Water Resources Management Authority

Government of the Republic of Zambia

Zambia

Kerstin Danert, Dotun Adekile, Murtaza Malik, Levy Museteka and Douglas Abuuru

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Achievements and Lessons Learned in the Implementation of Groundwater Regulation in Zambia

Contents

Abbreviations and Acronyms

BGR	Federal Institute for Geosciences and Natural Resources
BRRA	Business Review Regulatory Agency
CPCC	Competition and Consumer Protection Commission
DAZ	Drillers Association of Zambia
DWA	Department of Water Affairs
DWRD	Department of Water Resources and Development
EIZ	Engineering Institution of Zambia
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit
GSB	Government Service Bus
IT	Information Technology
MHLG	Ministry of Housing and Local Government
MS	Microsoft
MWDSEP	Ministry of Water Development, Sanitation and Environmental Protection
NWASCO	National Water Sanitation Council
SI	Statutory Instrument
UNICEF	United Nations Children's Fund
WARMA	Water Resources Management Authority
WRM	Water Resources Management
ZABS	Zambia Bureau of Standards
ZEMA	Zambia Environment Management Agency

Cover photo: Participants of UNICEF-supported drilling supervision course in 2018 (Source: Dotun Adekile)

Summary

Today, Zambia withdraws an estimated 1.5% of its total renewable water resources and is thus not, at a national scale, water scarce. However, it is projected that the population, currently at 18 million, will reach between 60 and 110 million by the end of the century. Increased water use is important for raising the agricultural productivity of smallholder farmers and reducing rural poverty, Zambia's mining industry is central to the country's exports, and generating foreign exchange and large-scale irrigated agriculture plays an important role for the economy and livelihoods. These realities, coupled with ongoing droughts and future climate change impacts, will all contribute to increased pressure on surface and groundwater resources. There are also risks of pollution of water resources from mining, agricultural and lack of sanitation infrastructure. All of the above illustrate the centrality of water resources in Zambia, and if not properly managed, could place the availability of water, especially fresh water, at risk.

Following decades of growing and widespread groundwater use in Zambia for domestic, agricultural, commercial and industrial purposes, 2018 witnessed the commencement of regulation of its development and use. Regulations of any kind are essentially control systems with specific capacities that set standards, gather information (or monitor) and modify behaviour. Based on a literature review and interviews with a range of stakeholders, this publication tells the story of moving towards regulating groundwater in Zambia to date.

The Water Resources Management (WRM) Act, 2011 was the basis for establishing the Water Resources Management Authority (WARMA). The Act contains 64 instances requiring regulation, which were grouped, providing a basis for eight Statutory Instruments (SIs). The three SIs that were promulgated[1] in 2018 are an important step towards protecting Zambia's aquifers and regulating abstraction, while supporting the sustainable development of the country's groundwater resources and protecting the interests of the general public. The three SIs define tariffs and charges for water use (SI 18), state that drillers must be licenced and set borehole standards (SI 19), and require groundwater users to apply for permits (SI 20).

The process of developing the regulations illustrates the importance of partnership and wide consultation. Since the promulgation of the three SIs in March 2018, a considerable amount of data has been collected by WARMA alongside the generation of substantial revenue. There has also been valuable learning about legal pitfalls alongside the practicalities of regulating – including administration, human resources, physical presence and the need for suitable Information Technology (IT) systems.

[1] Promulgation is the formal proclamation or the declaration that a new statutory or administrative law is enacted after its final approval. In some jurisdictions, this additional step is necessary before the law can take effect (Wikipedia, 2021).

Among all the stakeholders interviewed for the study, there was an appreciation of the importance of and need to regulate groundwater, alongside a recognition that, particularly given the size of the country, that this is a huge undertaking for WARMA. However, the regulations have been politicised, and even labelled "the borehole tax", which could affect implementation going forward. In Zambia, water is recognised, by law, as having as an economic value, and the cost of facilitating its use is recognised as having a significant administrative cost. It is essential that this and the associated permit, licence and use charges are widely understood, particularly by water users.

It is believed that there is widespread awareness of the new regulatory requirements, thanks to initial communication efforts by WARMA, but concerns exist that more is needed to communicate with water users who may not yet be aware of the regulations, including those who do not read newspapers, hear the radio or watch television, or who may have otherwise missed the initial campaign. Given the tremendous importance of water for the social and economic development of the country and the need for regulation, communication between WARMA and water users should actually be continuous. Collaboration between WARMA and organisations that represent different stakeholder groups provides one way of improving communication with water users, alongside use of mass media and other channels that enable face-to-face dialogue.

Among those interviewed for this study, there was generally goodwill towards the regulation, alongside concerns that while these three new SIs are generating revenue for WARMA, the process of translating the WRM Act, 2011 into regulations is not yet fully complete, and important gaps remain, with respect to groundwater pollution and protection, as well as local governance of water resources and allocations at catchment and sub-catchment levels. The SIs concerning these components of the Water Act, 2011 have not yet been issued. In fact, some very concerned stakeholders interviewed for this study doubt whether they will ever be completed, and thus question whether the holistic and integrated approach of Zambia's WRM Act, 2011 will be fully enacted as envisaged.

While over 30,000 existing boreholes were registered within the first year, and over 1,000 new permits to drill have been issued subsequently, it is taking time for digitisation of this information. This means that these data and other information (e.g. drilling logs) have not been as readily available as hoped. Likewise, since 2017, there has been a lack of comprehensive reporting by WARMA available in the public domain, including detailed information on the fees and charges collected, and how this revenue is being expended alongside grants and donor support.

Based on the findings of this study, the authors draw out three important lessons for other countries which are embarking on the process of trying to regulate groundwater:

1. Developing groundwater regulations takes time, needs to be government-led and requires the consultation of diverse stakeholders.
2. Within the planning process, consider what happens after promulgation.
3. Communicating about regulations and stakeholder engagement is an ongoing task.

Going forwards, it is recommended that:

1. WARMA, national stakeholders and partners accelerate efforts to ensure that all subsidiary legislation is developed for all aspects of the WRM Act, 2011, with process planning efforts that extend beyond their promulgation.
2. WARMA invests more in regular communication with those who are being regulated, including listening to, and documenting their concerns and ideas. As part of improved communications, WARMA should consider forming strategic partnerships with organisations that represent different stakeholder groups to reach them.
3. WARMA proactively demonstrates the value to those being regulated by sharing the valuable data that has been generated, alongside improving transparency towards the public with respect to the revenues generated and how these have been reinvested – publicly available annual reports would be a major step forward.
4. In prioritising where to invest staff time and resources, WARMA should focus its attention on water users that use large volumes such as mining, other industries, commercial farms and mechanised drillers, rather than rural domestic users, smallholder farms and small enterprises that use relatively low water volumes.
5. Accessible mechanisms for safeguarding and oversight are developed and introduced, so that those regulated are able to report potential abuses without having to take costly, legal action immediately.
6. Specifically, to the three SIs, there are a number of recommendations relating to the consideration of more equitable fees for water use, more emphasis on hydrogeologists and geoscientists and additional requirements for siting, borehole construction and reporting.

Introduction

Groundwater is destined to become one of the world's most precious, albeit hidden resources. Regulations, of any kind, are essentially control systems with specific capacities that set standards, gather information (or monitor) and modify behaviour (Morgan and Young, 2007). Despite decades of growing and widespread groundwater use in Zambia for domestic, agricultural, commercial and industrial purposes, it was not until 2018 that groundwater use began to be regulated. While this may seem recent, there are many countries around the world where there is no regulation of groundwater use at all, or where it remains in its infancy.

This publication tells the story to date of regulating groundwater in Zambia. It is written for those involved in or with an interest in water supply and water resources regulation as well as drillers, government, NGOs, investors and water users who want to learn from practical experiences. Readers do not require extensive background knowledge of groundwater resources or water resources regulation.

The authors have documented the process of developing these regulations and outcomes to date. By reflecting on and taking stock of Zambia's progress, it is hoped that this publication will inspire and encourage other countries to embark upon or continue on the regulatory journey, but with a greater awareness of some of the pitfalls and challenges that may be encountered. The study is based on experiences by the authors from participating in a small part of developing the regulations in 2016, followed by a review of internal reports, published and grey literature, a series of interviews with 18 stakeholders[2] across different groups, a review of the draft document by seven specialists, and finally an online validation workshop with ten stakeholders in June, 2021.

Since the promulgation[3] of three Statutory Instruments (SIs) in early 2018 that define tariffs and charges for water use (surface water and groundwater), set drilling standards, require drillers to be licenced and groundwater users to apply for permits, a considerable amount of data has been collected by the Water Resources Management Authority (WARMA) alongside the generation of substantial revenue.

This publication provides a brief overview of Zambia's country context including water resources and water use. It summaries the National Water Policy, 2010 and Water Resources Management (WRM) Act, 2011 before describing what the three new SIs specifically set out to regulate. The publication examines compliance with and enforcement of the regulations and the regulatory outcomes to date. Reflections by the authors and recommendations are summarised, as is a synopsis of key lessons learned.

1. Country Context

People, geography, geology

Zambia's estimated population at independence in 1964 was 3 million, which, by 2020, had grown to 18 million. By the end of this century, the population is projected to reach between 60 and 110 million (Figure 1). This high population growth is increasing demand for jobs as well as health care and other social services, which at present the economy is not able to provide (World Bank, 2018).

Zambia is a landlocked country located on the plateau of central-southern Africa between 1,000 and 1,600 m above sea level, and occupying over 750,000 km^2. A description of the country's geology is summarised in Box 1 and illustrated in Figure 2.

