests of stakeholders (including equity and gender considerations) are formally carried into the decision-making process is a matter yet to be seen as implementation and enforcement advance. Examples of stakeholder interests being taken into decision-making processes abound for surface water (with respect to agriculture) which has been under regulation for a very long time compared to groundwater.
- The strategies, guidelines and regulations do address the need for coordinated planning with land-use planning and other departments to a reasonable extent, but the actual implementation does not seem to take off or where it happens it remains weak. Probably one reason for this is the sectoral approach ('working in silos') which is still being preferred to the multi-sectoral approach.
- The strategies, guidelines and regulations do enable aquifer protection zoning.
- The regulations that are in place are independently enforced, but standard operating procedures for compliance monitoring and enforcement are still being developed.

5.4. Enablers required to unlock these gaps/challenges

A range of actions are possible to address the various gaps and challenges. These are outlined in Table 7.

Table 7: Enablers to address strategy and guideline gap and challenges

Groundwater gap/challenges	Enablers
Ineffective implementation of groundwater management strategies due to different players in the sector working in an uncoordinated manner.	<ul style="list-style-type: none"> ▪ Develop and implement the National Water Resources Strategy & Plan (More funding, partially supported by GIZ)
Lack of a nationally managed groundwater programme.	<ul style="list-style-type: none"> ▪ Develop a national groundwater management strategy that supports the National Water Resources Strategy ▪ Develop and implement the strategy for management and exploitation of transboundary aquifers (taken up by DWRD, support required during implementation)
Weak link between groundwater management and development, and land use planning.	<ul style="list-style-type: none"> ▪ Develop & implement Catchment Management Plans (CMPs) in the remaining 5 catchments (more funding)

Groundwater gap/challenges	Enablers
Not all the required guidelines for groundwater development and management are in place.	<ul style="list-style-type: none"> Undertake programme to update all guidelines. Formulation of guidelines for groundwater development (requires more funding).
<p>6.1. Inadequate financing/ investment in water resource development.</p> <p>Methods for pricing of fees and charges on groundwater are unclear. Even with a pricing strategy, it is very subjective and requires some scientific approach.</p>	<ul style="list-style-type: none"> Strengthen the implementation the raw water pricing strategy. Implement the Water Resources Development Trust Fund (implementation support).
Public access to geohydrological data held by the state is not adequately promoted and facilitated by WARMA and stakeholder institutions. Support needed for expansion of groundwater monitoring network, technical staff, training and equipment	<ul style="list-style-type: none"> Implement the designed national groundwater monitoring network and the national monitoring and information management system (more funding required).
The policy on requirements for drillers to be competent and use appropriate groundwater development methods is not supported by standards.	<ul style="list-style-type: none"> Strategy needs to be developed to ensure that the policy is implemented.

6. INSTITUTIONAL FRAMEWORK

6.1. Evolution

The institutional framework for groundwater management, before the 2015 was mainly provided by the then Department of Water Affairs and the Water Development Board (carrying the mandate according to the Water Act 1949) supported by the Ministry of Local Government and Housing through the Department of Water Supply and Sanitation, Commercial Utilities, Non-governmental Organisations, Community and Faith Based Organisations, Cooperating Partners, research and academic institutions, and to a less extent traditional authorities and rural communities.

Within this institutional framework, emphasis was more on water supply than water resources management. The water sector reforms started in the 1990s culminated in the policy and legal framework that provided the basis for the current institutional framework. Whereas previously the mandate for water management and development was mainly split between two government ministries, there is currently only one (Ministry of Water Development, Sanitation and Environmental Protection or MWDSEP) housing all key players in the management and development of water in the country.

6.2. Institutional arrangements to support groundwater management

The agencies under MWDSEP which collaborate in groundwater management are:

- Water Resources Management Authority or WARMA (*quasi*-government) main mandate carrier for water resources management and development in the country
- Department of Water Resources Development or DWRD (government) responsible for water infrastructure development and international waters
- Department of Water Supply and Sanitation or DWSS (government) responsible for water supply and sanitation
- National Water Supply and Sanitation Council (NWASCO), *quasi*-government, responsible for regulation of the WSS sub-sector
- Zambia Environmental Management Agency (ZEMA), *quasi*-government, responsible for environmental protection
- Department of Planning and Information (DPI), (government) responsible for water policy and planning
- Ministry of Agriculture develops irrigation, livestock watering and fisheries infrastructure. Before the relevant environmental regulation came into effect in 1997, the ministry implemented such projects without oversight from the ministry and agencies responsible for environment and water. Now both the Water and Environmental management frameworks in place do regulate such projects.
- Ministry of Mines and Minerals Development ensures safe any excavation made during the course of the exploration and that the holder of an exploration licence surrenders to Government, on termination, without compensation, the drill cores, other mineral samples and the boreholes and any water rights in respect of the boreholes.

Institutional responsibilities for key water resource management functions: planning, water use authorisation, compliance monitoring and enforcement, monitoring and information management systems are indicated below.

- **Planning** is carried out by the Ministry (MWDSEP) through the Department of Planning and Information (DPI)
- **Water use authorisation, compliance monitoring and enforcement, monitoring and information management systems** are carried out by WARMA
- **Water Infrastructure development and international waters management** are the functions of the Department of Water Resources Development (DWRD)
- **Water supply and sanitation** function is done through the Department of Water Supply and Sanitation (DWSS)
- **Regulation of water and sanitation** is done by the National Water and Sanitation Council (NWASCO)

All these institutions collaborate on matters of common interest.

Other key players include:

- University of Zambia, Copperbelt University and Mulungushi University responsible for academic and professional training; research and consultancy work in groundwater management.
- Cooperating partners (e.g., GIZ, World Bank, African Development Bank, JICA, SNV, The Nature Conservancy, World Wide Fund for Nature).
- Drillers Association of Zambia.
- Zambian Breweries (SABMiller, majority owner).

Until recently water management was essentially under two ministries (Ministry of Energy and Water Development and Ministry of Local Government and Housing) as depicted below. Currently the water portfolio falls under one ministry (Ministry of Water Development, Sanitation and Environmental Protection or MWDSEP). The Water Resources Management Authority (WARMA) falls under MWDSEP. WARMA is overseen by the Board of Directors and has 4 directorates: Water Resources Management and Information, Legal and Corporate Affairs, Finance and Human Resource Management and Administration. Organograms depicting aspects of the institutional arrangements are shown in Figures 2 and 3.

