

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

Malawi

Report Number 1.7





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: Malawi*. 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 Malawi 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 Malawi 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 Malawi 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
Prof Theresa Mkandawire	In-Country Consultant: Malawi

Stakeholders Engaged

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

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

In this regard, special thanks are given to:

Mr Manuel Quintino, Angola; Mr Kedumetse Keetile, Botswana; Mr Cyrille Masamba, Democratic Republic of Congo; Mr Trevor Shongwe, Kingdom of eSwatini, Ms Christinah Makoe, Lesotho; Mr. Luciano Andriavelojaona, Madagascar; Ms Zion Uka, Malawi; Mr Pokhun Rajeshwar, Mauritius; Ms Ana Isabel Fotine, Mozambique; Ms Maria Amakali, Namibia; Mr Frankie Jose Dupres, Seychelles; Mr Zacharia Maswuma, South Africa; Ms Mwanamkuu Mwanyika, United Republic of Tanzania; Mr Frank Ngoma, Zambia; and Mr Robert Mutepfa, 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
	Tanzania GW-PLI Roadmap	1.16
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
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 Malawi.....	1
1.3. Water resources.....	3
1.1.1. Status of water resources (surface water, groundwater and transboundary)	3
1.1.2. Surface water resources.....	4
1.1.3. Groundwater resources.....	4
1.1.4. Groundwater management.....	6
1.1.5. Status of groundwater infrastructure	7
1.1.6. Groundwater monitoring	8
1.1.7. Groundwater supply and demand	8
2. METHODOLOGY	10
2.1. Overview.....	10
3. POLICY	14
3.1. Evolution.....	14
3.2. Policies to support groundwater management	14
3.3. Gaps and challenges identified	16
3.4. Enablers required to unlock these gaps/challenges	19
4. LEGISLATION	21
4.1. Evolution.....	21
4.2. Legislation to support groundwater management	21
4.3. Gaps and challenges identified	22
4.4. Enablers required to unlock these gaps/challenges	23
5. STRATEGY AND GUIDELINES	25
5.1. Evolution.....	25
5.2. Strategies and guidelines that support groundwater	25



5.3.	Gaps and challenges identified	26
5.4.	Enablers required to unlock these gaps/challenges	26
6.	INSTITUTIONAL FRAMEWORK	27
6.1.	Evolution.....	27
6.2.	Institutional arrangements to support groundwater management	27
6.3.	Gaps and challenges identified	31
6.4.	Enablers required to unlock these gaps/challenges	32
7.	CHALLENGES TO IMPLEMENTATION	33
8.	ACTION PLAN.....	34
9.	REFERENCES.....	37
	Appendix A: Literature Inventory List.....	39
	Appendix B: Stakeholder List	40
	Appendix C: Desired Future State	43

LIST OF FIGURES

Figure 1: Methodology Outline	10
Figure 2: Institutional arrangements around groundwater management in Malawi’s – Ministry of Agriculture, Irrigation and Water Development	30
Figure 3: Organogram for Water Resources Department: Groundwater Division (Headquarters) under Director of Water Resources	31

LIST OF TABLES

Table 1: Enablers required to unlock policy gaps and challenges	19
Table 2: Enablers required to unlock legislative gaps and challenges	23
Table 3: Enablers required to support strategy and guidelines implementation	26
Table 4: Enablers required to address the institutional gaps and challenges identified in groundwater management in Malawi.....	32
Table 5: Action Plan “Must Haves”	34
Table 6: Action Plan “Should Haves”	35
Table 7: Action Plan “Could Haves”	35
Table 8: Action Plan “Won’t Haves”	36

LIST OF ACRONYMS

ACRONYM	DEFINITION
AfDB	African Development Bank
ACGF	Afghan Credit Guarantee Foundation
CIWA	Cooperation in International Waters in Africa
CJF	Climate Justice Fund
CMCs	Catchment Management Committees
DFID	Department for International Development
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
GDP	Gross Domestic Product
GEF	Global Environment Facility
GESI	Gender, equity and social inclusion
GMI-PLI	Groundwater Management Institute – Policy, Legal and Institutional
GOM	Government of Malawi
GVH	Group Village Head
GW	Groundwater
HPB	Hand Pump Boreholes
IMF	International Monetary Fund
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
LWB	Lilongwe Water Board
MGDS	Malawi Growth and Development Strategy
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoAWDI	Ministry of Agriculture, Water Development and Irrigation
MoIWD	Ministry of Irrigation and Water Development
MWP	Malawi Water Partnership
NFP	National Forestry Policy

NGO	Non-Governmental Organisation
NGS	National Groundwater Strategy
NSP	National Sanitation Policy
NWP	National Water Policy
NWRA	National Water Resources Authority
O&M	Operation and Maintenance
PLI	Policy, Legal and Institutional
SADC	Southern African Development Community
SADC GMI	Southern African Development Community Groundwater Management Institute
SOPs	Standard Operating Procedures
SRBA	Shire River Basin Agency
TBAs	Transboundary Aquifers
TWAP	Transboundary Water Assessment Program
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
VH	Village Head
VL0M	Village Level Operation and Maintenance
WHO	World Health Organisation
WPC	Water Point Committee
WRA	Water Resources Act
WRAs	Water Resources Areas
WRB	Water Resources Board
WUAs	Water User Associations
ZAMCOM	Zambezi Watercourse Commission

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 Malawi.

1.2. Socio-economic drivers for Malawi

Malawi's population is estimated to be 17 million (Chavula, 2018). The 2008 Malawi population census estimated the population to be 13.1 million with a density of 107 people per square kilometer (Chavula, 2012). According to the 2008 population census (Laisi, 2009), Malawi's annual population growth rate was estimated to be 2.39% per annum. The country's dependency ratio is at 99% (Laisi, 2009). Annual urban population growth rate was estimated as rising at a rate of 4.8% in 1998 and 6.7% in 2000 (Laisi, 2009). There will be more pressure on water resources of the country as the population continues to grow and industrialisation increases.

About 80–90% of Malawi's population is rural (MoIWD, 2008; GOM/MWP, 2008). Agriculture (which accounts for about a third of the GDP and drives livelihoods for two thirds of the population), is the

mainstay for the country's economy with subsistence and smallholder farming being prevalent among the rural population (IMF, 2017). Agriculture production contributes over 90% of foreign exchange earnings (Chavula, 2018) and it represents about 37% of the GDP (AfDB, 2012). Poverty remains high in Malawi mainly in rural areas with a Human Development Index of 0.400 (in 2011), placing it below the Sub-Saharan African average of 0.463 (AfDB, 2012).

According to the World Bank Country Report, Malawi is a small open economy in Sub-Saharan Africa with a per capita GNI of just US\$320 in 2016, making it one of the lowest in the world (IMF, 2017). Per capita income has grown at an average of little more than 1.5 percent between 1995 and 2014, below the average of 2.8 percent for non-resource-rich African economies (IMF, 2017). Malawi remains an outlier even compared to its peers that are geographically and demographically similar and were at a similar stage of development in 1995 (IMF, 2017).

Malawi is one of the poorest countries in the world with 50.7 percent of the population living below the poverty line and 25 percent living in extreme poverty (IMF, 2017). Efforts to reduce poverty have failed to yield the desired results due in part to a rapid population growth that erodes the marginal gains from economic growth. Malawi was ranked 174 out of 187 countries on the 2014 Human Development Index (HDI) indicating that it is one of the poorest nations in the world (UNICEF, 2014). A World Bank macro-poverty forecast exercise has projected that poverty in Malawi measured by the population living below the international poverty line has not changed between 2010 and 2016 (70.9 percent in 2010 to 69.6 percent in 2016) (IMF, 2017). The GDP per capita has been increasing at an average of 2.6 percent in the last ten years up to US\$494 reported in 2015 (IMF, 2017).

The electricity of the country is 96.7% hydroelectric and 3.3% fossil fuels (Laisi, 2009). Water resources development and management has mainly been financed through external sources such as World Bank, the African Development Bank, the European Union, CIDA, UNICEF, UNDP, WaterAid and others (Laisi, 2009).

The overarching theme for the Malawi Growth and Development Strategy III (MGDS III), the strategy that will take Malawi to the expiry of Vision 2020 is: "Building a Productive, Competitive and Resilient Nation". This theme aims to improve productivity, turn the country into a competitive nation and develop resilience to shocks and hazards. Water development is highlighted within the priority area "Agriculture, Water Development and Climate Change Management."

There is growing national demand on water resources and concern on its availability, particularly during the dry season, which calls for better management of the water resources to ensure that it is available and does not limit the social and economic development and poverty alleviation in the country. Malawi has in the recent years been vulnerable to floods and droughts, in some of the catchment areas, ranging from mild to severe impacts mainly due to lack of storage dams, reservoirs and regulation facilities on Shire River. In terms of water supply, in the urban centres, water production is failing to satisfy demand due to rapid population growth. The rate of population growth (2.8%) far exceeds investments in water supply and sanitation. Lilongwe and Blantyre are the most affected cities. If water resources can be properly

managed, vulnerabilities and hazards could be addressed and result in intensified agricultural production, better services and secured homesteads thereby transforming these places to become economical nuclei of Malawi and help lift many people out of abject poverty.

The Government places a high priority on water resources management and development in order to ensure food and water security at the household level through among other things enhancing water-harvesting technologies, promoting catchment protection and management including disaster risk reduction measures.

The mean annual rainfall in Malawi is estimated at 1,037 mm/year, with the average annual rainfall varying from 650 mm in the Lower Shire Valley to 1,600 mm in the northern Lake Shore Region. Around 63% of the county receives 650–1,000 mm per year and 20% receives greater than 1,200 mm/year (GOM/MWP, 2008). Despite this being relatively good rainfall (the second highest in the Southern African Development Community (SADC) region), Malawi has an erratic rainfall pattern, which poses one of the biggest threats to sustained economic growth. Even though Malawi has abundant water resources, it is categorized as water stressed, with estimated water availability during 2017 as 1050 m³/capita/year. The majority of the country's water demand is accounted for by agricultural, rather than domestic purposes and uses including irrigation, fish farming and livestock production.

The mean monthly temperature ranges from 10–16°C in the highlands of Nyika; 16–26°C on the plateau areas of the Central Region; 20–29°C along the lakeshore and 21–30°C in the Lower Shire Valley. Maximum temperatures rise as high as 40°C during October and November in the Lower Shire Valley and as high as 30°C in the plateau areas.

1.3. Water resources

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

All water resources in Malawi (surface and groundwater) are replenished by rainfall in catchment areas and on the surface of the water bodies in the case of surface water resources and in recharge areas for groundwater resources. The available total renewable water resources were estimated at 1,617 m³/capita-year in 2004 (MoIWD, 2008) and at less than 1,400 m³/capita-year in 2008 (GOM/MWP, 2008). The per capita water availability is declining due to rapid population growth.

Although progress has been made in the development of water resources, there are environmental issues that the country needs to address in order to conserve resources from further depletion and degradation. Issues that contribute significantly to the depletion and degradation of water resources in Malawi include poor management of catchment areas, environmentally unfriendly agricultural practices, rapid population growth, inappropriate discharge of industrial wastes and the weak institutional structures for enforcing the Water Resources Act (Chavula, 2012).

The quality of water resources in Malawi is also affected by other factors like the chemical composition of parent rocks, agricultural activities and the discharge of effluents including the disposal of wastes from residential areas and industrial sites.

The following summarise the status of water resources in Malawi (SDNP,1998):

- Declining amounts of water resources to meet the demand for domestic needs, industrial production and irrigation requirements;
- Declining flow depths in river channels and reduced depths of reservoirs due to sedimentation;
- Declining amounts of both surface and ground water due to inadequate rainfall in catchment areas;
- Reduction in base flows due to increased surface runoff resulting from depletion of vegetation cover;
- The deterioration of water quality in rivers especially those flowing through the cities of Blantyre and Lilongwe and the municipality of Zomba;
- Pollution of both surface and ground water resources due to excessive use of agrochemicals in catchment areas;
- Increased frequency of floods and droughts, possibly resulting from climate change factors; and
- Proliferation of water hyacinth in water bodies especially the Shire River.

In Malawi, water resources have multifunctional roles such as agriculture, domestic use, hydropower generation and industrial use. The Ministry of Agriculture, Irrigation and Water Development is responsible for the development and management of water resources (MoAIWD, 2017a).

Water resources monitoring, and assessment is currently unsatisfactory, with the majority of hydrological monitoring stations in a dilapidated state requiring major rehabilitation (MoIWD, 2008).