Politics and Economy

Zambia comprises ten provinces (Figure 3), each administered by an appointed minister. The country has witnessed relative political stability since independence, but governance is weak (World Bank, 2018). The economy is based mainly on mining, agriculture, forestry and tourism. A copper mining boom commenced in the 1920's, resulting in urbanisation in the northern Copperbelt towns (Earthwise, 2021). Copper mining earnings are now the major foreign exchange earner, with copper recently providing 70% of exports and 12% of Gross Domestic Product (GDP) (World Bank, 2018). In 2018, Zambia was the world's biggest exporter of raw copper (OEC, 2021) but the sector is described as an enclave industry, only employing some 90,000 workers, equivalent to about 8% of total formal employment (World Bank, 2018).

With an estimated GINI[4] coefficient of 57, economic inequality in Zambia is among the highest in the world, and in 2015, an estimated 57.5% of Zambia's population lived in extreme poverty[5] (World Bank, 2021). Despite Gross Domestic Product (GDP) growth of 7.4% on average between 2004 and 2014, poverty rates in the country have remained high, with growth benefitting those already well-off and increasing inequalities. The COVID-19 pandemic has had a negative impact on the Zambian economy, pushing what was already weakened by persistent droughts and falling copper prices into contraction, with the country now facing its first recession since 1998 (World Bank, 2021a).

[2] A total of 52 people were contacted for interview by the two lead authors from an initial list provided by WARMA and via a snowball method to reach out further. All interviews were undertaken remotely using Zoom or WhatsApp and based on a semi-structured interview guide covering the process of developing the regulations, extent of implementing the regulations, achievements, effectiveness, outcomes and learning, and any other comments or idea. The interview topics were developed from a detailed review of the book 'An Introduction to Law and Regulation: Text and Materials' by Morgan and Yeung (2007) and a desk review. All interviewees were asked for their consent, and promised anonymity by the two lead authors. On several occasions, interviewees did not show, and not all were able to reschedule. While this meant that fewer people were interviewed than planned, the two lead authors were able to triangulate responses and draw out inconsistences, which are presented within the narrative in this report. All nine stakeholder segments identified by WARMA were covered by the interviews.

[3] Promulgation is the formal proclamation or the declaration that a new statutory or administrative law is enacted after its final approval. In some jurisdictions, this additional step is necessary before the law can take effect (Wikipedia, 2021).

[4] The GINI coefficient is a number which is used to demonstrate the degree of inequality of distribution of income/wealth by estimating how the distribution deviates from a totally equal distribution.

[5] Extreme poverty is defined by the World Bank as a person living on less than $1.90 a day.

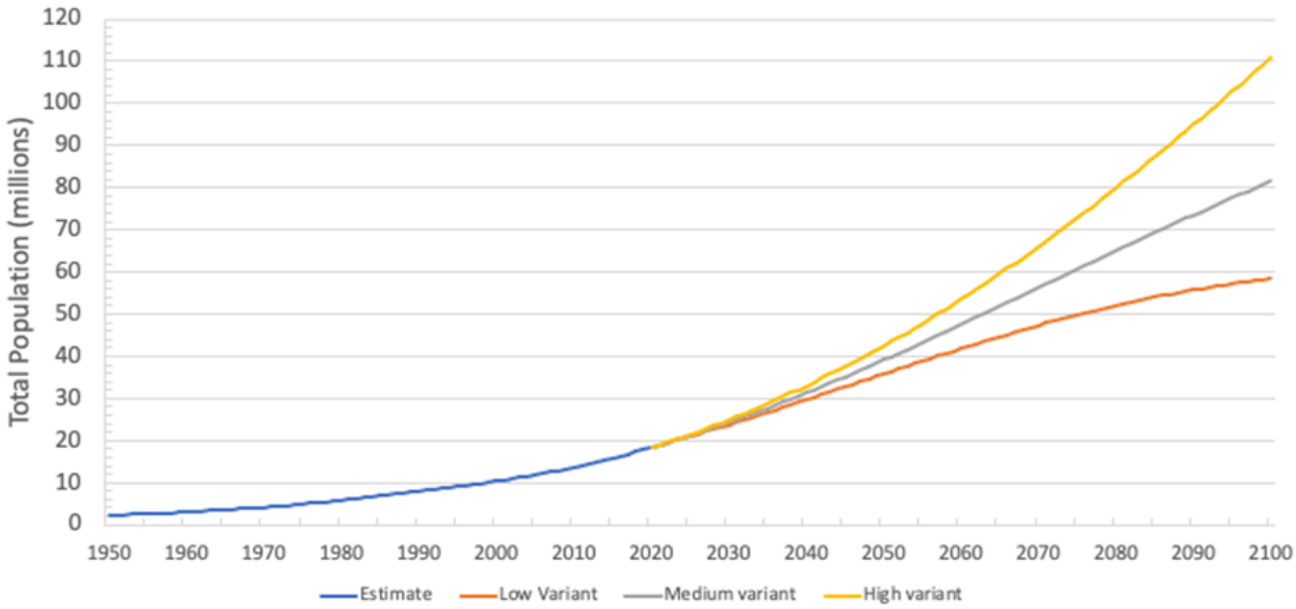


Figure 1 Population estimates for Zambia (UNDESA, 2019)

Box 1 Summary of the Geology of Zambia

Zambia's oldest rocks are the crystalline Precambrian Basement Complex rocks comprising mainly granites and gneisses outcropping in the east and in the north of the country. These rocks are intruded by other granites, syenite, gabbro, basalt, dolerite and andesite.

The Muva Supergroup overlies the Basement Complex rocks, consisting mainly of conglomerates, quartzites, schists and iron-rich sandstones and mudstones. The Muva Supergroup is intruded by carbonatites, dolerite and granite porphyry and pegmatities.

The Katanga Supergroup overlies the Muva. It consists of deposits of conglomerate, arkose, shale, argillite and greywacke, dolomites and limestones. The Katanga supergroup incorporates the Copper Belt of Zambia.

The Karoo Supergroup is represented by outcrops in major rift block valleys, in the east and south, such as the Luangwa, Lukusashi, Lunsemfwa, Rufunsa and mid-Zambezi rivers. It consists of tillite, sandstone and mudstones and coal formations. These are overlain by the Karoo basalts.

The Kalahari Group consists of consolidated sandstones and windblown sands in the western province. Quaternary alluvial deposits alluvial deposits line the major rivers, as well as the Bangweulu Swamps and Kafue Flats.

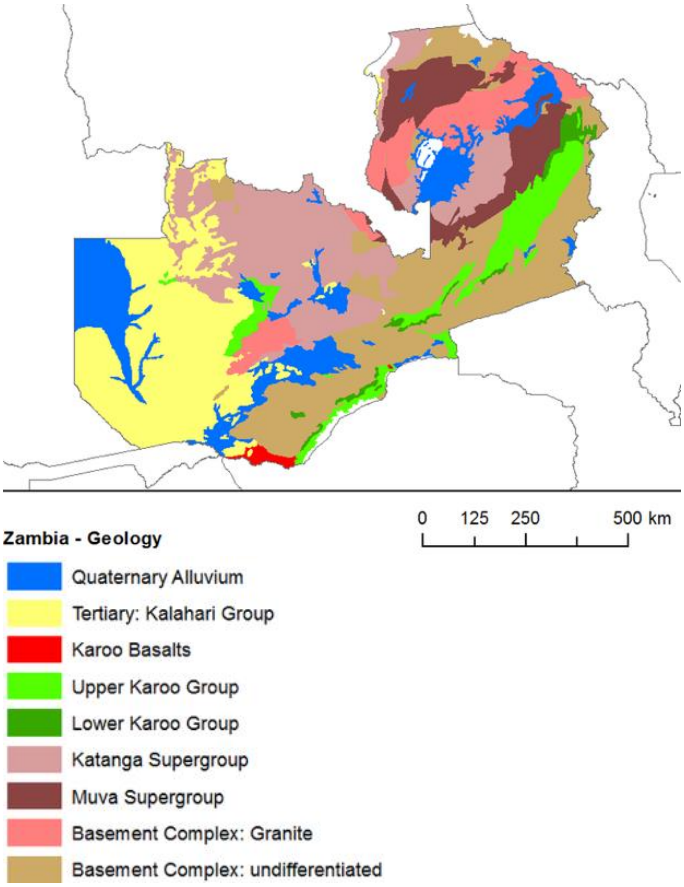


Figure 2 Geology of Zambia at 1:5 million scale (Earthwise, 2021)

An estimated 57% of Zambia's population live in rural areas (World Bank, 2021b), and the livelihoods of almost half of the economically active population is from agriculture (World Bank, 2018). The government estimates that there are 1.6 million smallholder farms in Zambia, defined as farms of 5 hectares or less (Zulu, n.d.). Echoing the aforementioned inequalities, growth within agriculture is largely by commercial farmers who have integrated into national and international markets and benefited from spending programs (World Bank, 2018). In contrast, "a vast group of people live in a parallel, semi-subsistence world characterized by the lack of access to key productive assets and market opportunities, leading to hunger, undernourishment, and malnutrition" (World Bank, 2018).

While many people have shifted out of low-productivity agriculture, typically, they have not ended up working in sectors that are more productive (World Bank, 2018). The World Bank (2018) states that Zambia's inability to reduce rural poverty results from a failure to raise the agricultural productivity of smallholder farmers. Constraints include limited access to land, water, machinery, coupled with a lack of diversification and technology adoption (World Bank, 2018). Smallholder, rain-fed farming could improve productivity if irrigation was increased alongside water use efficiency (World Bank, 2018).