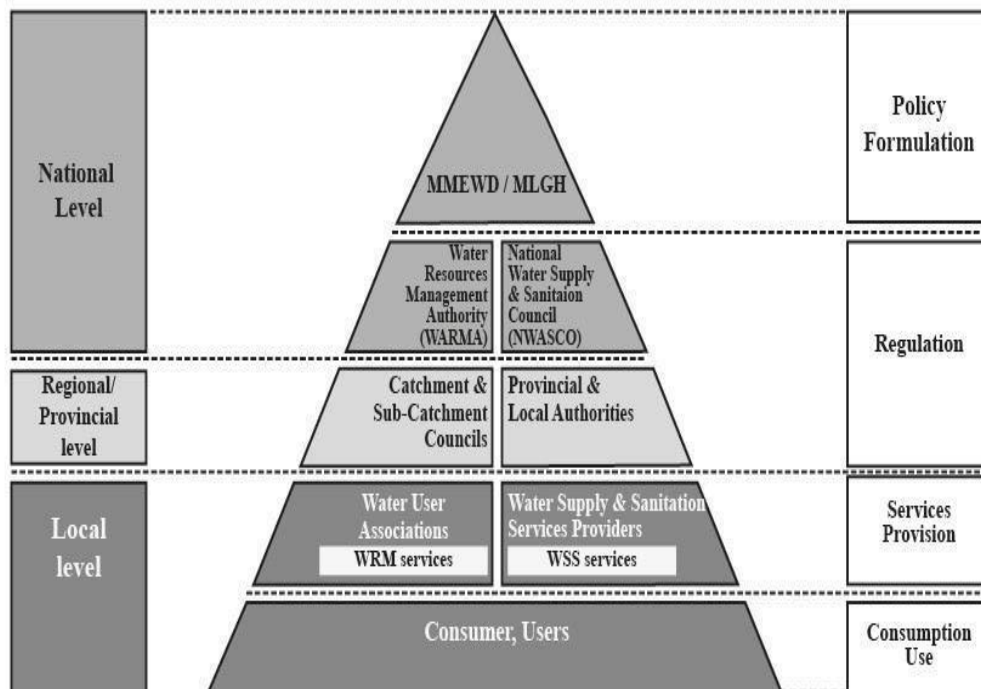


Figure 2: Decentralised institutional arrangement for water management

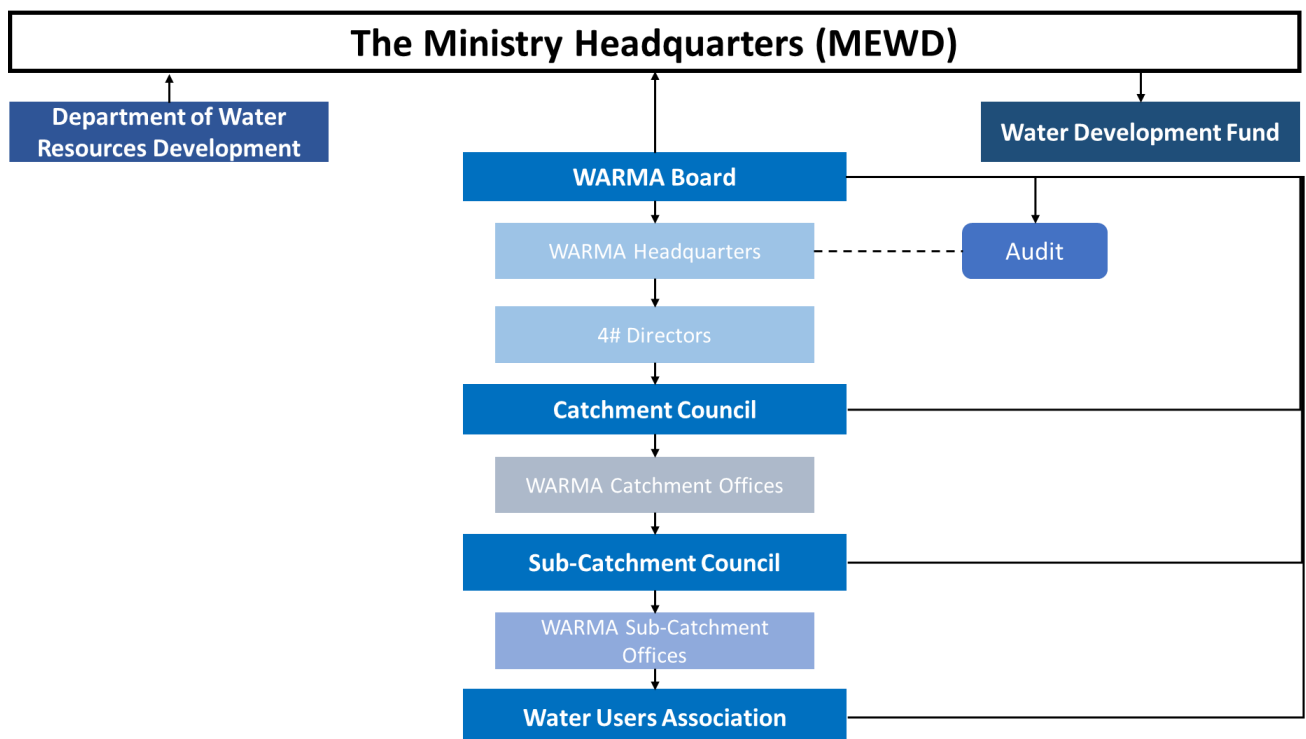


Figure 3: Institutional structure for water resources management

The key planning instruments that set out what the institutions aim to achieve include: The National Vision 2030, Seventh National Development Plan or 7NDP (2017 to 2021), Integrated Water Resources Management/Water Use Efficiency Implementation Plan up to 2030, Strategic Plans at institutional level and annual work plans.

Further points of relevance regarding institutional issues and interfaces with transboundary institutions include:

- Transboundary issues are dealt by the Department of Water Resources Development in the Ministry (MWDSEP). WARMA is also expected to provide advice to the Minister on transboundary water matters.
- MWDSEP and DWRD participate at the policy (Council of Ministers) and strategic/technical (ZAMTEC) levels of ZAMCOM
- DWRD and WARMA participate in training programmes on water resources management under ZAMCOM.
- Through SADC GMI, Aquifer Mapping for Chongwe project is planned for implementation.
- Government, through MWDSEP and as stated in the 7NDP (2017 to 2021), is promoting local and transboundary aquifer management. MWDSEP, through DWRD is developing national strategies for aquifer and international waters management and development.
- WARMA and ZRA, as water managers and dam operator collaborate on data exchange and other operational matters and also as members of the Joint Technical Operations Committee (JOTC), which was formally created by way of an Inter-Governmental Memorandum of Understanding (MoU) signed by Mozambique, Zambia and Zimbabwe on 7 July 2011 in Songo, Mozambique to provide a forum for collaboration on data and information exchange in the management of the Zambezi River catchment areas of Mozambique, Zambia and Zimbabwe. Subsequent to this MoU, the water and dam managers, namely, Administração Regional de Águas do Zambeze (ARA-Zambeze), Hidroeléctrica de Cahora Bassa (HCB), Zambezi River Authority (ZRA), ZESCO Limited, Zimbabwe National Water Authority (ZINWA) and Zimbabwe Power Company (ZPC) also signed a Memorandum of Agreement (MoA) to operationalise the MoU.

6.3. Gaps and challenges identified

It is understood that institutional processes are slow to develop and resolution of gaps and challenges that exist across the institutional frameworks are also lengthy in nature. However, a range of gaps and challenges currently exist that require attention.