1.1.2. Surface water resources

Malawi has a large network of surface water bodies covering 21% of the country's territorial area. Some of the water systems are shared with Tanzania and Mozambique. The most prominent water body is Lake Malawi which is about 475 km long with an area of 28,900 km²; of which 4,540 km² is in Mozambique (MDHS, 2004; GoM/MWP, 2008). Lake Malawi is the third largest lake in Africa and the 10th largest in the world (MDHS, 2004). The Shire river is the largest river in Malawi and is the only outlet of Lake Malawi. All the other major rivers drain into Lake Malawi. The Shire river provides vital environmental and social-economic functions, as it supplies over 96% of the country's power generating capacity; provides water to major urban centres of Blantyre and Limbe, rural water users along the length of the river, and irrigation schemes. About 93% of Malawi's territorial area is in the Zambezi basin which drains in the Indian Ocean in Mozambique (MoIWD, 2008). The remaining 7% falls within the Lake Chilwa catchment.

1.1.3. Groundwater resources

Development of groundwater resources has been primarily for drinking water supply for both rural and peri-urban areas.

Groundwater in Malawi occurs in three main aquifers, namely, Weathered Basement, Fractured Basement and Alluvial aquifers (GoM, 2015). Malawi has three major aquifer systems, namely: the extensive but low yielding weathered Precambrian. Basement Complex aquifer of the plateau area (1-2 L/s), the high yielding alluvial aquifer of the lake shore plains and the Lower Shire Valley and the Lake Chilwa - Mphalombe Plain

(>15 L/s), and the medium yielding aquifer of the fracture zone in the rift valley escarpment (5-7 L/s) (Chavula, 2018).

Groundwater provides a significant contribution to rural water supply in form of point source hand pump boreholes and protected shallow wells. They also contribute towards urban and market centers water supply systems through motorized boreholes reticulated to piped water supply systems. The groundwater resource is also used for provision of water for irrigation schemes to contribute towards water for production.

The prolonged in-situ weathering of the crystalline basement rocks has produced a layer of unconsolidated saprolite material and it is this, which forms an important source of groundwater for rural domestic requirements (SDNP, 1998). The average yield in the weathered zone of the basement complex lies in the range of 1 - 2 litres per second (Laisi, 2009).

Groundwater quality for Malawi

Groundwater quality in Malawi is highly dependent on aquifer lithology and it varies spatially (Chavula, 2012). Nationally, groundwater is generally suitable for drinking. In alluvial aquifers, groundwater is usually more mineralised than in basement aquifers. Chemical pollution of groundwater quality in Malawi is generally low. Nevertheless, some water points yield water of high electrical conductivity, which indicates a level of mineralization (Chilton and Smith-Carrington (1984). In some cases, electrical conductivity as high as 3,000 $\mu\text{S}/\text{cm}$, even 7,000 $\mu\text{S}/\text{cm}$ in extreme cases, has been reported. Chilton and Smith-Carrington (1984) further noted that water quality is variable within a few hundred meters indicating slow movement of groundwater i.e. low permeability as cited in the Dowa West project. High sulphate concentrations were also reported in this project. Only 40 out of 67 boreholes had sulphate values less than 400 mg/l, which is the maximum permissible value by the WHO (2006). In the presence of magnesium, high sulphate levels in water render the water unsuitable for consumption because of a laxative effect. It was reported that the high sulphate levels could be a result of progressive oxidation of sulphide rich parent material. High sulphate levels have been reported in some areas of the weathered basement (BGS/WaterAid, 2008). Chilton and Smith-Carrington (1984) further noted that high iron concentrations could be another cause for concern because of iron's bitter taste, discolouration of food and the effect on laundry. In such cases, people may go for unprotected water sources to avert these effects (Chilton and Smith-Carrington, 1984).

A number of boreholes in alluvial aquifers have been abandoned due to high salinity (Chavula, 2012). Chemical parameters found in relatively high concentrations in different areas include fluoride, sulphate, iron, chloride and nitrate. Groundwater from boreholes is generally of better microbial quality than that from shallow wells, which is more vulnerable to contamination. The following factors contribute to inferior shallow well water quality (Pritchard et al., 2008);

- shallow groundwater tables usually less than 2m, with seasonal fluctuations that bring them close to the ground surface where water is easily polluted;

- Faecal contamination since dambos are extensively used for grazing and watering of livestock all the year round;
- Poor siting of water points since dug wells are sometimes located very close to traditional water sources, which are always open and usually grossly polluted; and
- Lack of enforcement mechanisms by City authorities where urbanized locations use shallow wells or boreholes which are likely to be polluted by pollution sources such as pit latrines.

1.1.4. Groundwater management

The Water Resources Act of 1969 was replaced by the Water Resources Act of 2013. Part of the new Act was to establish the National Water Resources Authority (NWRA). Currently, there is on-going reorganization in government agencies on the management of water resources and actualization of the NWRA.

In terms of Institutions, the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) is responsible for water affairs (surface and groundwater). Groundwater development and management is under the Department of Water Resources and Water Supply. Water Resources Department has three Divisions namely; Groundwater Division; Surface Water Division and Water Quality section. Formerly, the Water Resources Board formed a fourth Division, but this has been replaced with the NWRA, an autonomous government-sponsored body, according to the new Act. The NWRA is responsible for the former Water Resources Board roles in addition to others. Some of the NWRA responsibilities include the following;

According to the WRA Act (2013) the Authority shall have the following powers and functions:

- to develop principles, guidelines and procedures for the allocation of water resources;
- to monitor, and from time to time reassess, the National Water Policy and the National Water Resources Master Plan;
- to receive and determine applications for permits for water use;
- to monitor and enforce conditions attached to permits for water use;
- to regulate and protect water resources quality from adverse impacts;
- to manage and protect water catchments;
- to develop principles, guidelines and procedures for the allocation of water resources;
- to monitor, and from time to time reassess, the National Water Policy and the National Water Resources Master Plan;
- in accordance with guidelines in the National Water Policy, to determine charges to be imposed for the use of water from any water resource;
- to gather and maintain information on water resources and from time to time to publish forecasts, projections and information on water resources;
- to liaise with the relevant stakeholders for the better regulation and management of water resources;
- to advise the Minister concerning any matter in connection with water resources;
- to assist the Minister in the coordination of hydrological and hydrogeological investigations;
- to coordinate the preparation, implementation and amendment of a water action plan and to recommend the water action plan to the Minister;
- at the request of the Minister, advise any other Minister on__

- issues of policy relevant to the investigation, use, control, protection, management or administration of water; or
- any other issue that may be referred to it;
- whether on request or otherwise, to review the law relating to water and advise the Minister on any amendments that may be required for the improvement or better administration of that law;
- to advise the responsible Minister, as the case may require, on any dispute between agencies involved in water management that may be referred to it; and
- to undertake any other functions conferred upon it under this Act or referred to it by the Minister from time to time.

The NWRA may, with the consent of the Director of Public Prosecutions given under the Criminal Procedure and Evidence Code, undertake the prosecution of any offences arising under this Act or in connection with the performance of its functions.

The Authority may, for the purpose of performing its functions under this Act, establish committees and delegate to any such committee such of its functions as it considers necessary.

The NWRA has not been operationalised because the Governing Board is not yet in place (it is the President who appoints the Board). Once the Board is in place, it will recruit the CEO who will then recruit the Technical staff. The Fund Order for National Water Resources Authority (NWRA) was approved, but it is yet to be vetted and gazetted. These issues are the ones that are hindering it from being operational.

The Groundwater Division of the MoAIWD is responsible for groundwater management including groundwater data management and abstraction applications' assessment. The Water Supply Division is responsible for operating and maintaining boreholes (Chavula, 2012).

The NWRA works alongside the Shire River Basin Agency (SRBA), created under a World Bank project, the Shire River Basin Management Programme. According to recommendations from a Consultancy on operationalization of the NWRA done in 2015, the SRBA will be a pilot Catchment Management Board under the NWRA, and ultimately, the aim is that the NWRA will oversee river basin/catchment management authorities or boards across the country, based on the major river basins.

1.1.5. Status of groundwater infrastructure

The status of groundwater infrastructure is poor. Boreholes fitted with Afridev hand pumps are extensively used for rural groundwater supply. Each borehole is designed to serve a total of 250 people at a per capita consumption of 36 L d⁻¹ within a walking distance of 500 m radius whereas a hand-dug well caters to 125 people (Chavula, 2018).

Most of the infrastructure is in a state of disrepair and requires major rehabilitation. A survey on functionality of boreholes equipped with hand pumps undertaken in Malawi in 2016 indicated that 74% of hand pump boreholes (HPBs) are functional at any one point; 66% of HPBs passed the design yield of 0.25 l/s; 55% passed the design yield and also experienced less than one month downtime within a year; and 43% of HPBs which passed the design yield and reliability, also passed the World Health Organisation

(WHO) standards of water quality. Vandalism, lack of maintenance and inadequate capacity are some of the challenges affecting groundwater infrastructure.

1.1.6. Groundwater monitoring

Current estimates indicate that groundwater constitutes only 3% of the overall national water use. Groundwater is widely used across Malawi for both domestic and agricultural purposes. Majority of the people in the rural areas in Malawi significantly depend on groundwater through boreholes and dug wells. The first groundwater development started in the 1930's (MoAIWD, 2017b). Over 400 dug wells were constructed in Malawi between 1931 and 1939 (MoAIWD, 2017b). After World War II, from 1947 to 1968, about 100 boreholes were constructed every year by mainly the Geological Survey Department (MoAIWD, 2017b). From 1969 to 1972, the construction rate increased to 500 boreholes every year in order to implement the large agriculture development programs (MoAIWD, 2017b).

More than 57,000 groundwater access points exist across the country, which have helped to increase the access to safe water in rural areas to 85.7% (GoM, 2017). However, some problems remain such as low functional ratios (77% MoAIWD, 2018; 58% Miller et al., 2018), seasonal variations of the water levels, lack of maintenance funds and, water quality issues amongst others.

Drought and poor water quality have meant more people are turning from hand dug wells to drilled boreholes. Estimates show that 65% of the population depends on groundwater for domestic supply: in rural areas, this rises to 82%, while in urban areas, it is closer to 20% (Chavula 2018). There are a number of urban centers in Malawi that get their water supply from groundwater, e.g., Madisi (Dowa district), Salima (Salima district), Karonga (Karonga district), Nkhotakota (Nkhotakota district) and Ngabu (Chikwawa district) (Chavula, 2018). It is envisaged that more rural areas and towns in Malawi will get their water supplies from groundwater resources in future because of the unreliable rainfall and irregularity of river flows, currently abstracted to sustain gravity fed rural piped water schemes and urban water.

Groundwater usage for irrigation potential is limited by the low yielding aquifers and is generally restricted to small gardens in many areas (Chavula 2018). Groundwater use for irrigated agriculture is at present mostly confined to growing vegetables and maize in dambo areas during the dry season (Chavula, 2018). In most cases, water is drawn from hand-dug wells and applied to crops using watering cans. However, Ngolowindo Irrigation Scheme in Salima district remains the major scheme in Malawi that uses groundwater as a source of water supply. Groundwater is abstracted from the alluvial aquifer using two electrical pumps fitted on boreholes yielding 6.2 and 10.5 L s⁻¹ respectively. The water is then stored in an overhead tank with a capacity of 927 m³ from where the water is conveyed to the field using siphons. Excess water is drained through a 1.5 km drain. In order to cope with the high-water demand, farmers plant crops in a staggering fashion.

1.1.7. Groundwater supply and demand

Current estimates indicate that groundwater constitutes only 3% of the overall national water use. Groundwater is widely used across Malawi for both domestic and agricultural purposes. Majority of the

people in the rural areas in Malawi significantly depend on groundwater through boreholes and dug wells. The first groundwater development started in the 1930's (MoAIWD, 2017b). Over 400 dug wells were constructed in Malawi between 1931 and 1939 (MoAIWD, 2017b). After World War II, from 1947 to 1968, about 100 boreholes were constructed every year by mainly the Geological Survey Department (MoAIWD, 2017b). From 1969 to 1972, the construction rate increased to 500 boreholes every year in order to implement the large agriculture development programs (MoAIWD, 2017b).

There were about 30,000 water boreholes and 8,000 protected hand dug wells in 2012 (Chavula 2012). Drought and poor water quality have meant more people are turning from hand dug wells to drilled boreholes. Estimates show that 65% of the population depends on groundwater for domestic supply: in rural areas, this rises to 82%, while in urban areas, it is closer to 20% (Chavula 2018). There are a number of urban centres in Malawi that get their water supply from groundwater, e.g., Madisi (Dowa district), Salima (Salima district), Karonga (Karonka district), Nkhotakota (Nkhotakota district) and Ngabu (Chikwawa district) (Chavula, 2018). It is envisaged that more rural areas and towns in Malawi will get their water supplies from groundwater resources in future because of the unreliable rainfall and irregularity of river flows, currently abstracted to sustain gravity fed rural piped water schemes and urban water.