Climate and climate change

Zambia's climate comprises three major agro-ecological regions, with Region I receiving less than 800mm of rain annually, Region II between 800 and 1,000mm and Region III between 1,000 and 1,500 mm of rain (Figure 4). Temperatures, which are moderated by altitude, range between 18 and 26 degrees centigrade (World Bank Group, 2021). Zambia has a highly variable climate and has experienced a series of climatic extremes over the past decades including droughts, seasonal floods and flash floods, extreme temperatures and dry spells (World Bank Group, 2021). Assuming medium high emissions, by the end of the century, average temperatures are predicted to rise by about 3 degrees centigrade, and rainfall is expected to decrease across most of the country (World Bank Group, 2021). Such a temperature increase is very high and raises concerns for all sectors.

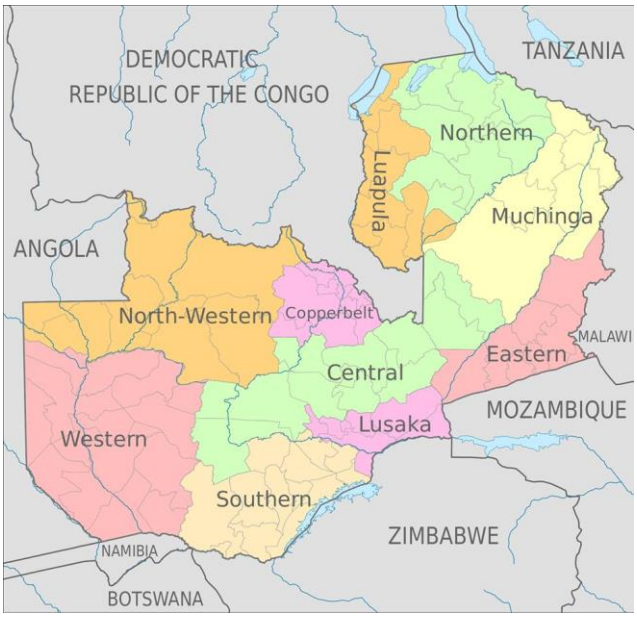


Figure 4 Map of Zambia showing provinces and neighbouring countries (Zambiareports.com, 2021)

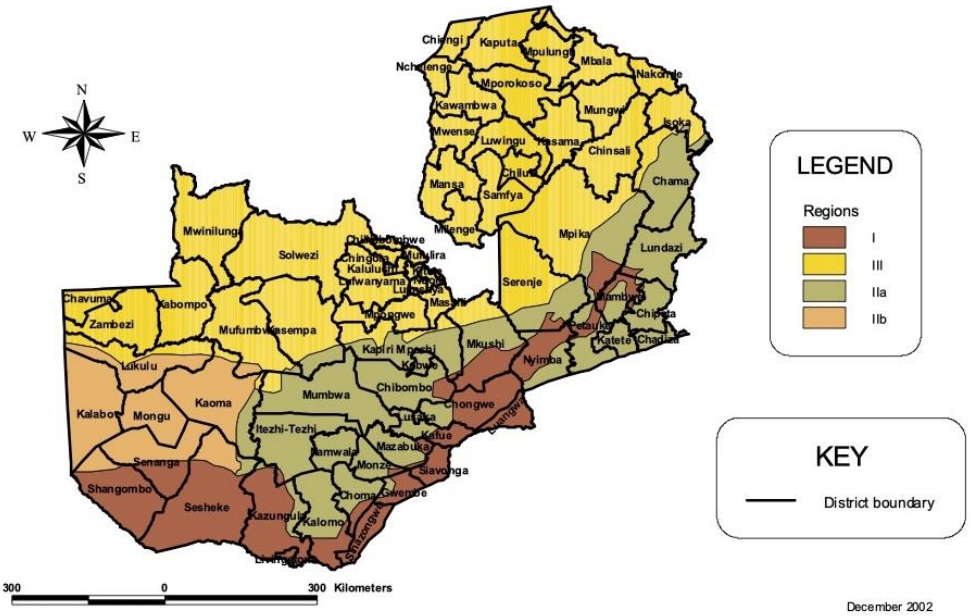


Figure 3 Agro-ecological regions of Zambia (Haggablade and Tembo, 2003)

2. Water Resources and Water Use

Surface water resources

Zambia contains six major surface water drainage basins, or catchments (Figure 5), comprising extensive wetlands, lakes, rivers and streams. The Zambezi[6] and the Congo[7] are the two major transboundary River Basins. The Luapula, Tanganyika and Chambeshi catchments are in the Congo River Basin in northern and north-eastern Zambia. The Kafue and Luangwa catchments are within the Zambezi catchment. The Zambezi River rises in the north west and flows through Zambia, ultimately to the Indian Ocean in a course characterised in the lower reaches by rapids, waterfalls and gorges. Thanks to a geological fault, the Victoria Falls has the steepest gradient and largest fall in the world, with the 1,700 m wide river dropping 100 m. However, many of all Zambia's surface water bodies are seasonal, especially in the western and southern parts of the country.

Groundwater resources

Figure 6 shows Zambia's aquifer types and productivity. The country's aquifers are classified into three main types):

- Aquifers where groundwater flow is mainly through fractures, fissures and/or discontinuities, classed as either highly or locally productive. These occur mostly in karstic limestones/marbles on the Copperbelt and stretch down into the Lusaka area.
- Aquifers where intergranular groundwater flow is dominant – which occur mainly in alluvial soils and Tertiary sand deposits
- Low yielding weathered and/or fractured aquifers with limited potential are largely in the Basement Complex, with some in igneous rocks (Earthwise, 2021).

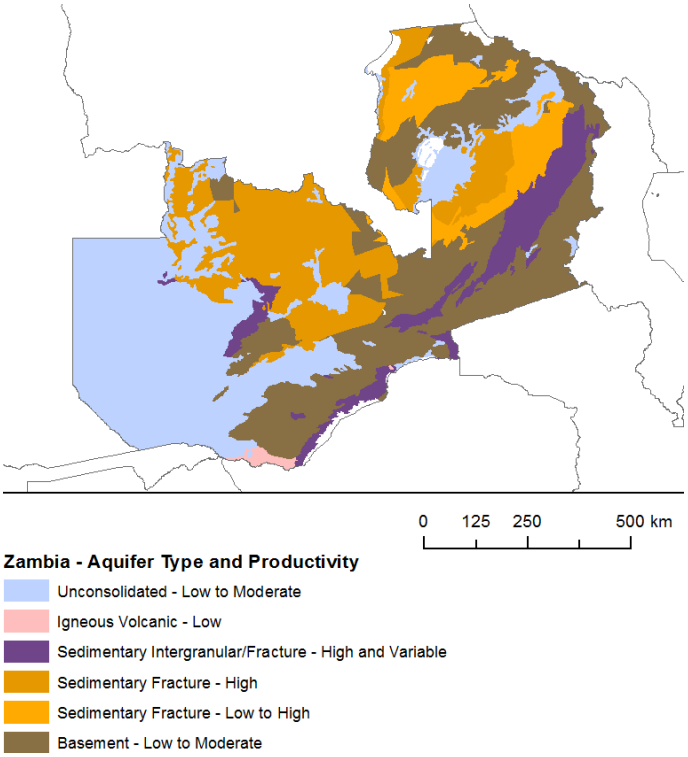


Figure 6 Aquifer Types and Productivity in Zambia

In general, water in rural areas is potable but the quality of groundwater in urban areas, threatened by low access to safe sanitation and microbiological contamination, is a widespread problem (Earthwise, 2021).

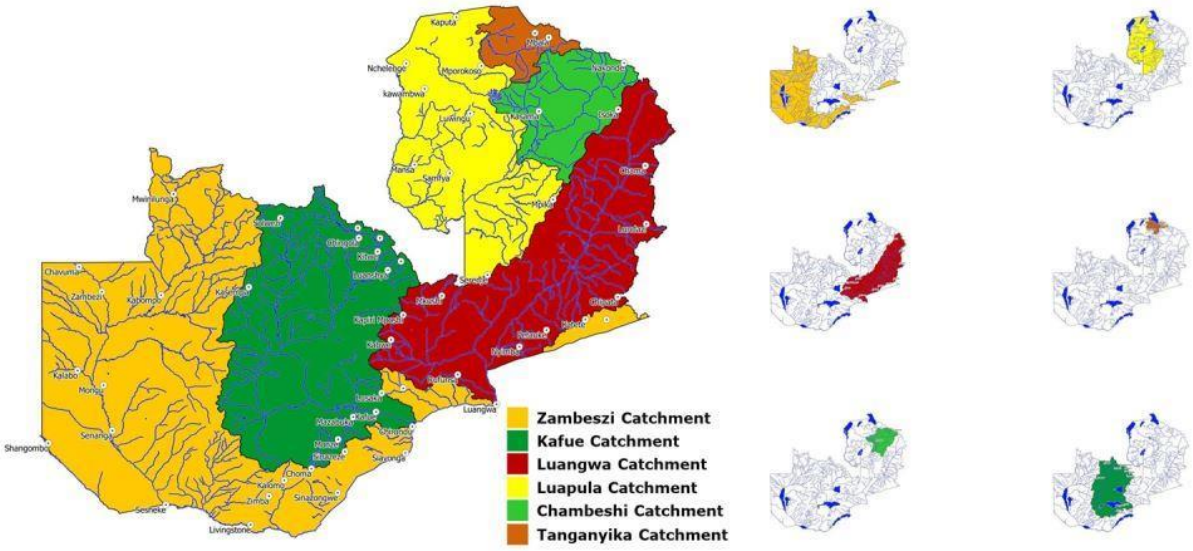


Figure 5 Aquifer Types and Productivity in Zambia

[6] The Zambezi Basin is shared with seven other riparian states: Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe.

[7] The Congo Basin is shared with nine other riparian states: Angola, Burundi, Democratic Republic of the Congo, Central African Republic, Cameroon, Republic of the Congo, Rwanda, Tanzania.