- There is no apex body exclusively managing groundwater in Zambia.
- Weak coordination exists between various institutions and hinders the implementation of policy, legislation and strategies. Engagement on groundwater management issues in Zambia has not been sufficient. The following are some forums where groundwater management issues are discussed, and information disseminated:
 - The Zambia Water Forum and Exhibition (ZAWAFE), an annual event where various topics including groundwater are discussed; display of water related products; and excursions are arranged
 - Water and Sanitation Association of Zambia (WASAZA), Water Nights (monthly event)
 - The Drillers Association of Zambia

- Various meetings take place at the University of Zambia where research presentations are made for academic purposes and for discussion and dissemination to stakeholders including government agencies.
- With support from the Groundwater Resources Management Project (GReSP), a stakeholder's forum was established which ended with the phasing out of the project.
- Effective institutional arrangements are coordinated at transboundary, national and local levels by the Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP) through WARMA and the Department of Water Resources Development (DWRD). The coordination of groundwater at transboundary level requires strengthening, a detailed strategy is required.
- At international level, the following are relevant forums where Zambian nationals participate and topics on groundwater are presented and discussed and information is disseminated:
 - Waternet Symposium, an annual event. Zambia is hosting the 2018 Symposium.
 - Various meetings under the Zambezi Watercourse Commission (ZAMCOM) and Lake Tanganyika Authority.
 - SADC GMI
- Inadequate trained human resources.
- Inadequate financial resources to fully implement programmes and invest long-term.
- Limited access to groundwater information.
- Use of different standards and approaches to groundwater development and management.
- Research outputs not well taken or not relevant to decision-makers.
- WARMA is established in only 4 out of 6 catchments with only one catchment having offices wholly owned by WARMA; and 1 out of 12 envisaged sub-catchments. Catchment areas (delineated according to six major river systems in Zambia and further into sub-catchments) consider both surface and groundwater under water resources management and development. Groundwater is a key component of the catchment management plan (CMP) which binds developments in the catchment to adhere to its provisions.
- About 10 informal water users associations have been established.
 - The WUAs are informal as they still await the issuing of regulations for constitution of the WUAs, catchment and sub-catchment councils. The draft regulations are being considered by the Ministry of Justice.
 - The functions of the WUA are to: (a) undertake projects that will ensure catchment protection; (b) monitor water quality and ensure water resources conservation; (c) collect hydrological, hydro-geological, meteorological, environmental, socio-economic and water quality and quantity data for submission to the sub-catchment council; (d) facilitate inspections under the WRM Act; € promote the participation of the community in water resources management and ensure gender mainstreaming in the decision-making process relating to the use of water; (f) investigate and deal with disputes relating to the use of water,

as may be prescribed; (g) propose local water management plans to the sub-catchment council and implement the plans; and (h) perform any other function assigned to the association by the sub-catchment council or as may be prescribed.

- The WUA is determined for a whole river catchment or part of it (area of interest for the concerned water users and stakeholders) which has to be delineated and declared as part of the required statutory instrument.
- Current staffing level of WARMA is about 20% of the full staff complement. The major constraint in up-scaling WARMA is financial. The other challenges are inadequate skilled staff and equipment.

6.4. Enablers required to unlock these gaps/challenges

Actions to address the various institutional gaps and challenges re reflected in Table 8.

Table 8: Enablers to address institutional gaps and challenges

Groundwater gap/challenges	Enablers
There is no apex body established for the management of groundwater	<ul style="list-style-type: none"> ▪ Both the Ministry and WARMA have key leadership responsibilities for groundwater management. Strengthening of these institutions would suffice in ensuring more effective groundwater management.
Weak coordination between institutions.	<ul style="list-style-type: none"> ▪ Inter- Ministerial drive required to initiate a more integrated approach. ▪ The development and implementation of the National Water Resource Strategy would support. ▪ Strengthen collaboration with Las (implementation capacity).
Transboundary water resource management requires strengthening	<ul style="list-style-type: none"> ▪ Develop & implement a strategy on transboundary groundwater management (being carried out by Department of Water Resources Development or DWRD)
Inadequate trained human resources	<ul style="list-style-type: none"> ▪ Build capacity in WARMA, DWRD, WSS and other governance structures for effective groundwater management (more funding for training and equipment). ▪ Coordinated planning of human resource development with institutions for learning. ▪ Provide incentives for increased private sector participation in groundwater management and development (need implementation capacity)
Inadequate financial resources to fully implement programmes and invest long-term	<ul style="list-style-type: none"> ▪ Develop resource mobilisation strategy. ▪ Implement the Water Resources Development Trust Fund through resource mobilisation (more implementation support). ▪ Increase government funding to WARMA, DWRD & WSS. ▪ Increase allocation in National Budget for groundwater development & related programmes. ▪ Provide incentives for increased private sector participation in groundwater management and development (need implementation capacity)

Groundwater gap/challenges	Enablers
Limited access to groundwater information	<ul style="list-style-type: none"> Invest in a robust groundwater database system (more funding). Implementation of the National Monitoring and Information system.
Use of different standards and approaches to groundwater development and management	<ul style="list-style-type: none"> Develop appropriate statutory instruments/ regulations.
Research outputs not well taken or not relevant to decision-makers	<ul style="list-style-type: none"> Build and strengthen collaboration in groundwater development and research (more funding and capacity).
WARMA is established in only 4 out of 6 catchments with only one catchment having offices wholly owned by WARMA	<ul style="list-style-type: none"> Aim to establish and operationalise the WARMA structures including WUAs (more funding required). Build/acquire offices and ensure good work environment for staff (more funding). Develop financing / resource mobilisation strategy. Support WARMA to establish water governance structures at catchment, sub-catchment and water users association level (more funding, training)
About 10 informal water users associations have been established	<ul style="list-style-type: none"> Develop a programme of institutional development for the water sector. This would need to be supported by a supporting capacity building strategy. Develop Catchment Management plans and Water Allocation plans in the catchments while ensuring that groundwater management is incorporated (more funding)
Current staffing level of WARMA is about 20% of the full staff complement	<ul style="list-style-type: none"> Develop human resourcing strategy, supported by a capacity building plan and a financing strategy. Engage and deploy staff to remaining catchment & sub-catchment offices (more funding, more human resource)

The WARMA HQ, with the responsibility for groundwater management on national level, will have an overview of groundwater systems and problems on a national scale. HQ will have frequent contact with all catchment offices and will facilitate knowledge exchange between catchment offices and identify knowledge gaps at catchment offices. (HQ is dependent on measurements and knowledge of the groundwater system in the catchment offices).

The catchment offices will have more focus on regional groundwater systems within their catchment; the technical performance of monitoring; and on decisions on new permits for groundwater abstractions. Knowledge skills of HQ and catchment offices will not differ much and therefore all courses will be followed by hydrogeologists and laboratory technicians of both Headquarters and all catchment offices, and so this cadre of staff can be trained together.

The following training and courses are planned for the short, medium and long-term.