Groundwater usage for irrigation potential is limited by the low yielding aquifers and is generally restricted to small gardens in many areas (Chavula 2018). Groundwater use for irrigated agriculture is at present mostly confined to growing vegetables and maize in dambo areas during the dry season (Chavula, 2018). In most cases, water is drawn from hand-dug wells and applied to crops using watering cans. However, Ngolowindo Irrigation Scheme in Salima district remains the major scheme in Malawi that uses groundwater as a source of water supply. Groundwater is abstracted from the alluvial aquifer using two electrical pumps fitted on boreholes yielding 6.2 and 10.5 L s⁻¹ respectively. The water is then stored in an overhead tank with a capacity of 927 m³ from where the water is conveyed to the field using siphons. Excess water is drained through a 1.5 km drain. In order to cope with the high-water demand, farmers plant crops in a staggering fashion.

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 collected consists of relevant policies, legislation, tools and guidelines available on general water resources and groundwater in Malawi. The literature inventory list is available in **Appendix A**. The stakeholder list is also available in **Appendix B**.

Several individuals/institutions were engaged for data collection using the structured questionnaire, based on the Desired Future State, 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.

3. POLICY

3.1. Evolution

Prior to 1994, Malawi did not have a comprehensive water Policy. Water governance was, until then, based on the Water Resources Act of 1969 and other related documents in government ministries. The 1994 Water Resources Management Policy and Strategies focused mainly on the water service delivery whose major outcome was among other things, the creation of the Ministry responsible for Water and three regional water boards, namely; Northern, Central and Southern Region Water Boards and the reconstitution of the Water Resources Board, Blantyre and Lilongwe Water Boards. The policy was therefore revised and approved by Government in 2000, to strengthen the management aspect of the water resources, which was considered weak in the 1994 Policy. The 2000 policy was however considered too verbose, and in some parts vague. Government also wanted the inclusion of international initiatives and principles, such as Integrated Water Resources Management. The new National Water Policy (NWP) was therefore developed in 2005.

Similarly, there was no single coherent sanitation policy in Malawi before 2008. Sectoral policies and pieces of legislation that dealt with sanitation, that dated back to the colonial period were the ones used to guide sanitation development in Malawi.

The National Sanitation Policy (NSP, 2008) specifies a broad framework and policy guidelines to enhance and support sanitation coverage in Malawi through formulation of sanitation strategies, plans and programs for improving the quality of life of the people of Malawi and the physical environment. The primary focus of the policy is safe disposal of excreta away from the dwelling units and work places (LWB, 2017).

3.2. Policies to support groundwater management

Malawi has a policy (National Water Policy (NWP), (2005)) to protect groundwater by preventing pollution and overuse. The government's policy is to provide clean potable water to all people so as to reduce the incidence of water-borne diseases and the time devoted by individuals particularly women to water collection. It has general principles, objectives and strategies on water resources development, pollution and water supply including the roles of stakeholders in water management for example Integrated Water Resources Management (IWRM) and consideration of cross cutting issues.

The policy is consistent with National Sanitation Policy (2008) as both aim at provision of sanitation services that are equitably accessible to and used by individuals and entrepreneurs, on promotion of public health and hygiene. Both policies promote private sector participation in the delivery of water supply and sanitation services and setting standards of treated and untreated water supply services. NWP (2005) is also consistent with other sectoral policies such as the Environmental Management Act (EMA) of 2017.

National Water Policy (2005) spells out that all Malawians must have access to fresh potable water at all times and since the majority of the population resides in the rural areas and dependent on groundwater,

the policy recognises the social, economic, gender and environmental values of groundwater. The Policy has a guiding principle that says, “Water shall be treated not only as a social good but also as an economic good’. The Policy has an overall objective for promoting and advocating water and sanitation services’ pricing and charging systems that recognize water as both a social and economic good in order to institute cost recovery principles. It also has an overall objective on promoting the mainstreaming of Gender and HIV and AIDS activities in the water and sanitation sector.

On environmental sustenance, the following guiding principles apply: Polluter-Pays Principle; water planning shall incorporate disaster preparedness and management to cope with climate change and climate variability; and All major water projects should undergo Environmental Impact Assessment (EIA).

Notably, groundwater is more resilient to the impacts of climate change than surface water, and as such if well managed and understood can provide a viable alternative source of water to support livelihoods as well as advancing water, energy and food security especially among vulnerable populations.

There is a specific objective for water resources management and development on promotion of water harvesting and conservation to make water readily available throughout the country for sustenance of among other things the natural environment.

There is a guiding principle of promoting Integrated Water Resources Management (IWRM) to ensure an integrated approach to the management of water resources. In addition, roles for the different sectors are outlined in the NWP policy (2005), which implies that the need for inter-sectoral collaboration is recognised. Also, under the Section on Water Utilisation, there are objectives that promote participation of various sectors in IWRM in development of their resources and calls for integrated planning, development and management of the water resources catchment areas. Such sectors are: agriculture services, irrigation services, fisheries planning, development and management, the energy sector and the Forestry Sector. These are general for water resources management and by implication; groundwater management is included even though facilitation is a challenge.

On whether 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, there is a guiding principle which says data users shall appreciate that due to the transient nature of the resource and the complexity of the natural environment, any water resources data are best estimations of the natural systems that is dependent on the sophistication of the measuring infrastructure.

The Policy has a Section on Institutional Roles and Linkages which recognises that water resources management requires an integrated approach involving a number of stakeholders and lists the various stakeholders and their roles.

The Ministry responsible for Water Affairs is given the role to provide policy direction and coordinate water sector programmes and to promote and adhere to regional and international obligations and agreements. The policy called for establishment of the NWRA, with a mandate to focus on water resources management

through IWRM. In terms of fees, the NWRA determines charges to be imposed for the use of water from any water resource. In this case the fees they collect are those related to water abstractions and discharges. But approving tariffs is still the Ministry's mandate. Consultations are also done with Ministry responsible for Statutory Corporations and Ministry of Finance.

Public access to hydrogeological data held by the state is promoted and facilitated through a guiding principle in the policy that says, 'Water regulation shall be based on reliable continuous data collection, management, and analysis to ensure accurate assessment of water resources and dissemination of information for effective planning of water resources development'. It also contains a specific strategy on establishment of a computerized networked database under Water Resources Management and Development. Under Institutional Roles and responsibilities Section, it indicates one of the roles as 'The Ministry responsible for Water Affairs shall be responsible to manage and disseminate water resources and sanitation information'.

The policy also includes additional environmental principles necessary to protect and sustain groundwater, including: the precautionary principle, the principle of subsidiarity, the principle of gender equity and social inclusion. The policy promotes mainstreaming of gender. There is also a polluter- pays principle. In addition, the policy mentions that allocation and regulation should consider social enhancement. It also promotes water pollution control for environmental sustainability and advocates for EIAs on projects. Principle 3.4.10 says Water demand management approaches shall be adopted in all cases of water resources development and management, and water allocations shall consider ecosystem integrity and bio-diversity including marine and estuarine life. Intergenerational equity is however not covered in the policy.

Other key policy issues that are included in the policy include the following;

- For the rural areas, technologies shall conform to the Village Level Operation and Maintenance (VLOM) concept;
- Water resources management shall be based on decentralization and local participation so that the unit of water resources management shall be the catchment;
- Promotion of demand responsive and demand driven approaches, beneficiary participation and empowerment;
- Creation of legal framework to guide implementation of the water policy; and
- The need to register all water facilities using a numbering system developed and adopted by the Ministry responsible for Water Affairs.

3.3. Gaps and challenges identified

Even though groundwater is recognised as a highly important source of domestic and agricultural water supply and a key resource for poverty alleviation, energy and food security, and the sustainable economic development of rural areas in other documents and reports, the National Water Policy (2005) considers water resources mostly in general terms. The NWP does not specifically recognise/ acknowledge that fact.

The following are some of the gaps that have been identified. The National Water Policy (2005) does not;

- include exploring and development of deeper high yielding boreholes in rural areas that can be reticulated;
- mention transboundary aquifers and need to establish cooperation mechanisms;
- recognise that there are other players who collect water resources data hence does not mention need for use of harmonised tools in data collection among institutions that collect groundwater data;
- mention need for comprehensive desk studies for every water development work, including drilling work;
- mention need for identification of potential risks to groundwater as part of field practice.

The National Water Policy (2005) is inconsistent with other natural resources management policies. There are conflicting policies like that of agriculture policy which promotes winter cropping in catchment areas whereas the water resources department is enforcing the observance of buffer zones in catchment areas. In addition, the buffer zone definitions are different with NWP. Increased agriculture along river banks increases environmental degradation.

The situation analysis in the NWP document is completely gender blind resulting in all objectives, policy statements and actions being gender blind.

Groundwater is affected by anthropogenic activities. Pollution of riverine systems and other ecosystems leads to pollution of groundwater.

Implementation is not done at all levels due to resource challenges. Government at the higher level is implementing many of the policies and strategies for example it established the National Water Resources Authority (NWRA) and also it plays a coordinating role for water development. Resources for coordination are however a challenge. At district level, staffing for some functions such as groundwater Division is not there hence it is a challenge. As for NGOs and Development partners, it depends on their interests as some just aim at provision of water without considering other strategies such as the need for IWRM and data collection.

Groundwater management has not been duly taken into account in other sectoral policies for example the Sanitation Policy (2007), National Environmental Policy of 1996, and National Forest Policy of 2016.

While the Policy and the associated water resources regulations are comprehensive, the main challenge in Malawi is lack of enforcement of the water resources regulations pertaining to groundwater protection from pollution and overuse. This is so because of the delayed operationalization of the National Water Resources Authority, a body tasked with the management of water resources in Malawi, notwithstanding the passing of the new Water Resources Act in 2013. The NWRA is the improved version of the old Water Resources Board (WRB) which was within the Ministry hence was not independent from the Ministry somehow, but NWRA is independent with its own offices and will have staff independent from Ministry responsible for water affairs.

NWP (2005) does not address the biophysical and ecological linkages between ground and surface water for their use, protection and management. Although NWP (2005) mentions the importance of maintenance of the ecological integrity of wetlands ("areas of marsh, fen, peatland or water, whether

natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”) in groundwater management in the objectives for water resources management and development, it is in general terms and not in particular reference to groundwater. The objective says: To promote good catchment management to protect and sustain the eco-system bio-diversity and wetlands. Much more has to be added into the policy. Some of the issues appear in other policies such as the Land Resources Policy or the Forestry Policy but do not relate directly to groundwater.

Main challenges being faced in Malawi include the following:

- i. Inadequate human, financial and technological capacity. There is low capacity of borehole drillers and government water technicians in basic hydrogeology. There are less than 15 qualified hydrogeologists in the country which is inadequate for effective supervision/ monitoring of groundwater development programs. Recurrent financial resources are usually not adequate to conduct groundwater management unless there are development projects. Also, there isn't enough equipment for deeper drilling.
- ii. Inadequate coordination of groundwater development e.g. drilling programs. The NWP does not give direction on how institutions should collaborate to ensure that work to support implementation of the NWP and other water-related initiatives is consistent with the efforts of national and district level water offices, e.g. NGOs often fail to coordinate with district officials to seek guidance or technical input on their initiatives and, sometimes work directly with communities, leading to introduction of new technologies not approved by Government that sometimes have poor results.
- iii. Poor groundwater quality in some areas e.g. salinity, presence of iron, fluoride
- iv. Weak enforcement of regulation mainly due to non-operationalisation of NWRA
- v. Inadequate data exchange among institutions involved in groundwater development
- vi. Poor hydrogeological documentation which affects planning and decision making;
- vii. Inadequate research and information management on groundwater in Malawi;
- viii. Inadequate monitoring of implementation of groundwater related policies;
- ix. Inadequate targeted financing
- x. Inadequate manuals/guidelines and policies
- xi. Poor understanding/awareness of the resilience of groundwater to climate change: The link between Climate Change and the Water-Energy-Food nexus with ground water being more resilient to Climate Change than surface water is not appreciated
- xii. Aquifer zoning; and lack of awareness/appreciation of the role of catchment protection in ground water recharge;
- xiii. There is no policy specifically addressing groundwater issues. Issues relating to groundwater are embedded in National water policy and legislation and other policies and Acts related to Environment and Mining. Instead of having groundwater embedded in the National Water Policy, it must clearly come out as a distinct part of water resources just as it will be necessary to have surface water stand alone.
- xiv. No direction on transboundary water issues.
- xv. Allocation of boreholes sometimes follows political influence rather than proportion of the population density and demand in districts.
- xvi. There is poor adherence to best drilling practices such as sealing of saline aquifers during construction of boreholes and capping of artesian wells

3.4. Enablers required to unlock these gaps/challenges

The table below reflects the enablers required to unlock the identified gaps and challenges being experienced in Malawi’s groundwater policy environment in.