Lusaka, Zambia's capital is built on a plateau composed mainly of schists and dolomitic marbles. The dolomite is a very important aquifer that provides the city with almost half of its 'drinking water' needs (Waele and Roberto, 2003). The fissures facilitate good water storage and transmission, but are also highly vulnerable to pollution. Uncontrolled urban expansion and mismanagement of the water resource and of urban waste has led to an overexploitation of the aquifer and to a generalised water quality depletion (Waele and Roberto, 2003). Measures need to be taken to prevent further deterioration. The Copperbelt of Zambia is another environment where there is a high risk of groundwater pollution due to the high proportion of tailings impoundments, residue heaps, high-density informal settlements and extensive sulphur ore deposits which may leak into the groundwater (Waele and Roberto, 2003).

Water volumes

Zambia's estimated total renewable water resources are estimated to be 104.8 x 109 m^3 (including 47 x 109 m^3 from groundwater), and per capita total renewable withdrawals in 2017 were estimated to be 6,218 m^3/inhab/yr (FAO, 2021). An estimated 1.572 x 109 m^3, equivalent to 1.5% of total renewable water resources is presently withdrawn (FAO, 2012). Zambia is currently not water scarce[8] . However, the rapidly growing population coupled with climate change impacts and droughts will increase pressure on surface and groundwater resources. There are also general risks of water resources being polluted through mining, agricultural activities and lack of sanitation infrastructure. All of these place the availability of water, especially fresh water, at risk.

Water for agriculture and industry

Of the estimated 1.572 x 109 m^3 of total water currently withdrawn, 73% is for agriculture (crops and livestock), 8% for industry (including mining) and 18% for municipal water[9] (FAO, 2021). More detailed knowledge of water use for irrigation, industry and livestock watering is limited by a lack of data. Notably, crop production is primarily rainfed, with only 5.1% of total grain production currently irrigated (FAO, 2021). Of the total irrigable land, 70 per cent is not irrigated (World Bank, 2018). Zambian farmers, of whom an estimated 1.6 million are smallholder farmers, are vulnerable to fluctuations in rainfall. In 2005, local farmers estimated droughts occurring every five years in minor form and a major drought at least once every ten years (Chileshe, 2005). Improving water storage volumes and increased adoption of irrigation are expected to reduce this vulnerability.

Water for domestic use

Zambia's population of the 1960's and before depended primarily on surface water, but over the decades, reliance on groundwater has grown (WARMA, 2017b). In 2015, an estimated 90% of urban and 53% of rural dwellers in Zambia, corresponding to 67% of the total population, had access to improved drinking water supply as their main source (LCMS, 2015).

Groundwater contributes significantly to domestic and municipal water supplies, with its importance being very visible in rural areas (Figure 7). In rural areas, groundwater is accessed from a variety of sources, most commonly via boreholes or dug wells that can be fitted with an electric pump, hand pump, wind powered pump, solar pump, diesel pump or a rope and bucket. Figure 8 shows trends in the use of boreholes or hand dug wells as the main drinking water supply in rural areas between 1990 and 2015, illustrating that Zambia's rural population is increasingly reliant on these sources.

In the case of urban areas (Figure 9), as well as boreholes and wells, groundwater also contributes to tap water through municipal piped supplies (JICA, 2014), but prior to the promulgations of the groundwater regulations in 2018, there was no comprehensive overview of the use of groundwater contribution in piped supplies.

While there are piped water supplies in some of Zambian towns, water is not generally available 24 hours/day, with some schemes not able to meet volumetric demands (JICA, 2015). Of the eleven commercial utilities, Luapala and Western Province, for example, were reported to only provide nine hours of water supply, with Nkana, Kafubu and Chambeshi providing 14 hours per day (JICA, 2015). Informants cite low pressure in the pipes as another problem, causing water to merely trickle in some settings. Those that are not connected (e.g. in peri-urban Lusaka) rely on other sources (Mulenga, 2011). In recent years there has been an increase in drilling private water supply boreholes, including thousands in urban areas (Anon, 2021c), which is leading to concerns about local over-abstraction (Nkhuwa *et al*, 2018). As public water supply has failed to expand to meet the growing population, households have engaged in self supply, primarily from groundwater. The availability of groundwater and the boom in the drilling industry have brought private boreholes within the reach of many households, particularly those living in urban areas. Figure 10 shows increase in the use of boreholes as the main drinking water supply between 2004 and 2015 for the total Zambian population.

[8] Falkenmark defines water scarcity as occurring when annual per capita water supply is less than 1,700m^3 (Chileshe, 2005).

[9] Adds up to 99% due to rounding to the closest whole percentage.

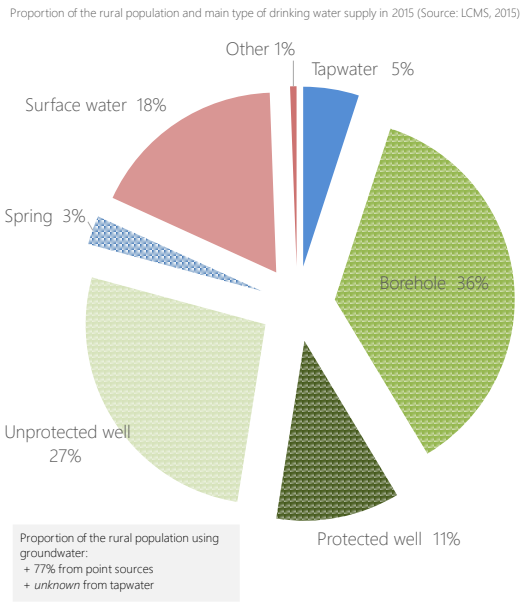


Figure 7 Proportion of the rural population and type of main drinking water supply in 2015 (LCMS, 2015)

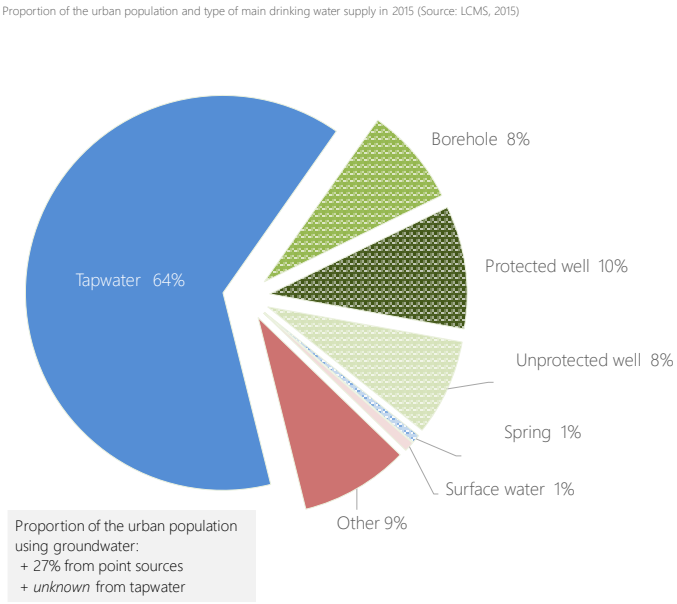


Figure 8 Proportion of the urban population and type of main drinking water supply in 2015 (Living Conditions Monitoring Survey, 2015)

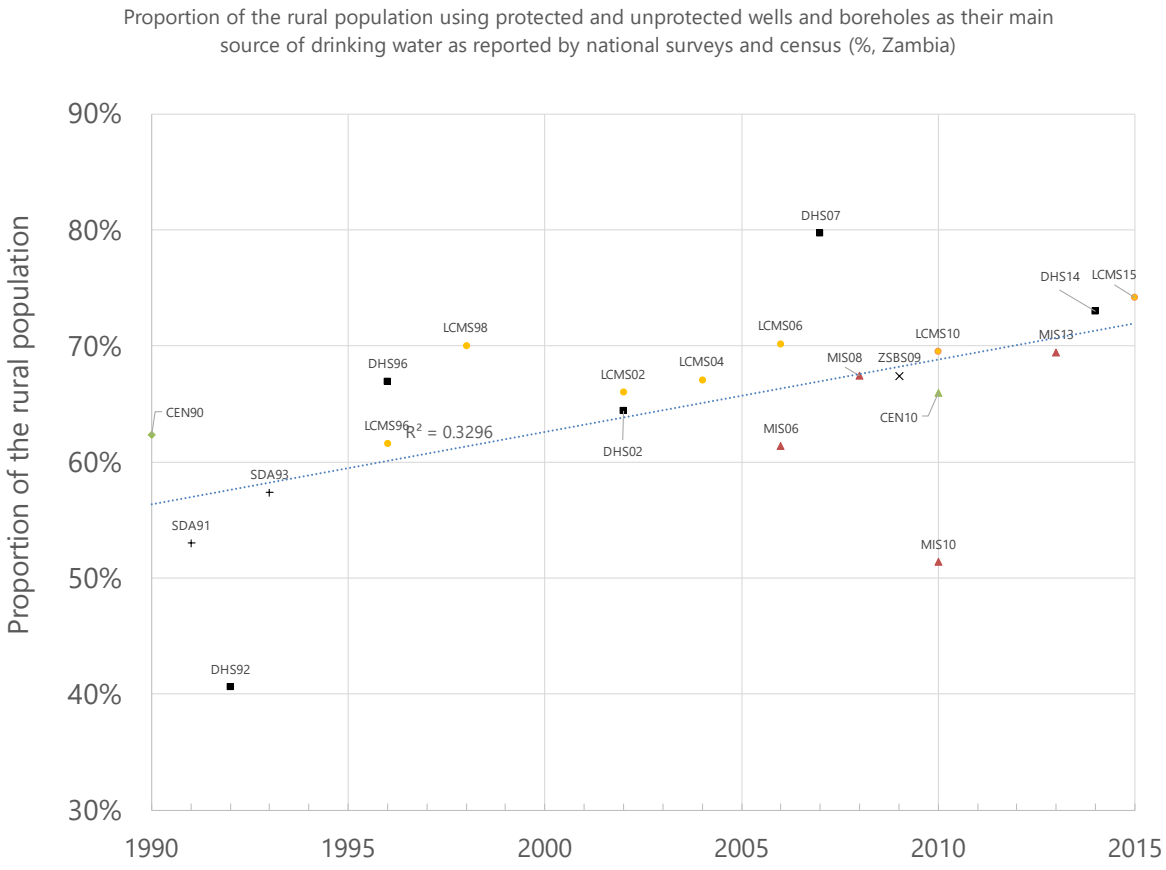


Figure 9: Proportion of the rural population of Zambia using a protected or unprotected well or borehole as their main source of drinking water (Source: Data from JMP, 2019)