- The short-term courses aim to improve the general knowledge about groundwater such as the knowledge of the geology and aquifer systems of Zambia, understanding of how different interventions will impact the groundwater system, update knowledge about groundwater monitoring and the basic knowledge of groundwater modelling.
- The medium-term courses aim to improve the (field) experience of the staff and the focus will be more on groundwater systems on regional scale and the link to the national groundwater system such as understanding the groundwater database (GeODin), developing groundwater modelling skills and building conceptual groundwater models.
- The long-term courses aim to improve the analytical skills of the participants so that the knowledge of the participants can be used in future projects on groundwater management issues

6.4.1. The Role of Groundwater Focal Point

The role of the Groundwater focal point (GFP) as part of the institutional framework is to have a good understanding of the policy, legislation and institutional framework for groundwater management in Zambia; have facts on national laws, policies, plans, strategies and priorities relevant to groundwater (e.g., fiscal, trade, land, decentralisation, privatisation, public health, transport and local government policies); gather information on stakeholders; be current on water sector reforms and issues pertaining to national level water resources management; develop a communication strategy around groundwater that meets the information needs at national level and regional (transboundary) level; identify and prepare best practices on raising the profile of groundwater in the national development discourse; share success stories from groundwater programmes with workmates, cooperating partners and the media; create networks, offer support and build coalitions; engage private sector to drive the agenda further for groundwater protection and increase water security; and engage Parliamentarians and Councillors, women, youth and the disabled on groundwater matters.

6.4.2. Example of Best Practise

Aspects of the groundwater framework in Zambia that may be considered best practice as it relates to:

Policy

- Integrated Water Resources Management (IWRM) as the accepted approach for water resources management in the country.
- Formation of decentralised governance institutions for water resources management.
- Recognition of groundwater as the most reliable source of water for the majority rural population.
- Recognition of the role of women in water management and decision-making.
- Recognising water as an economic and social good.

Strategy

- Development and implementation of the National Water Resources Strategy and Plans.
- Design and implementation of the nationally managed groundwater monitoring programme.
- Management of transboundary aquifers.

- Development and approval of the Raw Water Pricing Strategy to guide the formulation of the SI No.18 of 2018 on Charges and Fees.

Legislation

- Enactment of legislation that considers global shifts in the terms of water resource management; international conventions and treaties to which Zambia is a signatory; and the need to raise the profile of water in the national development agenda and to meet the water demands of the current and future mankind in Zambia.
- Providing for incentives for win-win situations and economic growth and offences to discourage negative practices relating to water use.

Institutional arrangements

- Providing for participation of water users, managers and policy makers in the development and management of water resources.
- Providing for distinct units within the water management and development institutions for surface water and groundwater management.

Financial arrangements

- Legally providing for development and implementation of the Water Development Trust Fund.
- Resource mobilisation through prioritising revenue collection; lobbying to increase the Government grant to WARMA in order to implement water infrastructure projects; engagement with Cooperating Partners.
- Promoting Public Private Partnerships in groundwater management and development.

7. CHALLENGES TO IMPLEMENTATION

The key challenges hindering the ability to deliver on good groundwater management are:

Policy challenges

- a) Lack of explicit policy provisions for groundwater management. Groundwater is addressed as treated 'water resources' but when it comes to implementation, it is the surface water element that dominates.
- b) Consequently, the relatively low prioritisation of water resources management in the national budgetary allocation and national planning also affects groundwater management.
- c) Lack of understanding and hence appreciation of the role of groundwater in society e.g., as major source of drinking water in the peri-urban and rural communities; as part of the hydrological cycle; and as part of ecological processes essential to sustaining life and the environment.
- d) Low levels of awareness of policy provisions. Consequently, there is limited participation by the public in water matters and uncoordinated development of water resources.

Legal challenges

- e) Weak enforcement of legal provisions and implementation of policies relating to groundwater management due to inadequate human capacity and technology; inadequate attention paid to inspection and monitoring; and lack of procedures for engaging the regulated water users and deterring violations. As a result, there is a culture of impunity and dishonesty in the use of water.
- f) Low levels of awareness of the law governing water resources management. This presents in low levels of compliance in paying fees and charges, and in the development and use of water. In addition, some people still think water is a gift from God and so should not attract any charge.

Institutional challenges

- g) Limited data and information on groundwater resources. The implementation of an initial national groundwater monitoring network has stalled and awaits funding. Currently data capture is slow and is limited to selected parts of the country.
- h) Inadequate skilled and trained human resource. The current staff under WARMA, DWRD and local authorities do not have sufficient skills required for effective groundwater management and also the number of staff is low compared to the required.

Other

- i) Profile of water, generally, is lower relative to economic sectors that depend on it. This is in relation to the share for water resources management and development in the national budget. However, within the water sector more funding goes to water supply and sanitation (WSS) than water resources management. Over 75% of the funds for WSS are contributed by cooperating partners.

A large rural population (over 50%) still lacks access to safe drinking water while groundwater is already the main source of domestic water supply. This is also required for economic activities and hence, access is a significant issue.

8. ACTION PLAN

The following actions have been identified as key in improving the management of groundwater resources in Zambia. These have been captured in Table 9.

Table 9: Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia -Must Have.

Prioritisation	Element	Description
Must have: <i>those elements of the regulatory framework that are critical</i>	Policy	<ul style="list-style-type: none"> Develop catchment management and water allocation plans incorporating groundwater management issues in 3 catchments. Prioritise groundwater management in WR planning, particularly for domestic and rural water supply. Develop & implement a strategy for effective transboundary groundwater management.
	Legislative	<ul style="list-style-type: none"> Ensure all requisite subsidiary legislation for WRM are issued: <ul style="list-style-type: none"> Persistent engagement with Ministry of Justice and MWDSEP; Organise high level meetings if need be to get additional support for the regulations; and Plan for and mobilise resources for sensitisation and awareness activities for the new regulations.
	Institutional	<ul style="list-style-type: none"> Hire one junior hydrogeologist to support the Senior Hydrogeologist at WARMA HQ in groundwater modelling for assessing new permit applications and predict effects of changes in ground water use (extraction for drinking water, agriculture and mining), recharge (climate, land use changes), interaction ground water-river system, and pollution with contaminants (mining activities, fertilizers in agriculture, urban pollution). Strengthen WARMA presence in all catchments. <ul style="list-style-type: none"> Recruiting at least 1 to 3 Analytical and Studies Officers with degrees from the fields of hydrology, geohydrology, water resources, and environmental science. The Analytical and Studies Officer(s) would report to the Data and Information Manager, which WARMA plans to establish under the Directorate of WRMI. Strengthen inter-sectoral collaboration and coordination. Support the establishment and capacitation of WUAs.

Prioritisation	Element	Description
	Strategy/ Guidelines	<ul style="list-style-type: none"> Develop and implement a nationally managed groundwater monitoring programme according to the following steps: <ul style="list-style-type: none"> Undertake an extensive data recovery programme; Field assessment of the ground water systems of Zambia; Design a national ground water monitoring network; Implement the national ground water monitoring network; Improved information access: web-portal and Graphic User Interface to assess new groundwater permit applications; and Set up a conceptual ground water model for evaluating new permits. The programme will be supported by an institutional plan, a training plan and an investment plan.