Table 1: Enablers required to unlock policy gaps and challenges

Item	Groundwater challenge/gap	Enablers
1	Lack of inclusion in NWP on exploring and development of deeper high yielding boreholes in rural areas that can be reticulated	<ul style="list-style-type: none"> ▪ Development of groundwater specific policies or have a groundwater specific section in the policy that would include this element.
2	Lack of inclusion in NWP of transboundary aquifers and need to establish cooperation mechanisms	<ul style="list-style-type: none"> ▪ Include transboundary issues and establishment of cooperation mechanisms in policy
3	Inadequate comprehensive groundwater research to inform decision making	<ul style="list-style-type: none"> ▪ Undertake comprehensive research on groundwater for proper management (encourage collaboration between academia and practices) <ul style="list-style-type: none"> ○ Capacity building with involvement of academia ○ Guidelines and advocacy
4	Inadequate human, financial and technological capacity	<ul style="list-style-type: none"> ▪ Capacity building in groundwater development (e.g. drillers, people involved in groundwater exploration, and managers of groundwater projects) ▪ Guidelines ▪ Advocacy ▪ Provision of financial resources for groundwater management ▪ Awareness and advocacy on technological advances ▪ Procurement of state of the technologies for groundwater management
5	Inadequate enforcement of water policy	<ul style="list-style-type: none"> ▪ Adequate resources for enforcement activities ▪ Stakeholder awareness ▪ operationalisation of NWRA

Item	Groundwater challenge/gap	Enablers
6	Weak inter-sectoral integration and collaboration of groundwater development e.g. drilling programs	<ul style="list-style-type: none"> ▪ Policy direction on how institutions should collaborate <ul style="list-style-type: none"> • Establish local groundwater management structures
7	Poor groundwater quality in some areas	<ul style="list-style-type: none"> ▪ Pollution prevention measures enforcement ▪ Protection zoning
8	Inadequate data exchange among institutions	<ul style="list-style-type: none"> ▪ Clear data sharing mechanisms establishment
9	Lack of 'explicit' National Groundwater Management policy	<ul style="list-style-type: none"> ▪ Emphasize conjunctive use including GW more clearly within existing policy _ strengthened by clearer GW guidelines and regulation
10	Gender blindness in most policy statements	<ul style="list-style-type: none"> ▪ Include gender terminology in policy statements
11	Poor adherence to best drilling practices such as sealing of saline aquifers during construction of boreholes and capping of artesian wells	<ul style="list-style-type: none"> ▪ Capacity Building ▪ Guidelines ▪ Advocacy
12	Limited adherence to best drilling practices such as sealing of saline aquifers during construction of boreholes and capping of artesian wells	<ul style="list-style-type: none"> ▪ Capacity Building ▪ Guidelines ▪ Advocacy
13	Poor understanding of the resilience of groundwater to climate change	<ul style="list-style-type: none"> ▪ Improve awareness through capacity building, and advocacy on the resilience of groundwater and its role in the advancement of water, energy and food security.

4. LEGISLATION

4.1. Evolution

The first Water Resources Act that Malawi had, was the 1969 Act. The Water Resources Act of 2013 was developed to address gaps that existed in the 1969 Act which include the use, management and protection of groundwater.

4.2. Legislation to support groundwater management

The Water Resources Act of 2013 (WRA, 2013) Water Resources Regulations (2018) and Environmental Management Act (2017) are legislation in place 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 in Malawi.

The human right to water is mentioned in Sections 37 & 38 of the WRA (2013) in terms of groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users. Hand pump wells are not subjected to EIA for example. This can be viewed as consideration for small scale users not being prohibited using groundwater for their domestic water uses.

The legislation allows for the categorisation of water users. There are commercial users and non-commercial water users. The permits to use water are issued to commercial users. The authorisation of groundwater use is not tied exclusively to land tenure as groundwater is considered a public asset and authority is vested in government to manage the resource sustainably and restrict (in the public interest) the rights accruing from its use to prevent over-abstraction or inequitable access or use by landowners. Through section 38 of the WRA (2013), groundwater use is allowed through use 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.

Legislation enables the regulation of borehole drillers, drilling and construction, information from drillers and standards for borehole drilling and construction. It also enables the regulation of groundwater exploration and it allows for zoning or similar mechanisms to protect overused or vulnerable aquifers. It designates groundwater conservation areas.

Section 37 of the WRA (2013) allows for regulation of abstraction and recharge and the reduction of use in times of water shortage and also ensuring sustainable protection and use of wetlands. Permits are required and EMA requires that EIA be undertaken. Section 86 of the WRA (2013) specifies the need for long term plans to ensure the sustainable use of groundwater, including drought management plans and cross-sectoral coordination.

WRA (2013) provides for effective implementation, including the mandate, competence and power of the relevant authorities in accordance with governance principles. All groundwater development activities are required to be supervised or carried out by competent professional hydrogeologists, drilling companies and such other bodies and professionals.

WRA (Section 44, 66 and 156) specifies when and how stakeholders, the public or other water users are to be engaged in planning, decision-making and self-management regarding groundwater through the Association of Water Users and Catchment Management Committees.

4.3. Gaps and challenges identified

The following are gaps and challenges that have been identified in the available legislation:

- Inadequate enforcement of existing water regulations/legislation
- No explicit reference to groundwater and conjunctive use management in legislation pertaining to catchment/water management and development plans and drought/emergency management plans.
- Legislation does not recognise and legalise affordable, small-scale and indigenous solutions to groundwater use.
- No specific mention of groundwater users being part of Associations of Water Users and Catchment Management Committees (CMCs).
- Lack of the provision for the creation of a professional body of National hydrogeologists to register and control participation of hydrogeologists
- No mechanisms for directly involving stakeholders (including the marginalised groups i.e. women and youths) in the development of laws and regulations related to groundwater
- Inadequate capacity
- Lack of encouragement in undertaking purpose-based comprehensive research in groundwater;
- Inadequate coverage of transboundary issues
- Fewer female technical staff (e.g. engineers, technicians) in the field of water engineering

Other challenges

- The legislation does not include that all water has a consistent status in law, irrespective of where it occurs. There is no explicit reference to groundwater and conjunctive use management in legislation pertaining to catchment/water management and development plans and drought/emergency management plans;
- The legislation does not recognise and legalise affordable, small-scale and indigenous solutions to groundwater use;
- WRA (2013) does not explicitly integrate groundwater for catchment level or basin level planning and neither does it specify that groundwater management planning should take into account and be integrated into land use and environmental planning;
- Lack of provision for the creation of a professional body of National hydrogeologists to register and control participation of hydrogeologists;
- On stakeholder engagement, WRA does not specify mechanisms for directly involving stakeholders in the development of laws and regulations related to groundwater;
- WRA does not specifically address the issue of the involvement of women and youth in decision-making and the implementation of groundwater supply schemes; and

- Much as legislation is there, enforcement is the main challenge.

4.4. Enablers required to unlock these gaps/challenges

In order to address the identified gaps and challenges, the following are some enablers.

Table 2: Enablers required to unlock legislative gaps and challenges

Item	Groundwater challenge/gap	Enablers
1	Inadequate enforcement of water regulations/legislation	<ul style="list-style-type: none"> ▪ Adequate resources for enforcement activities ▪ Stakeholder awareness ▪ operationalisation of NWRA
2	No explicit reference to groundwater and conjunctive use management in legislation pertaining to catchment/water management and development plans and drought/emergency management plans.	<ul style="list-style-type: none"> ▪ Establish Clear groundwater management objectives ▪ Reviewing/improving existing water legislation to ensure it also addresses the management of groundwater. (Interpretation of existing legislation may be critical to check this)
3	Legislation does not recognise or legalise affordable, small-scale and indigenous solutions to groundwater use.	<ul style="list-style-type: none"> ▪ Government to recognise affordable, small-scale and indigenous solutions to groundwater use.
4	No specific mention of groundwater users being part of Associations of Water Users and Catchment Management Committees (CMCs).	<ul style="list-style-type: none"> ▪ Legislation should point out that Water User Associations and CMCs to include groundwater management users
5	Lack of the provision for the creation of a professional body of National hydrogeologists to register and control participation of hydrogeologists	<ul style="list-style-type: none"> ▪ Create groundwater management association or national body
6	No mechanisms for directly involving stakeholders (including the marginalised groups i.e. women and youths) in the development of laws and regulations related to groundwater	<ul style="list-style-type: none"> ▪ Clear mechanisms of groundwater stakeholder engagement
7	Inadequate capacity	<ul style="list-style-type: none"> ▪ Capacity building- refresher courses, poor human capacity at district level etc.

Item	Groundwater challenge/gap	Enablers
8	Lack of encouragement in undertaking purpose-based comprehensive research in groundwater;	<ul style="list-style-type: none"> Provide resources for comprehensive research.
9	Inadequate coverage of transboundary issues	<ul style="list-style-type: none"> Include specific sections on transboundary issues in policy documents and legislation which should be elaborate enough.
10	Fewer female technical staff (e.g. engineers, technicians) in the field of water engineering	<ul style="list-style-type: none"> Affirmative action to employ female water engineers and technicians to influence policies on water resources.

5. STRATEGY AND GUIDELINES

5.1. Evolution

The first set of technical manuals for Malawi was developed in 2001 by the Ministry of Water Development. This was revised in 2016. The current 2016 Technical Manuals (<http://www.rural-water-supply.net/en/resources/details/807>), describe borehole aspects associated with groundwater development mainly for rural domestic supply and groundwater monitoring boreholes and the associated groundwater monitoring or management aspects thereof. The revision added a chapter on groundwater monitoring, database management and water permit. The accompanying documents are Standard Operating Procedures (SOPs) for groundwater sampling, aquifer pumping test, groundwater level monitoring, groundwater use permitting, drilling and construction of national monitoring boreholes, operation and management of the national groundwater database.

These strategies and guidelines to support groundwater management were produced under National Water Development Program 2 funded by the African Development Bank (AFDB) through consultative consultancy by Aurecon Consultants in 2012 and an edition for printing was supported by JICA in 2016.

5.2. Strategies and guidelines that support groundwater

The Ministry of Agriculture, Irrigation and Water Development- through the Water Quality and Groundwater Divisions and District Offices (there is no Water Quality and Groundwater Divisions at district, but Water Monitoring Assistants from Water Supply Department are used) - provide policy guidance on development and use of groundwater using National Water Policy, National Sanitation Policy, Environmental Management Policy. They also provide operating standards (there is a Boreholes Technical Manual and SoPs) and monitor the development and use of groundwater. This monitoring can be done at National, Regional or District level.

The NWRA is responsible for regulation. Using the Water Resources Regulations and Water Resources Act, they enforce the standards through monitoring together with the Department of Water Resources and penalise those who are not following the standards.

The following are some strategies that have been translated from the policy relating to groundwater;

- Malawi has set a minimum distance of 30 m for the location of boreholes from potential sources of groundwater pollution such as landfills, pit latrines, and kraals (shelters/enclosures for cattle, goats, etc.);
- Construction of boreholes for rural water supply are based on a maximum walking distance of 500 m radius, with a maximum population figure of 250 people being served per borehole;
- As a recommendation by the Government of Malawi, Water Point Committees (WPCs) that manage boreholes for rural water supply comprise 6 women and 4 men per borehole;
- The Government of Malawi has set a minimum per capita water consumption of 27 L/person/day for domestic use, namely for drinking and personal hygiene;
- Promotion of research in appropriate technology regarding groundwater development and pumping mechanisms;

- In the Water Resources Investment Strategy (2012) - one of the strategic priorities is that public water supply should take priority where water is scarce;
- In Strategic plan 2012-17- strategies include:
 - a. Improve existing water infrastructure and boreholes;
 - b. Build capacity and promote scientific investigation and research in the water resources management;

5.3. Gaps and challenges identified

Major gaps in regard to strategies and guidelines to support groundwater management include;

- Inadequate training of rural or local communities in basic groundwater management principles as well as provision of bye-laws in the general management of the environment;
- Inadequate enforcement of groundwater guidelines;
- Limited engagement of women in decision making positions at community level to influence where water source points could bring meaningful contribution to the society.
- Non-specificity of transboundary groundwater resources.

5.4. Enablers required to unlock these gaps/challenges

The following enablers are necessary to address the gaps and challenges identified in the implementation of the strategy and guidelines for groundwater management in Malawi.

Table 3: Enablers required to support strategy and guidelines implementation

Item	Groundwater challenge/gap	Enablers
1	Inadequate enforcement	<ul style="list-style-type: none"> ▪ Capacity building ▪ Adequate resources for enforcement activities ▪ Stakeholder awareness ▪ Political and administrative will to enforce
2	Limited engagement of women in decision making positions at community level	<ul style="list-style-type: none"> ▪ Affirmative action to incorporate women in water committees and decision-making positions at community level.
3	Non-specificity of transboundary groundwater resources	<ul style="list-style-type: none"> ▪ Include transboundary issues

6. INSTITUTIONAL FRAMEWORK

6.1. Evolution

Up until around 1980, water functions were a responsibility of several ministries which included the Water Resources Division (responsible for surface water resources), Ministry of Local Government (responsible for sanitation services and rural water supply) and other stakeholders including the private sector (Laisi, 2009). The first National Water Resources Master Plan was formulated in 1986 in Malawi. Since then, data on water resources development, management and utilisation had not been comprehensively analysed until 2017 (MoAIWD, 2017).