Abbreviations: CEN = Population and Housing Census; SDA = The Social Dimensions of Adjustment Survey; DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey; LCMS = Living Conditions Monitoring Survey; MIS = Malaria Indicator Survey; ZSB = Zambia Sexual Behaviour Survey

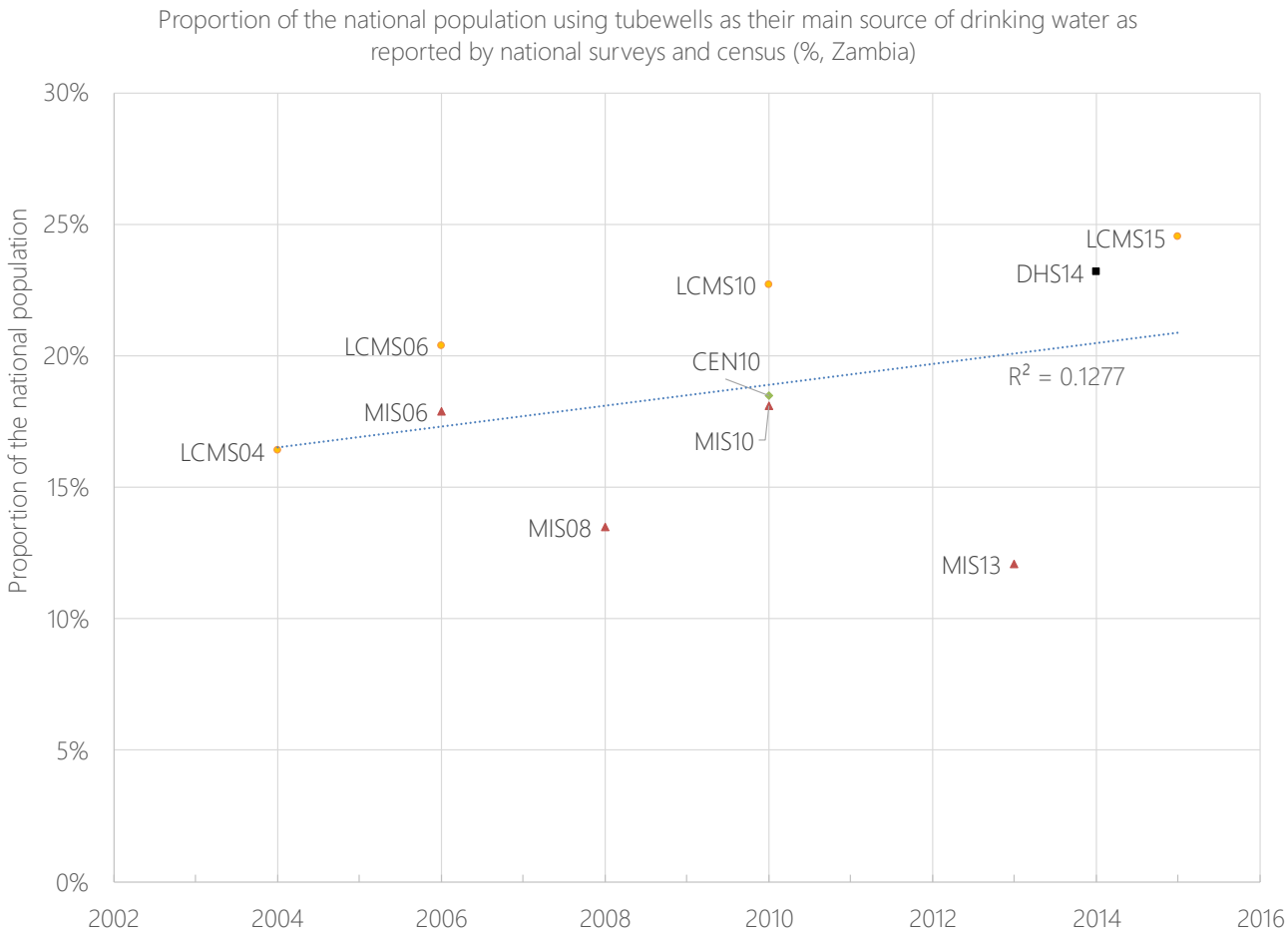


Figure 10: Proportion of the total population of Zambia using boreholes as their main source of drinking water (Source: Data from JMP, 2019)

Abbreviations: CEN = Population and Housing Census; LCMS = Living Conditions Monitoring Survey; MIS = Malaria Indicator Survey; ZSB = Zambia Sexual Behaviour Survey

3. Policy and Legal Framework

National Water Policy 2010

The WRM Act, 2011 is a culmination of efforts that commenced prior to independence[10] to regulate the development of the country's water resources, including reforms of the water sector in the late 1980's and early 1990's (summarised in Box 2). The Water Policy, 2010 aims to harness the water resources of the country for efficient and sustainable economic productivity and poverty reduction. The guiding principles are:

- Water is a basic human need
- Government shall be the trustee of the nation's water resources and will ensure that water is allocated equitably, protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner
- Domestic and non-commercial needs and the environment shall enjoy priority of use of water
- There shall be equitable access to water
- Water has a social value, and all domestic and non-commercial use of water will not be required to obtain a water permit

A key element of the Water Policy, 2010 is the recognition that water has an economic value and the cost of facilitating its use has a significant administrative cost element, which will be reflected in the fees for water permits for the use of water resources for economic purposes. This, economic value provides a cornerstone of the subsequent WRM Act, 2011.

National Water Policy, 2010 paved the way for the WRM Act, 2011, which established WARMA. The Policy is the basis for the subsequent development of the SI's documented in this study, with the following issues being particularly pertinent:

[10] The influence of colonial desires, and subsequent common threads over the 72 years since the Water Act, 1949, particularly pre– and post–independence and their implications for the country, warrant further study, particularly in the light of ongoing debates about the ongoing influence of colonialism in the water sector of former colonies.

- Recognition of the cross-cutting nature of water resources and including different sectors.

- Recognition of 30 other stakeholders other than the Ministry of Energy and Water.
- Repealing the Water Act 1949 to be replaced with new legislation, providing a framework that promotes Integrated Water Resources Management and effective regulation which harmonises all relevant legislation to avoid overlaps, conflicts and inconsistencies.
- Stipulation that permits are required for the use of water resources reflecting both the social and the economic value of water resources but that domestic and non-commercial uses of water resources will not be required to acquire permits.
- Recognition of the importance of reliable data and information on water resources for planning and decision making, including a water resources information management system, coupled with regular monitoring and assessment in conjunction with relevant institutions.

The National Water Policy, 2010 has been revised and superseded by the National Water and Sanitation Policy, 2020. However, the SIs documented by this study emerged from the 2010 policy, which is the reference of this report.

Water Resources Management Act, 2011

The WRM Act, 2011 supports the implementation of an integrated framework for water resources management which promotes infrastructure development in support of economic growth, poverty reduction and climate resilience. Central to the Act is that water is defined as a public good, and is thus amenable for regulation by government. Whereas previously, under the Water Act, 1949, the Water Board had been responsible for allocation of water and issuing water rights the WRM Act, 2011 paved the way for the establishment of WARMA to regulate the use of a public good. The WRM Act, 2011 contains 16 parts, as listed in Box 3, with the specific water use and groundwater aspects covered by the three SIs promulgated in 2018 highlighted in bold.

A review of the Act by WARMA found 64 instances that require SIs, which were clustered into eight themes[11]:

- Four themes concerned surface water and other general provisions, i.e., (i) catchment designation and delegation of functions, (ii) permits and allocations and permits for easements, (iii) reserve/statutory flows and **(iv) Fees and Charges**.
- One concerned (v) dams and other water works.
- The remaining three concerned **(vi) Groundwater and Boreholes**; (vii) **Licencing of Drilling companies** and (viii) Drillers and Water resource protection areas.

Although the first four themes were at an advanced stage (so-called Layman's Draft), by March 2016, only **Fees and Charges** have been promulgated (SI 18) alongside two groundwater-specific SIs covering **Groundwater and Boreholes** (SI 20) and the **Licencing of Drilling Companies** (SI 19).

The reasons for the ongoing delay in the other SIs are beyond the scope of this study. However, this leaves important gaps in the fulfilment of the WRM Act, 2011, including in relation to groundwater, and for the mandate of WARMA. The WRM Act, 2011 provides for the establishment of catchment and sub-catchment councils as well as user associations to implement the provisions of the Act at local level (Box 4). Unfortunately, subsidiary legislation for these is not yet in place, and so, decentralised and localised implementation cannot be carried out.