Table 10. Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia - Should Have.

Prioritisation	Element	Description
Should have	Policy	<ul style="list-style-type: none"> Develop and implement the National Water Resources Strategy and Plan. Ensure groundwater is incorporated in related sectoral policies and plans. Lobby for increased allocation in National Budget for groundwater development & related programmes. Promote inter-sectoral collaboration. Review of the 2010 National Water Policy to address groundwater policy gaps Review of the National Climate Change Policy to address groundwater policy gaps
	Legislative	<ul style="list-style-type: none"> Strengthen regulation and compliance monitoring. Review of subsidiary legislation on groundwater management
	Institutional	<ul style="list-style-type: none"> Establish a dedicated groundwater studies Unit (with 2 experienced and 4 graduate hydrogeologists) to complete the required studies for the national programme within 5 to 7 years. The Unit will be overseen by the Senior Hydrogeologists. Strengthen WARMA's analytical and modelling capacity in support of internal studies and investigation as well as provide products and services by: <ul style="list-style-type: none"> Developing a specialised analytical and modelling capacity at WARMA HQ;

Prioritisation	Element	Description
		<ul style="list-style-type: none"> ○ Recruiting 4 Hydro-technicians at each of the 4 Catchment offices to increase the capacity ▪ Improve groundwater information management system (collection, archival, processing, analysis, dissemination) ▪ Strengthen monitoring and evaluation.
	Strategy/ Guidelines	<ul style="list-style-type: none"> ▪ Undertake groundwater research to inform decision making

Table 11. Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia – Could Have

Prioritisation	Element	Description
Could have	Policy	<ul style="list-style-type: none"> ▪ Implementation of transboundary aquifer management
	Legislative	<ul style="list-style-type: none"> ▪ Tools developed for improved groundwater pricing; and compliance monitoring
	Institutional	<ul style="list-style-type: none"> ▪ Formation of network of research institutions.
	Strategy/ Guidelines	<ul style="list-style-type: none"> ▪ Guidelines for groundwater development and management

Table 12. Priority actions for the strengthening of the policy, legislative, strategy and institutional frameworks in Zambia – Won't Have

Prioritisation	Element	Description
Won't have	Policy	<ul style="list-style-type: none"> ▪ Inadequate funding for groundwater management ▪ Limited data and information on groundwater for decision making
	Legislative	<ul style="list-style-type: none"> ▪ Regulations not declared (especially for groundwater resource protection areas)
	Institutional	<ul style="list-style-type: none"> ▪ Understaffed groundwater management unit ▪ Groundwater unit staff without analytical and modelling skills ▪ Poor inter-sectoral and inter-institutional coordination.
	Strategy/ Guidelines	<ul style="list-style-type: none"> ▪ Prioritising of surface water resource management and development even where groundwater focus would be more beneficial and cost-effective

9. REFERENCES

- DWA/BGR - Department of Water Affairs & Federal Institute for Geosciences and Natural Resources (2007): The Groundwater Resources of Southern Province, Zambia (Phase 1).- by Bäumle R., Neukum Ch., Nkhoma J., & O. Silembo; Vol. 1 - Technical Report & Annex, 132 Pages. Lusaka/Hanover: DWA/BGR.
- Environmental Management Act 2011 (c.12). Lusaka: Government Printer
- FARR J L, GUMIREMHETE T, DAVIES J & ROBINS N S. 2005. Southern African Development Community Regional Situation Analysis. British Geological Survey Internal Report, CR/05/093N. 132pp.
- GOVERNMENT OF THE REPUBLIC OF ZAMBIA /FEDERAL INSTITUTE FOR GEOSCIENCES AND NATURAL RESOURCES, BGR. MINISTRY OF WATER DEVELOPMENT, SANITATION AND ENVIRONMENTAL PROTECTION (2012) Groundwater Vulnerability Map for Lusaka Province. 1st edition. Lusaka: MWDSEP
- GOVERNMENT OF THE REPUBLIC OF ZAMBIA. MINISTRY OF LANDS AND NATURAL RESOURCES (2009) National Policy on Environment. Lusaka: MLNR
- GOVERNMENT OF THE REPUBLIC OF ZAMBIA. MINISTRY OF NATIONAL DEVELOPMENT PLANNING (2017) Seventh National Development Plan 2017-2021. Lusaka: MNDP
- GOVERNMENT OF THE REPUBLIC OF ZAMBIA. MINISTRY OF WATER DEVELOPMENT, SANITATION AND ENVIRONMENTAL PROTECTION (2010) National Water Policy. Lusaka: MWDSEP
- Water Resources Management Act 2011 (c.21). Lusaka: Government Printer
- Water Resources Management Authority (WARMA), Republic of Zambia and Federal Institute for Geosciences and Natural Resources (BGR), Republic of Germany. (2018). Hydrogeological map of Zambia. (Editors). Lusaka/Hanover: WARMA/BGR
- Water Resources Management (Charges and Fees) Regulations 2018 (SI 2018/18). Lusaka: Government Printer
- Water Resources Management (Groundwater and Boreholes) Regulations 2018 (SI 2018/20). Lusaka: Government Printer
- Water Resources Management (Licensing of Drillers and Constructors) Regulations 2018 (SI 2018/19). Lusaka: Government Printer
- WORLD BANK (2009). Managing Water for Sustainable Growth and Poverty Reduction: A Country Water Resources Assistance Strategy for Zambia. Washington: The World Bank
- WWF (2016). Water in the Zambian Economy: Exploring shared risks and opportunities in the Kafue Flats
- YEC - Yachiyo Engineering Co. Ltd. (1995b): The Study on the National Water Resources Master Plan in the Republic of Zambia. Supporting Report (D), Hydrogeology. Lusaka: Ministry of Energy and Water Development.

APPENDIX A: LITERATURE INVENTORY LIST

No	Year	Title of Document	Author	Publisher	Report Number	Link (if it is a website document)
1	2011	The Water Resources Management Act		National Assembly of Zambia	Act No. 21 of 2011	http://www.parliament.gov.zm/node/6544
2	2018	The Water Resources Management (Charges and Fees) Regulations	Ministry of Water Development, Sanitation & Environmental Protection (MWDSEP)	Government Printer	Statutory Instrument (SI) No.18 of 2018	www.warma.org.zm
3	2018	The Water Resources Management (Licensing of Drillers & Other Constructors) Regulations	Ministry of Water Development, Sanitation & Environmental Protection	Government Printer	Statutory Instrument (SI) No.19 of 2018	www.warma.org.zm
4	2018	The Water Resources Management (Groundwater & Boreholes) Regulations	Ministry of Water Development, Sanitation & Environmental Protection	Government Printer	Statutory Instrument (SI) No.20 of 2018	www.warma.org.zm
5	2011	The Environmental Management Act		National Assembly of Zambia	Act No. 12 of 2011	http://www.parliament.gov.zm/node/7348