6.2. Institutional arrangements to support groundwater management

The Central Government is responsible for strategic planning, coordination, quality assurance and technical assistance systems, including collaboration efforts with donors/NGOs and the private sector. The Ministry responsible for Water Development and Irrigation is the lead Ministry to provide overall policy direction for water services in Malawi. Ministries of Health, Environmental Affairs, Ministry of Finance, Ministry of Gender, Local Government and Rural Development are also involved in the sector (MoAWDI, 2015).

The responsibility to manage groundwater resources in Malawi lies with the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) (Chavula, 2012). Both the Departments of Water resources (Groundwater Division) and Water Supply are responsible for policy formulation on groundwater development in the Malawi. The groundwater division is responsible for groundwater research, storage of borehole data, issuance of groundwater abstraction rights through the Water resources Board, whereas the responsibility to operate and maintain boreholes rests with the Water Supply Department (Chavula, 2012). The Ministry responsible for Water Development and Irrigation is organized under five departments, of which the department of water supply and the department of sanitation are responsible for the rural water supply and sanitation services. The water supply department has two divisions, with the first division being responsible for operation, maintenance and monitoring and the second is responsible for planning, design and construction. However, the department is understaffed. The 2012/13 Sector Performance Report indicates that out of the total 493 established staff posts for Water and Sanitation Department only 143 were filled (MoAWDI, 2015). The organogram is given in Figure 1.

The Ministry of Agriculture, Irrigation and Water Development's Groundwater Division is responsible for leading the training. The Division trains a number of personnel in hydrogeology and practical aspects e.g. drilling techniques. The Division also provides guidance on the type of training courses in groundwater that should be undertaken in the tertiary institutions.

The Ministry responsible for water affairs is also responsible for transboundary activities as this may require agreements with other member states or adherence to regional agreements. The WRA (2013) mentions that the Minister may establish bodies to implement international agreements.

In terms of groundwater, transboundary work is relatively a new area and currently there is a SADC GMI Project on conjunctive water management in the Shire Aquifer /River system which is for Malawi and Mozambique whose implementation started in June 2018. One of the outputs of this project will be a Strategic Action Plan which “will foster convergence toward a joint vision and framework for the shared water resources of the Shire River-Aquifer System”. Also, there is work on identifying the transboundary aquifers in Malawi which is being done under Climate Justice Fund (CJF). Yes, there are. The Transboundary Waters Assessment Programme (TWAP) identified 3 transboundary aquifers but studies by Strathclyde University in partnership with Malawi Government indicate that at local scale there are a lot more (over 25). The Zambezi Water Commission (ZAMCOM) does not cover these Transboundary Aquifers. Through efforts by SADC GMI, ZAMCOM is one of the partners of SADC GMI in the Shire Conjunctive Water Management in the Basin Project involving Malawi and Mozambique who share the Shire Alluvial Aquifer. Hence there is some involvement by ZAMCOM.

Management is mostly according to Districts although there are 17 WRAs. The NWRA is expected to have the catchment-based management through the 3 Catchment Management Boards that it is expected to establish after operationalization: The Shire Catchment Management Board, the Linthipe Catchment Management Board and Rukuru Catchment Management Board.

The Local Governments are responsible for the provision and management of rural water supply and sanitation services, in liaison with the ministry responsible for water. Local Governments carry out planning, budgeting and resource allocation, community mobilization and participation, follow up implementation by private sector and support the operation and maintenance of water services, monitoring, and reporting among other duties. However, the capacities of the Local Governments are still inadequate to undertake these tasks. District Councils do not have a revenue base to fund investment and they also don't have the funds to contribute to the operations and maintenance of existing facilities. Financing of rural water supply is restricted by the very low level of fiscal devolution (MoAWDI, 2015).

Local leaders consisting of the Village Head (VH), the Group Village Head (GVH) a Traditional Authorities (TA) also play a role in management of rural water supplies. Where there is strong local leadership, communities are actively engaged in the implementation, operation and maintenance of water supply facilities (MoAWDI, 2015).

Community users are organized in several forms to enable their full participation in planning and implementation stages through to Operation and Maintenance (O&M) of the water supply facilities. The Water Statute provides the legal platform for the formation of Water and Sanitation Committees, Water User Groups and Water User Associations at community level that will ensure sustainability and proper management of the facilities (MoAWDI, 2015).

Malawi has received considerable support from development partners for funding the development budget including rural water supply and sanitation. The major donors include World Bank, African Development Bank, European Union, DFID, UNICEF, and ACGF. Some donors transfer funds directly to NWDP while others manage the funds on their own (MoAWDI, 2015).

There are about 46 NGOs operating in 26 districts in the rural water supply sector. They are important and effective partners of government in development and are well-placed to raise public awareness and build capacity at the local level.

Universities and colleges in Malawi (e.g. University of Malawi – The Polytechnic, Chancellor College, Mzuzu University etc.) provide basic training in water-related subjects such as water resources management, hydrology, hydraulics, irrigation, environmental engineering, soil conservation, land husbandry and many more. Furthermore, the institutions have been involved in a limited number of research projects related to water resources management. There is need, however, for more collaboration among these institutions and Government. In addition, the Climate Justice Fund Project (led by University of Strathclyde) is doing research e.g. on borehole forensics, salinity in Chikwawa, Transboundary Aquifers in Malawi etc. They have been doing this in partnership with Malawi Government and some NGOs such as Water for People and Baseflow. However, sometimes these activities are done with donor driven agenda

WRA (2013) provides for effective implementation, including the mandate, competence and power of the relevant authorities in accordance with governance principles. All groundwater development activities are required to be supervised or carried out by competent professional hydrogeologists, drilling companies and such other bodies and professionals.

In addition, there are key planning instruments that set out what the institutions aim to achieve including the following:

- The Strategic Plan 2012-2017; which is out-dated and a new one has not yet come out.
- National Water Resources Master Plan (2017)- long term planning period is to 2035
- Malawi Growth and Development Strategy – now using MGDS III.

There are Water User Associations (WUAs) in Malawi. These are legal entities which operate as ‘small water boards’ at community level. They are responsible for overseeing operation and maintenance of rural water supply systems. However, most of these WUAs have technical and financial challenges especially for those for rural water supply (mostly gravity-fed). As for the ones which are under Water Boards, they are better off but still they face political interference (e.g. they can impose the leadership, they can inform the users that you should not be paying for the water). At water point level, there are Water Point Committees who are trained under CBM to maintain the facility and are taught sanitation

At District level there are structures such as District coordination Team (composed of water related sector Heads) which is the technical arm of the district council who look into water and sanitation issues.

There are also Technical Working Groups (TWGs) for Water Supply, Water Resources, etc. which provide fora for negotiation, policy dialogue, and agreement of plans and undertakings among stakeholders at technical level. Government, NGOs and Development partners meet. But meetings are rarely undertaken. In 2017 it may have met only once. These TWGs report to the Sector Working Group.

The NWRA has such structures also. There is a Board of Governors (which is not yet in place). Then there is a Water Resources Management Sub-Committee which reports to the Board of Governors. This one has been there even before the time of NWRA i.e. during the time of Water Resources Board (WRB) and it existed before 2013 (before the new Act was in place). The Water Resources Management Sub-Committee meets only once a year instead of quarterly due to lack of resources. Furthermore, there is also one Catchment Management Committee but when NWRA becomes operational it is expected that there will be many of these committees.

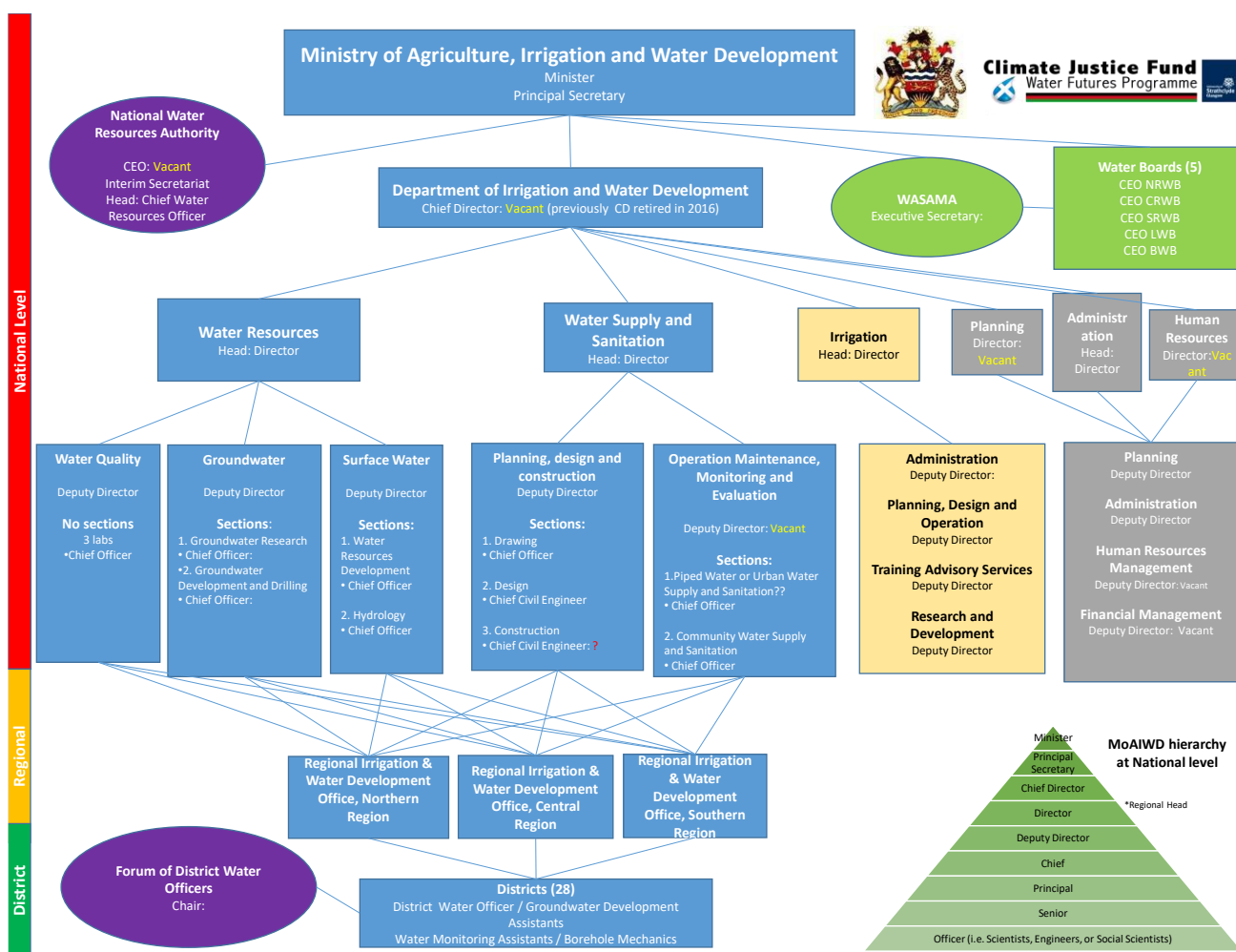


Figure 2: Institutional arrangements around groundwater management in Malawi’s – Ministry of Agriculture, Irrigation and Water Development