The lack of subsidiary regulations for other aspects of the WRM Act, 2011 significantly undermines the Act, and WARMA's function, particularly as the legal representation by local and traditional authorities and water users, is lacking. One interviewee expressed that momentum has somehow been lost in the regulatory process while another stated, *"WARMA is supposed to have established catchment area committees and sub-catchment committees, but these are not in place. The whole regulatory basis is to start with the users, but as these committees are missing, this cannot happen. Does WARMA want them … or are the regulations simply a cash cow?"*

However, there are aspects of Zambia's WRM Act, 2011, beyond the licencing and permitting in relation to groundwater development which the authors consider as inspirational, particularly in relation to governance, recognition of traditional practices, prioritisation of water use and what has precedence as outlined in Box 4.

Box 2 The Water Resources Management Act (2011) Parts

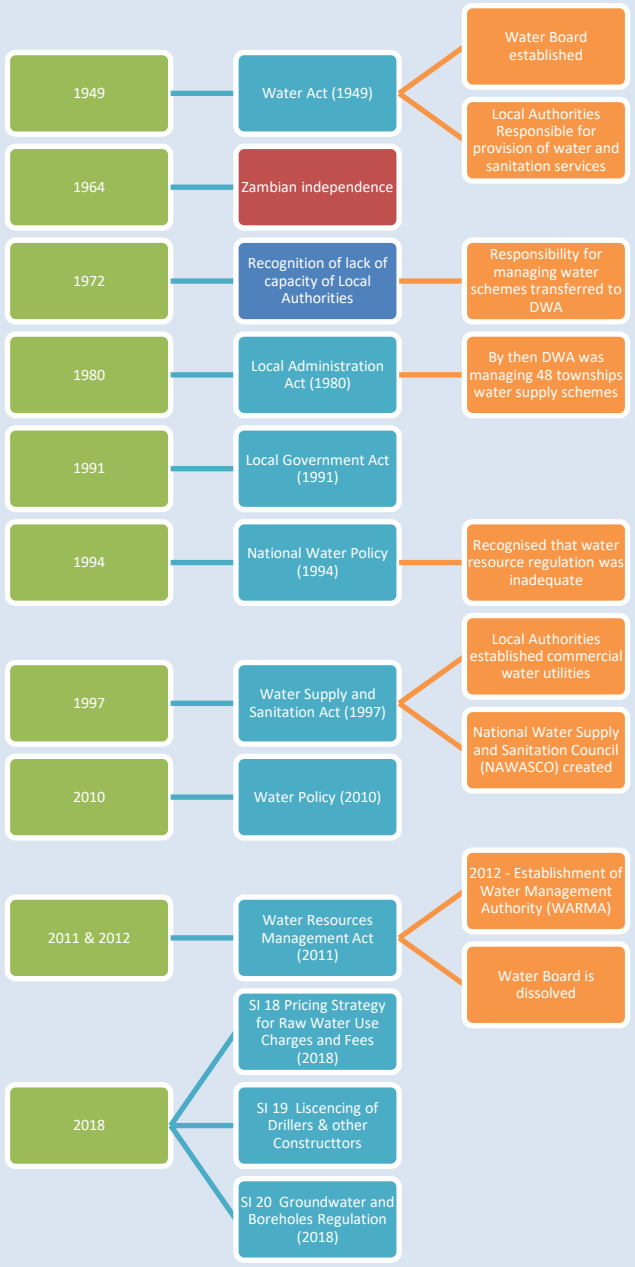
I.	Preliminary
II.	The Water Management Authority
III.	Catchment councils, sub-catchment councils and water users associations
IV.	Water Resources planning
V.	Water quantity and quality management
VI.	Water storage areas
VII.	Water quantity and quality management
VIII.	Water use
IX.	Permits for water use
X.	Licensing of Constructors and Drillers
XI.	Groundwater and Boreholes
XII.	Water works
XIII.	Easements
XIV.	Emergency situations
XV.	Water use charges, fees and water development trust fund
XVI.	Enforcement and general provisions

[11] Note that the names no longer all coincide with the names of the proposed SI's.

Box 3 Historical Background to the National Water Policy 2010

Regulation of the water resources of Zambia began in 1949, when a Water Act was enacted by the British colonial government. The act supported the establishment of the Department of Irrigation and Rural Development, which became the Department of Water Affairs (DWA). DWA had the mandate to manage and develop water resources for industrial use and to accelerate rural development through irrigation. DWA had responsibility for all aspects of water resources development in the country. By 1980 it was managing 48 township water supply schemes. DWA was regulating and managing the water resources of the country as well as being a user.

Other pieces of legislation and institutions dealing with environmental management compounded overlaps, as well as conflicts of roles and responsibilities. To address the situation, from the 1970s onwards the government commissioned several water reform initiatives to improve the management of and accessibility to water resources. In 1994, a National Water Policy was developed. In 1996, the government adopted the Water, Sanitation, and Health Education (WASHE) concept as a national strategy for the improvement of rural water supply and sanitation services. The strategy is implemented through district level committees (Government of Zambia, 2010).



The 1994 Water Policy was revised in 2004 to align with lessons learned, the Rio Declaration, the Millennium Development Goals, New Partnership for Africa's Development and the Southern African Development Community Revised Protocol on Shared Watercourses (SADC, 2001). There was also the need to re-examine the role of the water sector and priorities of the national development planning process and to integrate cross cutting issues such as gender, HIV/AIDS and climate change, as well as to re-consider the institutional and legal framework, align it to modern principles of water resources management and harmonise it with other pieces of legislation. The revision culminated in the National Water Policy 2010 (Government of Zambia, 2010).

Box 4 Inspiring Aspects of the Water Resources Management Act (2011) (Author's Emphasis)

Part I Preliminary
Section 5 (2) The Authority shall ensure that traditional practices as recognised in customary areas and which are beneficial to water resource management are taken into account in the management of water resources.
Part III Catchment Councils, Sub-catchment Councils and Water Users Association
Section 17 (1) and (2). A catchment council shall be constituted for each catchment comprising three representatives from the provincial administration situated in the catchment and not more than nine other stakeholders representing, as far as is possible, the users of water in the catchment, nominated by the users of water.
Part IV Water Resources Planning
Section 29 (2). The Minister may, on receiving a recommendation from the Board, declare, by statutory notice, a catchment, sub-catchment or geographic area to be a water resource protection area requiring special protection.
Section 30. In the approval of any proposal the Board shall — (a) ensure the protection, conservation and sustenance of the environment;...(d) respect any national heritage site or monument declared under the National Heritage Conservation Commission Act; (e) collaborate with the appropriate authorities responsible for wildlife, natural resources, tourism and forestry; and (f) ensure the right of access by members of the public to places of leisure, recreation or any natural beauty related to a water resource.
Part V Water Quantity and Quality Management
Section 44. The Minister shall, on the recommendation of the Authority, by notice in the Gazette and in a daily newspaper of general circulation in Zambia, specify the reserve for all or part of a water resource.
Part VI Water Shortage Areas
Section 51(1). The Minister may declare any area as a water shortage area, where the Minister is satisfied that there is a need to mobilise water resources.
Section 52 (1). The Board may, ... in respect of a water shortage area — (a) suspend or amend any permit; (b) make orders in relation to the use of any water;
(c) with the consent of the Minister and the traditional authority, where the area falls within customary land as provided in the Lands Act, enter or authorise any other person to enter on any land for the purpose of — (i) using water from any water works, borehole, mine or quarry on the land; (ii) sinking boreholes on the land and using water from the boreholes; and (iii) conserving the water.
Section 52 (2) (c). The Board shall pay compensation to the occupier of the land, as may be prescribed by the Minister, by statutory instrument.
Section 52 (3) ....in a water shortage area, the following purposes shall have priority in that order: (a) domestic and non-commercial purposes; (b) environmental purposes; (c) municipal purposes; and (d) agricultural purposes.
Section 53. (1) A person shall not, in a water shortage area, sink, deepen or alter a borehole for any purpose before obtaining a permit.
PART VIII Water Use
Section 61 (2). When classifying water for various purposes a sub-catchment council shall, ... (e) ensure that the following purposes have priority in that order — (i) domestic and non-commercial purposes; (ii) environmental purposes; and (iii) any other purposes determined by the sub-catchment council in order of the development and management priorities;
Section 63. A person who intends to apply for a permit to use water for any purpose, other than for domestic and non-commercial purposes, in a customary area and that use is likely to substantially affect the supply of water for domestic and non-commercial purposes for the occupants of that customary area, that person shall, prior to making an application to the Director-General (a) obtain approval of the traditional authority in that area; and (b) put in place alternative means for securing water for domestic purpose.
PART XII Water Works
Section 108. (1) A Government scheme shall take precedence over a community project and all other purposes for the use of water. (2) A community project shall take precedence over all other purposes for the use of water, except a Government scheme.

Water Resources Management Authority

WARMA became operational in October 2012, with the Board of Directors inaugurated in April 2013. However, there was an interim period with no Board, with a board put in place in November 2017. The organogram is reproduced in Figure 10. The WRM Act, 2011 provides for a decentralised system of management that manages water resources at catchment and sub-catchment levels. Zambia's catchment areas are shown in Figure 6. Kafue Catchment Office was established in January 2016, and now has offices in Lusaka and Mazabuka. This was followed later in 2016 by Luangwa (in Kabwe) and Chambeshi (also in Kasama), and in 2017 by Zambezi Catchment Office in Livingston. Tanganyika and Luapula catchments are currently overseen by the Chambeshi Catchment Office in Kasama.

As of 15 May 2021, WARMA had a total staff of 79[12] including, 12 (Kafue), 10 (Luangwa), 9 (Chambeshi), and 7 (Zambezi). In terms of staffing structure, each catchment should have a manager, hydrologist, hydrogeologist, hydro technician, hydro informatics officer, inspector(s) and office assistant. As a relatively new organisation in a vast country, coupled with the promulgation of the new regulations in early 2018, roles and responsibilities between posts were not always clear. According to WARMA, it is not currently possible for the agency to fill up the full structure of the organisation due to a lack of

[12] As reported verbally to lead author by WARMA staff member.

funding, with the combination of revenue from water use charges and government funding not sufficient (Anon, 2021a).