No	Year	Title of Document	Author	Publisher	Report Number	Link (if it is a website document)
6	2013	The Environmental Management (Licencing) Regulations	Ministry of Water Development, Sanitation & Environmental Protection	Government Printer	Statutory Instrument (SI) No.112 of 2013	
7	1997	The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations	Ministry of Water Development, Sanitation & Environmental Protection	Government Printer	Statutory Instrument (SI) No.28 of 1997	
8	2018	7NDP Implementation Plan 2017 - 2021	Ministry of National Development Planning	Ministry of National Development Planning (MNDP), Lusaka, Zambia		
9	2017	Seventh National Development Plan (7NDP) 2017 - 2021	Ministry of National Development Planning	Ministry of National Development Planning, Lusaka, Zambia		
10	2010	Vision 2030	Ministry of National Development Planning	Ministry of National Development Planning, Lusaka, Zambia		
11	2018	Detailed Design - Ground Water Network (Overall Assessment and Optimization Study	AURECON	Water Resources Management Authority (WARMA), Lusaka, Zambia	Volume 3	

No	Year	Title of Document	Author	Publisher	Report Number	Link (if it is a website document)
		and Design of the Country Hydrometeorological Network)				
12	2018	Institutional Plan (Overall Assessment and Optimization Study and Design of the Country Hydrometeorological Network)	AURECON	Water Resources Management Authority (WARMA), Lusaka, Zambia	Volume 7	
13	2018	Training Plan (Overall Assessment and Optimization Study and Design of the Country Hydrometeorological Network)	AURECON	Water Resources Management Authority (WARMA), Lusaka, Zambia	Volume 8	
14		Revised SADC protocol on Shared watercourses				
15		ZAMCOM Agreement				

APPENDIX B: STAKEHOLDER LIST

Full Stakeholder List

No	Title	Name	Surname	Affiliation	Role:	Sector Group	Telephone	Email:	Priority (yes/no)
1	Mr	Simon	Kang'omba	Assistant Director - Department of Water resources Development	Focal Point/Groundwater Expert	Government	+26097852 8175	kangomba@yahoo.com	Yes
2	Mr	Lemmy	Namayanga	Acting Director General - Water Resources Management Authority	Groundwater Management	Quasi- Government	+26097852 8175	lnamayanga@gmail.com	Yes
3	Professor	Imasiku	Nyambe	Researcher - University of Zambia	Academician/Groundwater Expert	Research, Academic	+26095579 3600	inyambe@gmail.com	Yes
4	Mr	Christopher	Chilongo	Drillers Association of Zambia	President	Private sector		cchilongo@yahoo.com	Yes
5	Dr	Kawawa	Banda	University of Zambia	Lecturer/Groundwater Specialist	Academia	+26097753 3041	kawawabanda@yahoo.co.uk	Yes

No	Title	Name	Surname	Affiliation	Role:	Sector Group	Telephone	Email:	Priority (yes/no)
6	Mr	Chisanga	Siwale	Department of Water Resources Development,	Principal Officer	Water Government	+260977674413	siwalechisanga@yahoo.com	No
7	Mr	Pascal	Mwila	Department of Water Resources Development,	Principal Geomatics Officer	Government		pmwila69@gmail.com	
8	Mrs	Beauty S.	Mbale	Water Resources Management Authority,	Acting Water Resources Operations Manager	Quasi-government	+260979068018	beautyshamboko@yahoo.com	
9	Ms	Malama	Munkonge	USAID Zambia	Cooperating Partner	Government (US)	+260969341041	mmunkonge@usaid.gov	No
10	Ms	Flora	Simumba	Ministry of Water Development, Sanitation and Environmental Protection		Government			

List of stakeholders engaged

Name	Institution, Designation	Stakeholder Grouping
Mr. Simon Kang'omba	Department of Water Resources Development, Assistant Director – International Waters (Focal Person)	Government
Prof. Imasiku Nyambe	University of Zambia, Senior Lecturer/ Groundwater expert	Academia
Dr. Kawawa Banda	University of Zambia, Lecturer/Groundwater Specialist	Academia
Mr. Chisanga Siwale	Department of Water Resources Development, Principal Water Officer	Government
Mr. Pascal Mwila	Department of Water Resources Development, Principal Geomatics Officer	Government
Mr. Lemmy Namayanga	Water Resources Management Authority, Acting Director General	Quasi-government
Mrs Beauty S. Mbale	Water Resources Management Authority, Acting Water Resources Operations Manager	Quasi-government
Mr. Christopher Chilongo	Drillers Association of Zambia, President	Private sector
Ms. Malama Munkonge	USAID Zambia	Independent Agency of the US Government
Ms. Flora Simumba	Ministry of Water Development, Sanitation and Environmental Protection (SADC Gender Focal Point for Zambia)	Government

Validation Workshop and Broader Stakeholders

Name	Position	Stakeholder Group
Mr Melvin Sikazwe	District Health Planning and Budgeting Officer at Ministry of Health	Government (Validation Workshop)
Mr Elijah Musonda	Manager-Water Supply at Lusaka Water & Sewerage	Government (Validation Workshop)
Mr Pasca Mwila	DWA, Senior Hydrogeologist	Government (Validation Workshop)
Mr Curtis Muleya	National Water Supply and Sanitation Council	Government (Validation Workshop)
Mr Graham Douse	Director at Dombeya Ltd	Water User Association (Broader Stakeholder)

APPENDIX C: DESIRED FUTURE STATE

Reflection of Policy Framework as per the minimum requirement for the Desired Future State

Minimum requirement for desired future	Status	Comment
A long-term policy to protect groundwater by preventing pollution and overuse. This policy is comprehensive, implemented at all appropriate levels, consistent with other water management policies and be duly taken into account in other sectorial policies;	Partially achieved	The policy provisions mainly refer to water resources which includes both surface and groundwater resources. The implementation at all levels is provided for but again as water resources combined.
The social, economic and environmental values of groundwater are all recognised;	Achieved	These are recognised for the whole water sector (i.e. surface and groundwater resources combined)
The human right to water is recognized and a rights-based approach to groundwater management is taken, <i>inter alia</i> , through:	Achieved	Groundwater considered as water resource in general
Prioritization of drinking water/basic human needs in water legislation;	Achieved	
Ensuring that land-based rights cannot entitle unlimited access/use of freshwater, including groundwater;	Achieved	
Ensuring groundwater is legally recognized as a public good;	Achieved	Both the Constitution of Zambia and the National Water Policy provide for this
Recognising the role of groundwater in meeting basic human needs for food security;	Achieved	As water resources
Legal recognition of customary rights to freshwater, including groundwater;	Achieved	
Legal mechanisms to ensure gender equity in access, use and management of freshwater, including groundwater;	Partially Achieved	Regulations drafted but not yet issued. Recognition includes social inclusion issues to cater for vulnerable groups: women, children, aged and disabled.
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.	Achieved	Domestic and non-commercial use of water does not require a permit; incentive exists for small-scale users; but of course this is not exclusively for groundwater but water resources combined.
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;	Achieved	Rural water supply in Zambia means groundwater development and therefore is well recognised as a key resource for poverty alleviation and for food security.
The biophysical and ecological linkages between ground and surface water for their use, protection and management are recognised, including land use zoning for	Partially achieved	Recognition is there but not explicitly stated. For example, the Chilanga discharge zone is a potential area for protection and conjunctive use