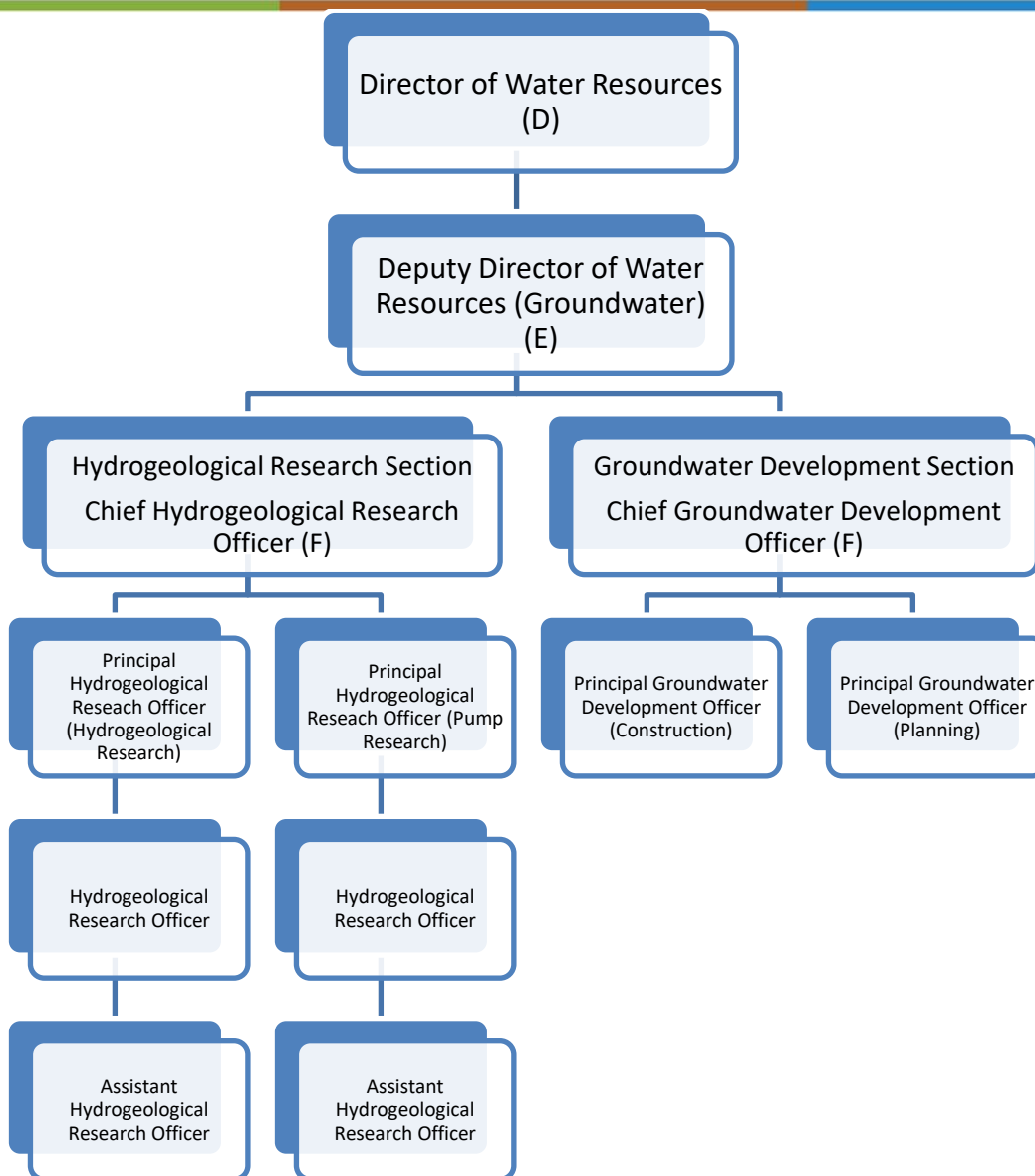


Figure 3. Organogram for Water Resources Department: Groundwater Division (Headquarters) under Director of Water Resources

6.3. Gaps and challenges identified

The main gaps to be addressed on institutional arrangements for groundwater management in Malawi include the following:

- Inadequate human, financial and technological capacity. There are less than 15 qualified Hydrogeologists in the country which affects supervision and monitoring of groundwater development programs. Capacity building in groundwater development needs immediate redress as most of the people involved in groundwater development in Malawi are not fully qualified hydrogeologists/groundwater experts. This applies to drillers, people involved in groundwater exploration, and managers of groundwater projects; recurrent financial resources are usually not adequate to conduct groundwater management unless there are Development Projects; no equipment for deeper drilling;

- Weak enforcement of regulation mainly due to non-operationalisation of NWRA;
- Inadequate data exchange among institutions involved in groundwater development;
- Inadequate comprehensive groundwater research;
- Inadequate comprehensive knowledge in groundwater availability and quality; and
- Lack of the provision for creation of a professional body of National hydrogeologists to register and control participation of hydrogeologists in Malawi who may affect the quality of outputs from national groundwater development activities.

6.4. Enablers required to unlock these gaps/challenges

The table below highlights some of the key enablers necessary to address the institutional gaps and challenges identified.

Table 4: Enablers required to address the institutional gaps and challenges identified in groundwater management in Malawi

Item	Groundwater challenge/gap	Enablers
1	Lack of a national groundwater body or association hydrogeologists to register and control participation of hydrogeologists in Malawi	<ul style="list-style-type: none"> ▪ Create national groundwater management association ▪ Operationalise NWRA
2	Inadequate human, financial and technological capacity	<ul style="list-style-type: none"> ▪ Training at various levels ▪ Availability of financial and technological capacity
3	Weak enforcement of regulation	<ul style="list-style-type: none"> ▪ Operationalise the National Water Resources Agency ▪ Build enforcement capacity i.e. more staffing and training
4	Inadequate comprehensive groundwater research	<ul style="list-style-type: none"> ▪ Comprehensive research on groundwater regarding availability and quality.
5	Inadequate comprehensive knowledge in groundwater availability and quality	<ul style="list-style-type: none"> ▪ Comprehensive research on groundwater regarding availability and quality.

7. CHALLENGES TO IMPLEMENTATION

Key challenges that are hindering the ability to deliver on good groundwater management are as follows

- Groundwater is not explicitly included in the water resources documents. Mostly, it is by implication;
- Uncoordinated water use management and regulation among sectors;
- Conflicting regulations;
- Inadequate coordination of groundwater development e.g. drilling programs. The NWP does not give direction on how institutions should collaborate to ensure that work to support implementation of the NWP and other water-related initiatives is consistent with the efforts of national and district level water offices, e.g. NGOs often fail to coordinate with district officials to seek guidance or technical input on their initiatives and, sometimes work directly with communities, leading to introduction of new technologies not approved by Government that sometimes have poor results;
- Weak enforcement of water resources regulations. This is due to a number of reasons including inadequate human and financial capacity, conflicting policies with other sectors such as agriculture that promotes cropping in river banks, unclear rights and regulations;
- Chronic budgetary deficit
- Inadequate human capacity (human) at all levels including communities;
- Inadequate funds to carry our groundwater monitoring work, research and training. There is a Section for Hydrogeological and Pump Research but the ORT funding is not adequate.
- NGOs and Government do not share data generated from drilling activities, hence a lot of data is lost and analyses of groundwater in some areas use limited data.
- Non-operationalisation of National Water Resources Authority (NWRA) for regulation;
- Traditional methods of water governance and management, i. e. indigenous knowledge systems – how these could merge with scientific systems in managing water resources;
- Lack of encouragement in undertaking purpose-based comprehensive research in groundwater;
- Mapping of groundwater aquifers;
- Inadequate data on quantity and quality of water;
- Zoning of potential water development priority projects;
- Inadequate coverage of transboundary issues. The policy, legal and institutional framework in Malawi is silent on transboundary issues;
- Inadequate data collection and transmission systems in some river basins;
- Absence of a professional body of groundwater professionals;
- Poor groundwater quality. This results from poor catchment management (sedimentation, agricultural wastes, industrial wastes, etc. In addition, modern technologies allow using the subsurface for a number of activities such as mining-related activities which may contaminate groundwater. Inappropriate drilling, abstraction, poor well casing and well maintenance can also cause groundwater pollution. Drilling and pumping can mobilise naturally occurring pollutants such as fluoride (Mechlem, 2016).

8. ACTION PLAN

The MoSCoW method of prioritisation has been used to develop the action plan. This method identifies the *Must have*, *Should have*, *Could have*, and *Won't have* elements for the Groundwater Management Regulatory Framework.

Table 5 : Action Plan “Must Haves”

Prioritisation	Element	Description
Must have: <i>those elements of the regulatory framework that are critical</i>	Policy	<ul style="list-style-type: none"> ▪ Include transboundary issues and establishment of cooperation mechanisms ▪ Include policy direction on how institutions should collaborate ▪ undertake protection zoning ▪ Awareness and advocacy on technological advances ▪ Community awareness raising on environmental issues such as catchment protection
	Legislative	<ul style="list-style-type: none"> ▪ Regulate abstraction and recharge to protect groundwater quantity. ▪ legislation to include specific sections on transboundary issues ▪ enforce existing legislation on environmental management
	Institutional	<ul style="list-style-type: none"> ▪ Include groundwater management users in Water User Associations (WUAs) and Catchment Management Committees (CMCs) ▪ Create groundwater management associations or national body ▪ establish groundwater management institutions/structures ▪ develop clear mechanisms for groundwater stakeholder engagement ▪ strengthen human capacity through training ▪ Adequate resources for enforcement activities including monitoring of both groundwater and surface water resources for both quantity and quality ▪ Undertake EIA and environmental audits
	Strategy/ Guidelines	<ul style="list-style-type: none"> ▪ raise awareness on groundwater management issues ▪ Allow for zoning or similar mechanisms to protect overused/vulnerable aquifers. ▪ explicitly integrate groundwater for catchment level or basin level planning and specify that groundwater management planning should take into account and be integrated into land use and environmental planning; ▪ Undertake comprehensive research on groundwater for proper management

Prioritisation	Element	Description
		<ul style="list-style-type: none"> ▪ Build capacity in groundwater development (e.g. drillers, people involved in groundwater exploration, and managers of groundwater projects) ▪ Provide financial resources for groundwater management (development and enforcement) ▪ Include transboundary basins in formal protocols and standards on data collection and storage

Table 6 : Action Plan “Should Haves”

Prioritisation	Element	Description
Should have	Policy	<ul style="list-style-type: none"> ▪ Establish coordination mechanisms including transboundary issues ▪ Policy to be gender-sensitive in its terminology ▪ Include mandatory installation of monitoring infrastructure of boreholes especially for large-scale users
	Legislative	<ul style="list-style-type: none"> ▪ strengthen and harmonise legal and institutional framework in water sector and other related sectors ▪ Legislation to be gender-sensitive in its terminology
	Institutional	<ul style="list-style-type: none"> ▪ Operationalise the National Water Resources Authority (NWRA). ▪ Community awareness raising on environmental issues such as catchment protection ▪ Procurement of state of the technologies for groundwater management ▪ Stakeholder awareness on groundwater management
	Strategy/ Guidelines	<ul style="list-style-type: none"> ▪ Establish clear mechanisms for enforcing strategies and guidelines

Table 7 : Action Plan “Could Haves”

Prioritisation	Element	Description
Could have	Policy	<ul style="list-style-type: none"> ▪ Develop national groundwater management policy with clear objectives ▪ Provide for groundwater management leadership
	Legislative	<ul style="list-style-type: none"> ▪ Upgrade existing legislation to clearly promote conjunctive use which refers to the sustainable utilisation of all water sources including groundwater

Prioritisation	Element	Description
		<ul style="list-style-type: none"> recognise and legalise affordable, small-scale and indigenous solutions to groundwater use;
	Institutional	<ul style="list-style-type: none"> experience sharing nationally and regionally
	Strategy/ Guidelines	<ul style="list-style-type: none"> include clear definitions of groundwater services functionality in guidelines

Table 8 : Action Plan “Won’t Haves”

Prioritisation	Element	Description
Won’t have	Policy	<ul style="list-style-type: none"> Continued Institutional dominance of surface water in a country where the majority relies on groundwater, and where surface water resources are fully allocated
	Legislative	<ul style="list-style-type: none"> Continued legal and policy uncertainty regarding groundwater institutions and local governance
	Institutional	<ul style="list-style-type: none"> Consolidation and dominance of interim and relatively weak local groundwater governance organisations
	Strategy/ Guidelines	<ul style="list-style-type: none"> Lack of traction for revised NGS

9. REFERENCES

- AfDB (2012) *Malawi country strategy paper 2013-2017*. African Development Bank.
- BGS, WaterAid (2008) *Groundwater Quality: Malawi*. British Geological Survey/WaterAid. Natural Environment Research Council
- Chavula, G.M.S. (2018) *Malawi Country Report on the Water, Energy and Food (WEF) Nexus*. A Malawi Country Report submitted to SADC as part of the SADC - EU Project on "Fostering Water, Energy and Food Security Nexus Dialogue and Multi-Sector Investment in the SADC Region." Lilongwe.
- Chavula GMS. 2012. *In: Groundwater Availability and Use in Sub-Saharan Africa: a review of fifteen countries*. Pavelic P et al. (Eds). International Water Management Institute, Sri Lanka.
- Chilton, P.J., Smith-Carington, A.K. (1984). *Characteristics of the weathered basement aquifer in Malawi in relation to rural water supplies*. Challenges in African Hydrology and Water Resources (Proc. Harare Symp., July, 1984) 235–248. IAHS publ. no.144.
- GoM. (2018). *The Action Plan*. Government of Malawi. http://www.sdn.org.mw/enviro/action_plan/chap_4.html. Accessed: 9 August 2018.
- GoM. (2016). *National Forestry Policy*.
- GoM. (2015). *Atlas for the hydrogeological and water quality Maps*. Malawi. Ministry of Agriculture, Irrigation and Water Development. National Water Development Programme.
- GOM/EP&D. (2008). *2008 Malawi Millennium Development Goals Report*.
- GOM/MWP. (2008). *Integrated Water Resources Management/Water Efficiency (IWRM/WE) Plan 2008–2012*. Ministry of Irrigation and Water Development. MWP/CIDA. Lilongwe
- IMF. 2017. *Malawi: Economic Development Document*. The World Bank. IMF Country Report No. 17/184.
- Masangwi, S.J., Morse, T., Ferguson, G., Zawdie, G., Grimason, A.M. (2008). *A preliminary Analysis of the Scotland-Chikwawa Health Initiative Project on Morbidity*.
- Environment and Health International. *Magazine of the International Federation of Environmental Health, Congress Edition, ISSN 1683, Vol. 10, No. 2*.pp. 10–22.
- Laisi, E. (2009). *IWRM Survey and Status Report: Malawi*. Global Water Partnership – Southern Africa.
- LWB. (2017). *Lilongwe Water and Sanitation Project. Environmental and Social Management Framework (ESMF)*.
- MDHS. (2004). *Malawi Demographic and Health Survey*. National Statistical Office (NSO) [Malawi], and ORC Macro. 2005. Calverton, Maryland: NSO and ORC Macro.
- Mechlem, K. (2016). *Groundwater Governance: The Role of Legal Frameworks at the Local and National Level-Established Practice and Emerging Trends*. *Water* 2016,8, 347; DOI:103390/W8080347. MDPI. www.mdpi.com/journal/water.