As a simple comparison, the Netherlands, with a similar population size to Zambia, employs over 11,000 staff in 21 water authorities to manage water defences, quantity and quality, and navigable waterways (Dutch Water Authorities, 2017). While the tasks currently undertaken by WARMA are not of the scope or scale of the authorities in the Netherlands, the authors argue that it is still worth noting that WARMA has less than 1% of staff numbers in comparison.

Stakeholders

WARMA grouped all of the stakeholders that would be affected by the regulations into nine segments. These are set out in Figure 12, which also shows interactions between the different groups. National bodies such as the Zambian drillers association[13] and Zambia National Farmers Union (NFU) are particularly important to engage with as they represent the interests of their members.

It is important to note that while hydrogeologists are not explicitly mentioned in the regulations, they are included under the term 'engineers'. According to WARMA, hydrogeologists must be members of the Engineering Institution of Zambia (EIZ) and so are also covered by SI 19. There is a requirement for hydrogeologists to register annually with WARMA, for which they pay a fee (Table 1) and receive a receipt/certificate.

4. Three New Statutory Instruments

Developing the new regulations

The SIs were developed by WARMA and supported by the Ministry of Local Government and Housing with external support agencies GIZ[14], BGR and UNICEF, with inputs by the Department of Water Resources and Development (DWRD)[15] and others. The scope, methodology and timeframes for developing the groundwater regulations were defined in May 2015. From then up to promulgation in March 2018, the process of developing the three SIs included a process planning meeting, three stakeholder workshops with technical specialists, an online discussion to support learning from other countries, public consultation with farmer groups, mining and hydropower companies and municipal and industrial users, and a series of meetings between WARMA and the Ministry of Justice (see Annex). It was noted, however, that there were relatively few participants from the private sector despite its importance.

From those involved who were interviewed, all expressed the opinion that the process had enabled their views to at least be heard and considered, even if this had not been finally incorporated, and that the process enabled many issues to be clarified. It was also noted that the technical recommendations contained significantly more issues than were finally incorporated into the regulations themselves.

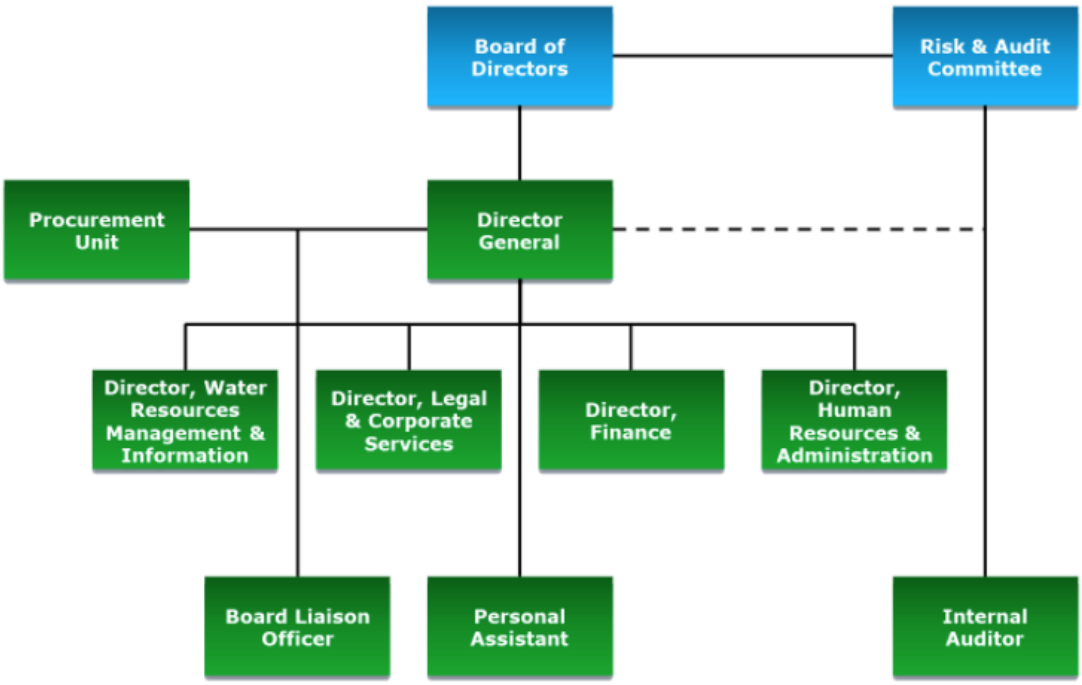


Figure 11 Water Resources Management Authority Organogram (WARMA, 2021)

[13] There is no requirement of a driller's association in the WRM Act, 2011, but, as in other countries, it has been deemed useful to bring drillers together under one umbrella and thus enable them to thus jointly raise concerns with government and other stakeholders. Although a Drillers Association of Zambia has been established, and is active, including striving to improve the capacity of the drilling sector, concerns have been raised regarding its legal status as a private limited company rather than as an association or an NGO. By its nature, the governance of a limited company may not be the ideal fit for a membership organisation.

[14] The process was supported by GIZ, who were involved in crafting the Water Act, 2011 (i.e. before WARMA was established in 2012), with a technical GIZ team working alongside the Water Board that in place prior to WARMA, with a staff of four.

[15] Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP).

WARMA established technical working groups that worked on the technical content of the SIs. BGR paid for consultants for each group, as well as a lead consultant to pull all of the themes together, while DWRD provided technical inputs. Notably the lead consultant remained with the process from its initiation, right through to promulgation in March 2018. UNICEF supported the consultative processes for the SIs in the country. Skat and UNICEF ran an e-discussion through the Rural Water Supply Network (RWSN) on licensing, permitting and groundwater protection (Danert *et al*, 2016).

The process planning and stakeholder mapping meeting in mid-March 2016 was instrumental in clarifying roles, given that several partners were offering piecemeal support and the need to consider the interface between technical and legal aspects (Nyoni, 2016b). However, the process planning stopped at dissemination and awareness raising and did not cover the launch, or what it would mean for WARMA, water users and drillers once the SI's were promulgated. This proved to be an oversight with significant consequences, as discussed below. The legal drafting of the SIs, was undertaken by the Ministry of Justice. This meant that questions could be answered throughout, which may well have brought about a speedier process to promulgation than would have been the case had private legal consultant been involved as had been envisaged.

The WRM Act, 2011 (Section 150) requires that charges and fees are in accordance with a pricing strategy issued by the Minister, in consultation with WARMA. Charges and fees are to provide reasonable returns on costs associated with: the management of water resources; the processing of hydrological and hydro-geological data and information; and water related infrastructure investments. In January 2018, after a series of country-wide consultations and deliberation with major categories of water users, the Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP) published the Pricing Strategy for Raw Water Use Charges and Fees. The strategy sets out the principles, objectives and approaches for pricing all activities for the use of raw water where permits are required under the WRM Act, 2011 and forms the basis for SI. 18.

Three SIs were set up to cover certain aspects of groundwater regulation. SI 18 outlines the charges and fees, SI 19 sets standards for borehole drilling, drilling (companies), constructors and engineers, and SI 20 covers groundwater use. SIs 19 and 20 also stipulate the information required from drillers and constructors, and groundwater users respectively. The latter two SIs provide WARMA with the legal basis to collect information on past and new boreholes drilled, as well as about and from drillers and constructors. SI No 18 introduces collection of fees and charges for groundwater, thus generating additional revenue for WARMA. In the case of surface water, fees and charges have been updated with this SI.

Statutory Instrument No. 18 – Water Resources Management (Charges and Fees) Regulation 2018

SI No. 18 was is in accordance with Sections, 7, 150, 151, 152 and 153 of the WRM Act, 2011. It covers surface and groundwater, stipulating the fees and charges applicable to various extractive water users, i.e. hydropower, agriculture, mining, industry and municipal as well as non-extractive users. Dilution permits, drainage and water works dams, weirs and diversion canals are also covered. Table 1 presents the items specifically relating to groundwater. While there is a fee for a permit for domestic boreholes, there are no water use charges. However, there are water charges for commercial use (e.g. mining, industry and agriculture). SI 20 specifies the types of drilling companies whereas SI 18 sets out their licence fees. SI 19 puts the duration of the drillers licenses at three years, but with an annual renewal by 31 October First Schedule – Form. II).