Minimum requirement for desired future	Status	Comment
groundwater protection and recharge (conjunctive use);		of groundwater but such areas are not well covered by the policy
The importance of the maintenance of the ecological integrity of wetlands in groundwater management is recognised (recharge zones);	Achieved	Newly adopted wetlands policy (2018) and also the NWP give recognition
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;	Achieved	The provision is included in the policy and legislation.
The need for 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;	Partially	The need for studies of the aquifers have been identified for a better understand of the situation
The roles of various stakeholders and water users in groundwater management is recognised and participation of stakeholders in decision-making and groundwater management is promoted and facilitated;	Partially	There is new legislation for groundwater management which is just starting to be implemented in 2018.
An apex body that is responsible explicitly for GW management and playing the role of custodian/trustee on the part of the state is clearly defined;	Achieved	Effective functioning of WARMA started much later (2013) than the Act which established it (2011)
Effective institutional arrangements are coordinated at trans boundary, national and local levels;	Partially Achieved	There are some agreements signed but the monitoring and implementation process are not that active either effective. Existing water resources management institutions need to be reinforced on groundwater matters
Public access to geo-hydrological data held by the state is promoted and facilitated	Partially Achieved	This information is free, however need to be requested to the management body. Zambia has commenced development of groundwater database (GeoDIN). However the initial plans are that the general public will pay a processing fee to access specific processed products from the database.
- Additional environmental principles necessary to protect and sustain groundwater are mandated, including: the precautionary principle, the principle of gender equity and social inclusion (GESI), the principle of subsidiarity, and the principle of intergenerational equity.	Partially Achieved	These principles are included in the existing policies but not specifically for groundwater. Also regulations and guidelines to implement the principles are not yet in place.

Reflection of Legal Framework as per the minimum requirement for the Desired Future State

Minimum requirement for desired future	Status	Comment
Provide Status of Groundwater		
All water has a consistent status in law, irrespective of where it occurs	Achieved	
Explicit reference to groundwater and conjunctive use management in catchment/water management and development plans and drought/emergency management plans	Partially Achieved	
Human right to water recognized in groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users	Achieved	Reference to groundwater as part of water resources in general
ii. Regulate Groundwater Quantity a. Provide conditions for accessing groundwater i. Water use authorizations:	Achieved	
Legislation must enable the authorisation of groundwater use (with a system that does not discriminate, especially against the rural poor);	Partially Achieved	Regulation/Guidelines yet to be issued
The permitting of groundwater use should not be tied exclusively to land tenure;	Achieved	
Legislation should allow for the categorisation of water users;	Achieved	
Groundwater should be 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;	Achieved	Reference to groundwater as part of water resources in general
New legislation should strive towards 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	Not achieved	The water resources act does not explicitly provide for usufruct rights to groundwater. In fact, groundwater permits are not transferable.
The legislation recognises and legalises affordable, small-scale and indigenous solutions;	Achieved	It is indicated in the Act and there is inclusion in the regulations of indigenous solutions e.g., water divination.
The legislation should enable the regulation of borehole drillers, regulation for drilling, control of drillers, information from drillers and standards for borehole drilling;	Achieved	SI no. 19 of 2018

Minimum requirement for desired future	Status	Comment
Legislation should give 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);	Achieved	
The legislation should enable the regulation of exploration;	Not Achieved	As prescribed by Part 10 – licensing of drillers and constructors
The legislation should allow for zoning for overused/fragile aquifers;	Achieved	The act provides for groundwater protection areas which must be expanded by some subsidiary regulation.
Groundwater use organizations should be integrated into existing institutional frameworks (e.g., catchment management, customary institutions)	Achieved	Groundwater users are part of the water users associations at local level.
Stakeholder engagement		
The legislation should 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;	Partially Achieved	Regulations yet to be issued.
There should be specific 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	Partially Achieved	Regulations yet to be developed and issued.
The legislation should specifically address the issue of the involvement of women and youth in decision-making and the implementation of groundwater supply schemes.	Partially Achieved	Regulations yet to be issued.
Monitoring and data collection to support regulation		
The legislation should specify the need and parameters for a sustainable system for data collection, management and dissemination, including standardization and harmonization of data. This entails a national monitoring and information system which captures quantity and quality data from key aquifers;	Partially Achieved	Regulations yet to be issued although a national groundwater database exists and data is already being collected.
The legislation should 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	Not Achieved	The legislation supports this but regulations and guidelines need to be developed and issued.

Minimum requirement for desired future	Status	Comment
appropriate prediction of future hydrogeological conditions;		
In transboundary basins, legislation should address the need for standardization and exchange of data as well as the establishment of joint inventories; and	Partially Achieved	The agreements on the transboundary water courses already include these needs but this is done mainly for surface water.
The legislation should enable access by the public to geohydrological data held by the state.	Partially Achieved	Data is accessed by some e.g., research institutions and development agencies but the legislation provides for WARMA in Section 152 of the Act to collect fees for data via a Statutory Instrument. So far what is charged is processed information e.g., maps
iii. Water conservation and efficiency of use Legislation should enable regulation to ensure the efficient use of groundwater, such as the use of economic incentives and imposition of technologies.	Partially Achieved	These could be provided for in the regulations
Compliance and Enforcement		
Clear mechanisms for promoting compliance with groundwater regulations should be included in the legislation	Partially Achieved	Regulations for groundwater use are only beginning to be enforced
Enforcement provisions should include, <i>inter alia</i> , 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.	Achieved	
iv. Conflict resolution mechanisms and/or the right to appeal	Partially Achieved	Only WARMA is doing it at the moment but with the issuing of requisite regulations and formation of governance structures down to the water user level, conflict resolution will be done by these lower level structures
Regulatory measures		
The legislation must enable the relevant authority (Minister) to make regulations on any relevant matter in the legislation	Achieved	
Legislation should provide a clear ability 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	Achieved	

Reflection of Strategy and Guidelines Framework as per the minimum requirement for the Desired Future State