- MGDS. (2017). *Malawi Growth and Development Strategy (MGDS) III: Building a Productive, Competitive and Resilient Nation*. Malawi Government. 2017–2022. Government of Malawi.
- MoIWD, (2008). *Water and Sanitation Sector: Joint Sector Review Report*. Ministry of Irrigation and Water Development.
- MoAWDI. (2015). *Malawi Rural Water Supply Investment Plan:2014-2020*. National Water Development Programme.
- MoAIWD (2017a). *National Water Resources Master Plan*. Main Report: Existing Situation. Ministry of Agriculture, Irrigation and Water Development. Republic of Malawi.
- MoAIWD (2017b). *National Water Resources Master Plan*. Annex 2: Groundwater Resources. Ministry of Agriculture, Irrigation and Water Development. Republic of Malawi.
- Pritchard M, Mkandawire T, & O’Neill JG. (2008). *Assessment of groundwater quality in shallow wells within the southern districts of Malawi*. *Physics and Chemistry of the Earth*, 33(8), 812-823.
- SDNP (1998). *State of Environment Report for Malawi*. Chapter 6. http://www.sdn.org.mw/enviro/soe_report/chapter_6.html. Accessed: 10 August, 2018.
- SPR. (2016). *Malawi Government 2016/2017 Sector Performance Report for Irrigation*. Water and Sanitation Sector.
- UNICEF. (2014). Annual Report 2014. Malawi resources annual report. https://www.unicef.org/malawi/MLW_resources_annual_report2014
- WHO. (2006). *Guidelines for Drinking-Water Quality*. First Addendum to 3rd edition. Recommendations, vol. 1. World Health Organisation. <http://www.who.int/water_sanitation_health/dwq/gdwq0506.pdf>

APPENDIX A: LITERATURE INVENTORY LIST

No.	Year	Title of Document	Author	Publisher	Report Number	Link (if it is a website document)
1	2005	National Water Policy	Malawi Govt	Capital Printing Press		
2	2013	Water Resources Act	Malawi Govt		No. 2	
3	2017 & 2018	Water Resources Regulations	Ministry of Justice		Sub.D72:03	
4	2017	National Water Resources Master Plan in the Republic of Malawi	MoAIWD		Annex 2	
5	2015	Malawi Rural Water Supply Investment Plan 2014-2020	MoAIWD		National Water Development Programme	
6	2007	National Sanitation Policy	Malawi Govt			
7	2015	Atlas_Hydromapping_Malawi	Malawi Govt			
8	2018	Malawi Country Report on the Water, Energy, and Food (WEF) Nexus	Chavula G	SADC		

APPENDIX B: STAKEHOLDER LIST

Full Stakeholder List

No.	Title	Name:	Surname:	Affiliation	Role (job title/occupation:	Sector Group
1	Mr	Prince	Mleta	Department of Water Resources	Deputy Director of Groundwater/ Acting Director of Water Resources	National Government
2	Mr	Peaches	Phiri	Department of Water Resources	Deputy Director of Water Quality & Pollution Control	National Government
3	Mr	Peter	Chipeta	Department of Water Resources	Regional Irrigation & Water Development Officer, Central	National Government
4	Mr	Phideria	Moyo	Department of Water Resources	Regional Irrigation & Water Development Officer, South	National Government
5	Ms	Zione	Uka	Department of Water Resources	Chief Groundwater Officer	National Government
6	Mr	Macpherson	Nkhata	Department of Water Resources	Chief Hydrogeological Research Officer	National Government
7	Mr	Elton	Laisi	Consultant	Environment Management Expert	NGO
8	Mr	Patrick	Chintengo	Department of Water Resources	Principal Hydrogeologist	National Government
9	Mr	Ganizani	Matiki	Department of Water Resources	Principal Drilling Officer	National Government
10	Mr	Patrick	Mlomba	Department of Water Resources	Hydrogeological Research Officer	National Government
11	Mr	Owen	Phiri	Department of Water Resources	Principal Water Chemist	National Government
12	Mr	Oswald	Mwamsamali	NWRA Secretariat	Chief Water Resources Officer	National Government
13	Mr	Peter	Banda	NWRA Secretariat	Senior Assistant Water Resources Officer	National Government
14	Dr	Geoffrey	Chavula	SRBA	Executive Director -SRBA	River Basin Agency/ Academia
15	Mr	Gift	Wanangwa	Department of Water Resources	Groundwater Development Officer- South	National Government
16	Mr	Muthi	Nhlema	BASEflow	Team Leader	NGO
17	Mr	Steve	Kumwenda	BASEflow	Hydrogeologist	NGO- BASEflow
18	Prof.	Robert	Kalin	University of Strathclyde	Director, Climate Justice Fund Project	Development Partner/ Academia

No.	Title	Name:	Surname:	Affiliation	Role (job title/occupation:	Sector Group
19	Ms	Christina	Fraser	University of Strathclyde	(PhD researcher)	Researcher
20	Mrs	Kate	Harawa	Water For People	Country Director	NGO
21	Mrs	Deborah	Muheka	World Vision International	Technical Program Manager- WASH	NGO
22	Mr	Masauko	Mnthunzi	United Purpose	Global WASH Expert	NGO
23	Mr	Thanasius	Sitolo	Department of Water Supply and Sanitation	Chief Community Water Supply Officer	National Government
24	Dr	Peter	Matipwiri	PBM	Drilling Company/ Consultant	
25	Mr	P.	Zimba	Tropical Drilling Company		
26	Mr.	Kondwani	Mponda	Department of Water Resources	Principal Hydrogeologist	National Government
27	Mr/	Swethen	Matamula	Department of Water Resources	Lecturer	Academia
28	Assoc Prof	Cosmo	Ngongondo	Department Geography & Earth Sciences	Lecturer	Academia

List of Stakeholders consulted through the questionnaire

Name	Institution	Designation	Stakeholder Grouping
Ms Ziona Uka	Ministry of Agriculture, Irrigation and Water Development (MoAIWD), Department of Water Resources	Chief Groundwater Officer. Focal Person	Government
Prof Geoffrey Chavula	Shire River Basin Agency (SRBA)	Executive Director.	River Basin Agency/ Academia
Mr Elton Laisi	Consultant	Environment Management Expert.	NGO.
Mr MacPherson Nkhata	Ministry of Agriculture, Irrigation and Water Development (MoAIWD), Department of Water Resources	Chief Hydrogeological Research Officer.	Government



Name	Institution	Designation	Stakeholder Grouping
Mr Patrick Chimtemgo	Ministry of Agriculture, Irrigation and Water Development (MoAIWD), Department of Water Resources	Principal Hydrogeologist.	Government
Mr Prince Mleta	Ministry of Agriculture, Irrigation and Water Development (MoAIWD), Department of Water Resources	Acting Director – Water Resources. Focal person.	Government

Validation Workshop

Name	Position	Stakeholder Group
Mr Steve Kumwenda	Program Hydrogeologist at Baseflow	NGO (Validation Workshop)
Mr Patrick Chintengo	Hydrogeologist at Ministry of Irrigation and Water Development	Government (Validation Workshop)
Mr Geoffrey Chavula	Associate Professor in Water Engineering; Former Director of Centre for Water, Sanitation, Health and Technology Development	Research, Government (Validation Workshop)
Mr Peter Banda	Environmental and Water Resources Officer in the Department of Irrigation	Government (Validation Workshop)

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	<p>The policy has general principles, objectives and strategies on water resources development, pollution and water supply including the roles of stakeholders in water management. For example IWRM, consideration of cross cutting issues, but other issues are left out. The policy does not explicitly include groundwater issues and implementation is not at all levels.</p> <p>The policy is consistent with other policies such as the National Sanitation Policy.</p> <p>It does not completely take into account other sectoral policies because harmonisation of natural resources policies has not really been done although during the preparation of the 2005 policy other sectors were invited</p>
The social, economic and environmental values of groundwater are all recognised;	Achieved	The policy mentions water being not only a social but an economic good. It recognises the impact of environmental degradation on water quality. There is the environmental aspect referred to in the guiding principles and objectives and strategies for water quality and pollution control
The human right to water is recognized and a rights-based approach to groundwater management is taken, <i>inter alia</i> , through:	Achieved	There is a guiding principle which says 'The protection and use of water resources for domestic water supply shall be accorded the highest priority over other uses'.
Prioritization of drinking water/basic human needs in water legislation;	Achieved	The prioritization was set
Ensuring that land-based rights cannot entitle unlimited access/use of freshwater, including groundwater;	Partially achieved	It is in general terms. No specific reference to groundwater.
Ensuring groundwater is legally recognized as a public good;	Partially achieved	It is not clear in legislation. No specific reference to groundwater
Recognising the role of groundwater in meeting basic human needs for food security;	Partially achieved	By implication since the majority of rural people depend on groundwater.
Legal recognition of customary rights to freshwater, including groundwater;	Achieved	In general terms
Legal mechanisms to ensure gender equity in access, use and management of freshwater, including groundwater;	Partially Achieved	NWP has an overall objective on promoting the mainstreaming of Gender and HIV and AIDS activities in the water and sanitation sector. But the situation analysis in the policy document is completely gender

		blind resulting in all objectives, policy statements and actions being gender blind.
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.	Partially achieved	Rights to freshwater are clear but the pricing mechanism to incentivise equitable distribution is not included.
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;	Partially Achieved	Though not in particular as groundwater but as water resources. Although groundwater is recognised as such in other documents and reports, the National Water Policy talks of water resources mostly in general terms and does not specifically recognise/ acknowledge the fact that it is highly important source of domestic and agricultural water supply and a key resource for poverty alleviation.
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);	Partially achieved	This is not explicit. But strategy on "Undertaking appropriate integration between surface water and groundwater resources management" is there, which may be quite general but somehow referring to conjunctive management. Much more can be made explicit.
The importance of the maintenance of the ecological integrity of wetlands in groundwater management is recognised (recharge zones);	Partially achieved	Although the National Water Policy mentions it in the objectives for water resources management and development, it is in general terms, not in particular reference to groundwater.
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	There is a guiding principle of promoting IWRM to ensure an integrated approach to the management of water resources, and in addition, roles for the different sectors are outlined in the policy, which implies that the need for intersectoral collaboration is recognised. There is no mention of groundwater separately. Also through joint sector review meetings.
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 achieved	Though not explicitly stated, there is a guiding principle which says Data users shall appreciate that due to the transient nature of the resource and the complexity of the natural environment, any water resources data are best estimations of the natural systems that is dependent on the sophistication of the measuring infrastructure.
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;	Achieved	The Policy has a Section on Institutional Roles and Linkages which recognises that water resources management requires an integrated approach involving a number of stakeholders and lists the various stakeholders and their roles, though not specific to groundwater.
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	The Groundwater Division in the Ministry of Agriculture, Irrigation and Water Development is responsible for groundwater management.