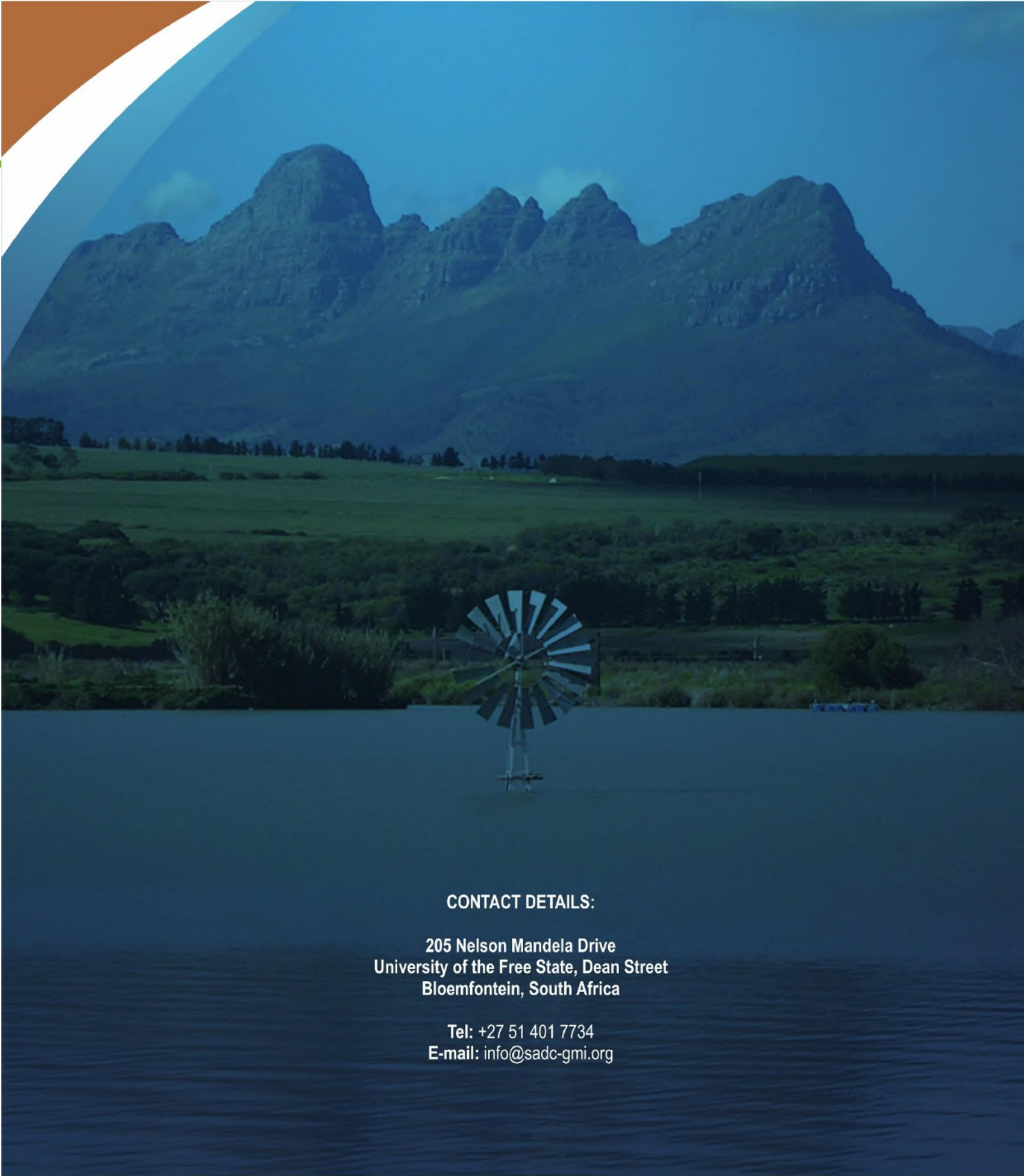
Minimum requirement for desired future	Status	Comment
Provide Status of Groundwater		
v. Groundwater Protection Mechanisms		
<i>Regulating Pollution (Point source and non-point source)</i>		
i. Water quality targets; ii. Regulation of emissions/wastewater discharge/waste storage including the impact of mines on groundwater quality: Permits can be used to regulate the discharge, disposal and possibly the storage of waste should specifically take into account the vulnerability of the aquifer concerned and the provisions necessary for its protection;	Partially achieved	Legislation provides for setting of ambient water quality standards and guidelines. Waste regulation is provided for under the Environmental Management Act and the same goes for the impact of mining on groundwater. The Mines and Minerals Act recognises the need for EIA in groundwater exploration. Water quality standards are developed for drinking water and bottled drinking water by the Zambia Bureau of Standards and the source of such water is mainly groundwater. • Classification of water bodies awaits issuing of regulations
iii. Classification of water bodies; and	Partially achieved	The water bodies were already classified under the existing legislation. Regulation yet to be issued
iv. Reducing and regulating abstraction.	Achieved	
v. Powers of compliance monitoring and enforcement	Partially achieved	Compliance monitoring and enforcement powers are given but enforcement still weak.
<i>Regulating Depletion</i>		
Regulation of abstraction and recharge (usually via permitting);	Partially Achieved	The Act provides for regulation against depletion but requisite regulations and guidelines are yet to be developed. Compliance and enforcement is still weak
Sustaining wetlands;	Partially Achieved	Large wetlands have protection under the Ramsar Convention; some which lie with National Parks have protection and others lying outside have no protection at all. Wetlands policy has the necessary provisions but was only recently adopted
Land use zoning – prohibition of abstraction in certain zones; cropping or irrigation practices;	Partially achieved	The legislation just beginning to be implemented.

Minimum requirement for desired future	Status	Comment
protection zones for recharge areas; no surfacing/drainage requirements; and		
Legislation must make it mandatory for installation of monitoring equipment of boreholes especially for large-scale users (the information must then be supplied to the state).	Partially achieved	The legislation just beginning to be implemented.
Powers of compliance monitoring and enforcement	Not Achieved	Compliance and enforcement is still weak
Planning		
The legislation should specify the need for long term plans to ensure the sustainable use of groundwater, including drought management plans and cross-sectorial coordination;	Achieved	Legislation supports water resources planning at national, catchment, sub-catchment and water users association level; long-term planning is envisaged at all levels; Groundwater is considered in the plans but provisions are general; Adaptive management is encouraged
Where water legislation provides for catchment level or basin level planning, groundwater should be integrated into those plans (for example through impact assessment requirements);	Achieved	
The legislation should specify that groundwater management planning should take into account and be integrated into land use and environmental planning; and	Partially Achieved	Generally provided for, not explicitly stated. ESIA is a requirement before a permit is issued for new large water users.
Planning should be cyclical and based on continuous learning from data and stakeholder feedback to ensure adaptive management and effective responses to changing climatic, social, political and institutional contexts/drivers.	Achieved	

Reflection of Institutional Framework as per the minimum requirement for the Desired Future State

Minimum requirement for desired future	Status	Comment
Legislation should contain provision for its effective implementation, including the mandate, competence and power of the relevant authorities in accordance with uniform governance principles;	Achieved	Legislation provides for institutional arrangements that can support effective groundwater management but are not fully functional e.g., WARMA

Minimum requirement for desired future	Status	Comment
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;	Partially achieved	
The authority or body should collaborate with other authorities, competent for public health, land-use planning, soils management, waste management;	Achieved	Collaboration is provided for and so far it is achieved with Zambia Environmental Management Agency; Zambia Bureau of Standards; Ministry of Health; Local Authorities, Ministry of Agriculture and Ministry of Lands
Water user associations and other appropriate forums (such as municipalities) should be utilized to strengthen the user advocacy role and achieve new partnerships and a joint management of the common resource.	Partially achieved	Formal structures await issuing of requisite regulations



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**




GROUNDWATER MANAGEMENT INSTITUTE