Effective institutional arrangements are coordinated at trans boundary, national and local levels;	Not achieved	Co-ordination of institutional arrangements is there at national and local level but not at transboundary level.
Public access to geo-hydrological data held by the state is promoted and facilitated	Achieved	<p>The Policy contains a specific strategy on establishment of a computerized networked database under Water Resources Management and Development.</p> <p>Under Institutional Roles and responsibilities Section, it indicates one of the roles as ‘The Ministry responsible for Water Affairs shall be responsible to manage and disseminate water resources and sanitation information’.</p> <p>No specific mention of geo-hydrological data access though.</p>
- 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	<p>The policy has principle of gender equity and social inclusion- it promotes mainstreaming of gender.</p> <p>There is polluter- pays principle.</p> <p>There is mention that allocation and regulation should consider social enhancement.</p> <p>Promotes water pollution control for environmental sustainability.</p> <p>Advocates for EIAs on projects.</p> <p>Principle 3.4.10 says Water demand management approaches shall be adopted in all cases of water resources development and management, and water allocations shall consider ecosystem integrity and biodiversity including marine and estuarine life.</p> <p>Intergenerational equity is however not considered.</p>
Other key policy issues that are included in the policy that have not been addressed here.	Achieved	<p>-for the rural areas, technologies shall conform to the VLOM concept</p> <p>-Water resources management shall be based on decentralization and local participation so that the unit of water resources management shall be the catchment</p> <p>-promotion of demand responsive and demand driven approaches, beneficiary participation and empowerment</p> <p>-creation of legal framework to guide implementation of the water policy</p> <p>- The need to register all water facilities using a numbering system developed and adopted by the Ministry responsible for Water Affairs</p>
Key groundwater policy challenges being faced in the country	Achieved	-Inadequate human, financial and technological capacity- there are less than 15 qualified Hydrogeologists in the country which affects

		<p>supervision/ monitoring of groundwater development programs for example; recurrent financial resources are usually not adequate to conduct groundwater management unless there are Development Projects; no equipment for deeper drilling,</p> <p>-Inadequate coordination of groundwater development e.g. drilling programs. The NWP does not give direction on how institutions should collaborate to ensure that work to support implementation of the NWP and other water-related initiatives is consistent with the efforts of national and district level water offices, e.g. NGOs often fail to coordinate with district officials to seek guidance or technical input on their initiatives and, sometimes work directly with communities, leading to introduction of new technologies not approved by Government that sometimes have poor results.</p> <p>-Poor groundwater quality in some areas e.g. salinity, presence of iron, fluoride</p> <p>-Weak enforcement of regulation mainly due to non-operationalisation of NWRA</p> <p>Inadequate data exchange among institutions involved in groundwater development</p> <p>-Poor hydrogeological documentation which affects planning and decision making;</p> <p>-Inadequate monitoring of implementation of groundwater related policies;</p> <p>-Inadequate targeted financing</p> <p>-Inadequate manuals and policies</p>
<p>Policies that have been translated into strategies for groundwater management.</p>	<p>Achieved</p>	<p>Strategies in the National Water Policy are used in the water development strategic plan (202-2017), and appear in the MGDS II and MGDS III. Some strategies in MGDS III relating to groundwater development are:</p> <ul style="list-style-type: none"> Improving water supply in rural and urban areas; Strengthening monitoring and evaluation system for water utilization and management; Promoting scientific research and investigation <p>In the Water Resources Investment Strategy (2012)- one of the strategic priorities is that public water supply should take priority where water is scarce.</p> <p>In Strategic plan 2012-17- strategies include:</p> <ul style="list-style-type: none"> -Improve existing water infrastructure and boreholes -Build capacity <p>On the principle of IWRM, one strategy is establishing Catchment Management Authorities and devolving water resources management to catchment level using IWRM approach, on the objective 'to</p>

		ensure compliance by all stakeholders with water sector policies, standards and guidelines’ there is a strategy on ‘Establishing and maintaining a register of all NGOs, the private sector and individuals involved in water and sanitation activities’.
Additional comments		Instead of having groundwater embedded in the National Water Policy it must clearly come out as a distinct part of water resources just as it will be necessary to have surface water stand alone. NWP 2005 is under review.

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		
At the national level, there is legislation in place that explicitly addresses 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.	Achieved	To some extent as provided by the Water Resources Act of 2013. However, enforcement of these regulations is very weak because the National Water Resources Authority has not been operationalized yet.
Title and year of any legislation that deals with the use and/or protection of groundwater, bearing in mind that there may be more than one piece of legislation that deals with groundwater;	Achieved	Water Resources Act (2013) Water Resources Regulations (2017). Environmental Management Act (1996). This has been repealed by EMA 2016 which is not yet operational because it has not yet been given an effective date
All water has a consistent status in law, irrespective of where it occurs	Not achieved	Not really
Explicit reference to groundwater and conjunctive use management in catchment/water management and development plans and drought/emergency management plans	Not achieved	There is no specific reference to groundwater and conjunctive use.
Human right to water recognized in groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users	Achieved	Sections 37 & 38 WRA Hand pump wells are not subjected to EIA. This can be viewed as consideration for small scale users not being prohibited using groundwater for their domestic water uses.
Regulate Groundwater Quantity		
Provide conditions for accessing groundwater		
Water use authorizations:		
Legislation must enable the authorisation of groundwater use (with a system that does not discriminate, especially against the rural poor);	Partially achieved	
The permitting of groundwater use should not be tied exclusively to land tenure;	Not fully tied	Covered somehow in Sections 38 and 68 (9) of the WRA 2013
Legislation should allow for the categorisation of water users;	achieved	There are commercial users and non-commercial water users. Hence the permits to use water are issued to commercial users.
Groundwater should be declared a public asset and/or authority vested in government to restrict,	achieved	The Act (2013) has these statements “All water resources are hereby vested in the State, subject to

Minimum requirement for desired future	Status	Comment
in the public interest, the rights accruing from its private ownership to prevent over-abstraction or inequitable access/use by landowners;		any rights of a user granted by or under this Act or any other written law” and, “The bed and banks of watercourses and lakes and the adjacent land strips are declared public land and the Authority shall determine and regulate the management thereof.”
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	achieved	Both large scale and small scale users are required to get a permit Somehow in section 38 of the WRA (2013).
The legislation recognises and legalises affordable, small-scale and indigenous solutions;	Partially achieved	It recognises the use of hand dug wells in Section 38. Indigenous solutions are however not explicit.
The legislation should enable the regulation of borehole drillers, regulation for drilling, control of drillers, information from drillers and standards for borehole drilling;	achieved	Section 84 of the WRA of 2013
The legislation should enable the regulation of exploration;	achieved	Section 68 (WRA, 2013)
The legislation should allow for zoning for overused/fragile aquifers;	achieved	Part vi, section 66 is on control and protection of groundwater. It designates groundwater conservation areas. The challenge is inadequate enforcement.
Groundwater use organizations should be integrated into existing institutional frameworks (e.g., catchment management, customary institutions)	Partially achieved	By implication they are supposed to be into Associations of Water Users and CMCs. Sections 28 on CMCs and 131 on Associations of Water Users (AWU). No catchment councils exist as yet but once in place the major water users could be incorporated into decision – making processes.
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;	achieved	Through the Association of Water Users and Catchment Management Committees, through public hearings. Sections 44, 66, 156
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	Not achieved	The policy mentions Integrated Water Resources Management only in passing but does not specifically mention its Principles.
The legislation should specifically address the issue of the involvement of women and youth in decision-making and the implementation of groundwater supply schemes.	No	Not specified
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	achieved	The Act mentions that the Authority shall provide for the collection, collation and analysis of data on flow, rainfall

Minimum requirement for desired future	Status	Comment
data. This entails a national monitoring and information system which captures quantity and quality data from key aquifers;		‘.....and monitoring stations and investigation and monitoring boreholes;’ It is mentioned among other things i.e. it doesn’t stand out WRA Sec 16 & 18
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 appropriate prediction of future hydrogeological conditions;	Not achieved	Not to that extent. However, it specifies the requirement to monitor groundwater both through monitoring boreholes and productive boreholes during construction to collect appropriate data. Such data can be used to guide and advice regarding hydrogeological condition and groundwater supply status for different purposes. Capacity is lacking.
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	Refer Sec 141 WRA. Joint venture not mentioned but mention of Minister establishing bodies in the country Information exchange mentioned but standardisation doesn’t come out
The legislation should enable access by the public to hydrogeological data held by the state.	achieved	It is included in the legislation
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.	achieved	
Compliance and Enforcement		
Clear mechanisms for promoting compliance with groundwater regulations should be included in the legislation	achieved	However, enforcement is lacking.
Legislation gives water inspectors the right to enter land.	achieved	Section 140 has indicated this.
Enforcement provisions should include, inter alia, inspections authority for groundwater management institutions, the ability to impose fines and/or additional administrative penalties and adjust those as necessary, and enumerate criminal offenses associated with failure to comply with the law.	Achieved	“Any person who discharges effluents in contravention to the provisions of this Act commits an offence and upon conviction shall be liable to a fine of...” This is what is mentioned in Section 144 of the Act. It is broad to water not specific to groundwater pollution though.
Conflict resolution mechanisms and/or the right to appeal		
legislation contains clear mechanisms for conflict resolution and/or the right to appeal on matters pertaining to groundwater use and protection	Achieved	The CMCs and AWUs are there to assist in conflict resolution. As well as the tribunal
Regulatory measures		
The legislation must enable the relevant authority (Minister) to make regulations on any relevant matter in the legislation	Achieved	Eg Part XII (Tribunal), 72, 129 (High Court). The Minister is the responsible Authority for the execution of all pronouncements of the legislation.
Legislation should provide a clear ability for the government to pass regulatory measures, such as	Achieved	However, the passing of the regulatory measures such as abstraction fees or waste disposal charges is not

Minimum requirement for desired future	Status	Comment
abstraction fees and waste disposal charges, to provide revenue to water management institutions and to incentivise appropriate use of groundwater		necessarily for revenue but to regulate use and maintain water standards and quality.

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		
ii. Groundwater Protection Mechanisms		
Regulating Pollution (Point source and non-point source)		
Water quality targets;	Achieved	
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	Sections 74 and 88 in WRA (2013). Although they are somehow general not explicitly looking into the issue of “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”. Even the EMA has this
Classification of water bodies; and	Partially achieved	The water bodies were already classified under the existing legislation.
Reducing and regulating abstraction.	Achieved	The authority may vary the licence so as to alter the discharge or quantity of water or any other aspect of water use authorized by the licence in terms of shortage or deterioration of water (Section 49 and 65)
Powers of compliance monitoring and enforcement	Partially achieved	Although included in the legislation there is a need to ensure the monitoring process of the explorations.
Regulating Depletion		
Regulation of abstraction and recharge (usually via permitting);	Achieved	Even though no regulation is observed during periods of water scarcity as this is also the time when demand may be high. The authority may vary the licence so as to alter the discharge or quantity of water or any other aspect of water use authorized by the licence in terms of shortage or deterioration of water (Sections 49 and 65)
Sustaining wetlands;	Achieved	Section 37 (WRA, 2013) Permits are required to do so under Water Resources Act 2013 and EMA requires that EIA be done accordingly

Minimum requirement for desired future	Status	Comment
Land use zoning – prohibition of abstraction in certain zones; cropping or irrigation practices; protection zones for recharge areas; no surfacing/drainage requirements; and	achieved	Permits are required to do so and EMA requires that EIA be done accordingly Construction of boreholes in water areas is not permitted Catchment areas are protected areas
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).	No. Implied	There is a hint in Section 44. “A licence to abstract and use water shall be issued subject to.....(c)_proper water management by,(iii) requiring monitoring, analysis and reporting by the licensee on every water use dependent upon the licence, including bulk uses or local authority uses.....” But the Water Resources Regulations Section 112 “Within two years of coming into force of these Regulations, every authorized major water user, whether for water abstraction or effluent discharge, shall be required to have installed a controlling device and measuring device for the accurate measurement of water abstracted, obstructed or diverted and for effluent discharged, as the case may be”.
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;	Partially achieved	The Act says the Minister may, in relation to any water source, where the situation so requires due to shortage or anticipated shortage of water, by notice published in the Gazette and in such other manner appropriate for such area as the Minister may see fit, on the advice of the Authority, declare any part of Malawi to be a controlled area and establish a comprehensive and integrated plan for managing land, water and other natural resources within that area Section 86 WRA (2013)
Where water legislation provides for catchment level or basin level planning, groundwater should be integrated into those plans (for example through impact assessment requirements);	Not conspicuously	It is presumed
The legislation should specify that groundwater management planning should take into account and be integrated into land use and environmental planning; and	No	
Planning should be cyclical and based on continuous learning from data and stakeholder feedback to ensure adaptive management and	Yes	WRA (2013) Sections 18 & 35

Minimum requirement for desired future	Status	Comment
effective responses to changing climatic, social, political and institutional contexts/drivers.		

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	All groundwater development activities are required to be supervised or carried out by competent professional hydrogeologists, drilling companies and such other bodies and professionals. However, what is lacking is the provision for the creation of a professional body of National hydrogeologists to register and control participation of hydrogeologists in Malawi who may affect the quality of outputs from national groundwater development activities
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;	achieved	The Ministry has the capability and operationalising the NWRA will even improve this. There is however, more need to increase the capacity of water experts in various disciplines within the water fraternity in order to cope up with demand at the present and into the future as population increases.
The authority or body should collaborate with other authorities, competent for public health, land-use planning, soils management, waste management;	Achieved	Section 95 WRA (2013).
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.	achieved	Association of Water Users and Catchment Management Committees. What is missing is provision of establishment of National Association of Hydrogeologist or groundwater professionals to guide and promote ethics regarding groundwater management and development in the country.



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