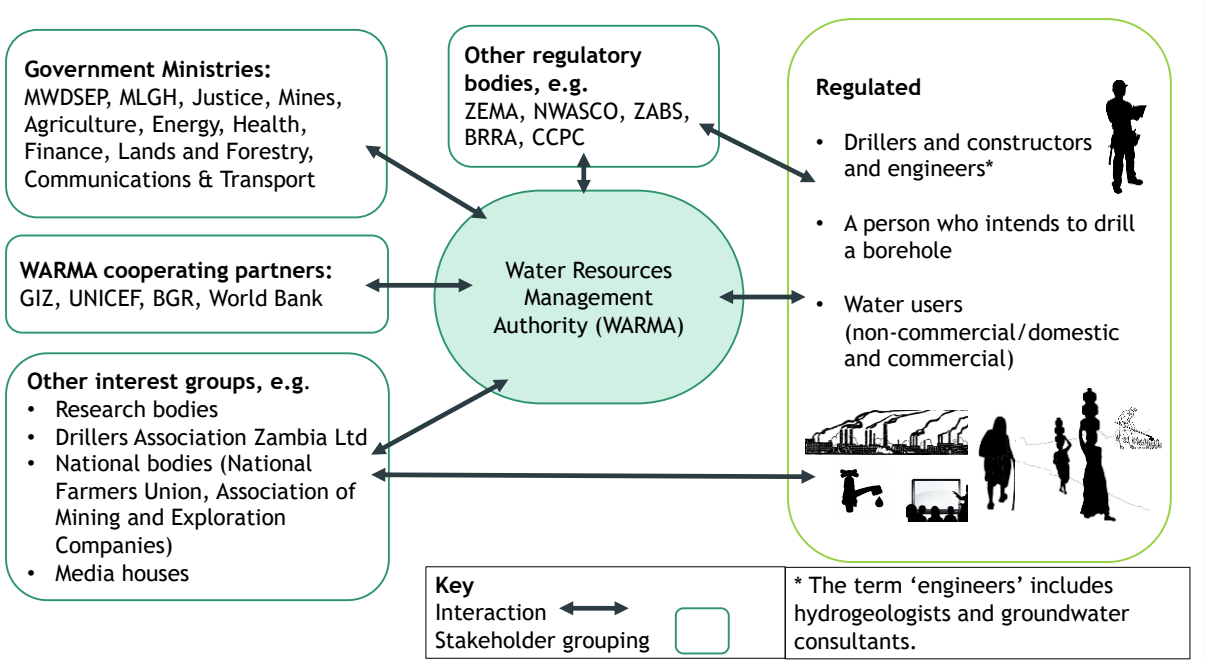


Figure 12 Actors and interactions in the regulatory space

Table 1 Fees and charges relating to groundwater in SI No. 18

Activity	Fee unit	Fee in ZMW*	Fee in USD**
Registration of a borehole (one off)	833.33	250	11
Application for a permit to drill a borehole (one off)			
Domestic	833.33	250	11
Commercial	1666.67	500	22
Drillers License			
Category A (Zambian)	100,000	30,000	1,348
Category A (Non-Zambian)	266,666.67	80,000	3,595
Category B (Zambian)	66,666.67	20,000	899
Category B (Non-Zambian)	166,666.67	50,000	2,247
Category C	33,333.33	10,000	449
Category D	6,667.67	2,000	90
Register of Constructors, Engineers and Drillers			
Zambian	833.33	250	11
Non-Zambian	1,666.67	500	22
Access charges (per m^3) and usage tariff***	These depend on type of use and volumes		

Notes:
* Between 2018 and 2021, one fee unit = 0.3 ZMW;
** Exchange rate 22.2532 ZMW = 1 USD, 30 April (buying USD at 0% (https://www1.oanda.com/currency/converter/)
*** Domestic use of 10m^3 is exempted

Statutory Instrument No. 19 – Water Resources Management (Licensing of Drillers & other Constructors) Regulation 2018

SI 19 is in accordance with sections 88 and 89 of the WRM Act, 2011 and provides for the application for, modification to or renewal of a license by whoever intends to engage in the business of drilling. Successful applicants are to be issued with a license by WARMA. The license can be revoked where the licensed violates the conditions of the license. WARMA is to maintain a register of **licensed constructors, drillers and engineers.** The three schedules that accompany SI 19 are summarised in Box 5. The penalty for contriving the regulation, if convicted, is 100,000 penalty units (currently ZMW 30,000, or USD 1,348 based on exchange rates in Table 1) or up to 12 months of imprisonment or both.

Statutory Instrument No. 20 – Water Resources Management (Groundwater and Boreholes) Regulation 2018

SI 20 is in accordance with section 179 of the WRM Act 2011. It provides for:

- An application to drill borehole should be made to WARMA.
- Location of a borehole meets the minimum distance specified in the Second Schedule (Box 6)
- A successful borehole is installed with: full casing of the borehole from bottom to the top; gravel pack; bottom plug; sanitary seal.
- An unsuccessful borehole is backfilled, and capped with grout within 24 hours.
- A defective borehole reported to WARMA or a catchment manager within 14 days.
- Contravention can result in a prison term not exceeding twelve months or a fine of not exceeding one hundred thousand penalty units.

Box 5 Summary of the three schedules that accompany SI No. 19

Schedule Number:

1. Forms I, II and III:
   - Form I – Application for a Groundwater Drilling License.
   - Form II – Format of the Drilling License containing the particulars of the applicant and the seal of WARMA. It states the conditions of the license (i.e. not transferable, can be revoked for lack of adherence and three-year validity)
   - Form III – Notice of Refusal to Grant a License which notifies an applicant whose application has been refused and the grounds for refusal.
2. Classes of Drilling License:
   - Class A should have at least four drilling rigs, and three test pumping units plus four cargo trucks. Minimum staff requirements are four drilling supervisors, four drillers and two hydrogeologists/geologists.
   - Class B should have at least two, but no more than four rigs, two test pumping units and two cargo trucks. Minimum staff requirements are one drilling supervisor, two drillers and one hydrogeologist/geologist.
   - Class C should either have one rig or hires a rig, one test pumping unit and one cargo truck. . Minimum staff requirements are one drilling supervisor, one driller and hydrogeologist/geologist.
   - Class D should have low-cost technology/manual drilling and one driller.
3. Format of the Register of Drillers and Engineers containing name, address, license number, class of license, dates of issuance and expiry of the license for each individual licensee.

Box 6 Summary of the two schedules attached to SI No. 20

The First Schedule contains six forms.

- Form I Notice to Drill a Borehole to be submitted by the owner
- Form II Application to drill a borehole (requires that before submitting the form, all the required information should be completed. A domestic borehole applicant should submit a sketch map or site map covering a radius of 30 metres showing the property boundary, road, distance from septic/pit latrine or any other potential pollution source. This implies that the regulation covers domestic boreholes).
- Form III Notice of Grant to Drill a Borehole
- Form IV Notice of Refusal to Drill a Borehole
- Form V Borehole Registration Form
- Form VI Defective Borehole Report

The Second Schedule contains the thresholds for toxicity in a defective borehole, minimum distances between boreholes in relation to water quantity, minimum distances between boreholes and pollution sources and the register of boreholes. Minimum distances between boreholes are 50m for intergranular – porous or fractured sandstones and fractured basements; 30m for the fissured deep weathered zone and 100m in cavity or karstic fractured limestone and 200m in unconsolidated sediments. Distances to pollution sources range from 30m (to a pit latrine, septic tank and soakaway and unprotected shallow wells) to 500m to cemeteries.

5. Promulgation

Communication

The change brought about by the WRM Act, 2011 and the three new SIs is significant, as it is a shift from water users able to use groundwater on their land without recourse, to having to request permission. Thus, for WARMA and its partners, it was very important to ensure that water users and the drilling industry were made aware of the regulations, including the law underpinning them. When the new regulations came into force in March 2018, WARMA ran a communications campaign to raise awareness among the general public, including newspaper articles (Lusaka Times, 2018), as well as TV and radio spots.

Stakeholders interviewed were very positive about the way it was done, and its achievements, e.g. "WARMA has done a good job at explaining why they want the regulations, and that they want to get a good picture of groundwater use and quality for the country". Drillers have heard that it is beneficial for them because it enables only good drillers practising in the country.

Most interviewees recommended that communication to the public should continue, and was pointed out that in some cases, particularly in rural settings situated far from Lusaka, face-to-face interaction may be the only way to really enable water users to understand the regulations and what is required. Apart from the traditional media, there are several other existing channels (e.g. civil society organisations, National Farmers Union, Chamber of Mines, Drilling Association) which are well-placed to bring information to the attention of water users and drillers.

Launch

"Regulation is messy if you already have infrastructure in place that you are trying to regulate retrospectively" (study interviewee).

The regulations came into force as soon as they were promulgated on 11 March 2018. Initially, a deadline of six months was set for registration of existing boreholes. The result was an influx of people registering in-person with paper applications at the WARMA head office in Lusaka as well as at the Catchment Offices. This was the only registration option available at the time. Given the few WARMA offices around the country, this meant that some people had to travel considerable distances. To quote interviewees: "*the start of the registration caught [WARMA] unawares*"; *"the day of the first deadline to register existing boreholes there was a traffic jam in front of WARMA Lusaka offices as so many people wanted to register"* and "*WARMA staff had so many people coming in at once to register that some could not get on with their regular activities*". The initial short deadline was not practical, and thus was extended.

Neither the administrative procedures nor the staffing were in place to deal with the volume of borehole registrations. Furthermore, WARMA's administrative and Information Technology (IT) systems to support the registration process were inadequate to deal with the quantity. There was initially no mechanism to track payments electronically. Instead, WARMA officers were tasked with hand-checking bank payment receipts in order to issue borehole permits as well as drillers licences. In order to deal with the situation, staff with different mandates had to be drafted to support the registration process, and were thus at times prevented from undertaking their regular activities.

In addition, with no grace period for the registration of drillers, any drilling company operating without a licence was operating illegally. According to one interviewee, there was initially considerable inertia among the drillers to apply … "*for two weeks, drilling in Zambia came to a standstill*". According to WARMA, the first drillers licence was issued on 25 March 2018. As noted above, the process planning had not gone beyond promulgation. Such an important oversight is a very important lesson for others, and for introducing new regulations in Zambia in the future. In hindsight, a grace period for driller registration was needed, and administration, including a suitable IT system to process the registrations should have been established (and tested) beforehand. However, how this would have been financed, and whether it would have extensively delayed promulgation are open questions.

6. Compliance and Enforcement

Registration of drilling companies, constructors and engineers (SI 19)

Within 2019 drilling licences and water permits could be applied for online. Today, there seems to be high motivation among the drilling companies to ensure that they are licenced. It has been suggested that the harsh measures initially, while very distressing for some, did contribute to setting the tone of the need for compliance across the drilling industry. To quote one interviewee, "*The impounding of drilling equipment in North West province was good for enforcement and creating awareness … especially given how [Zambia] has struggled with enforcement*".

Several interviewees mentioned that some drilling companies had subsequently moved their businesses across the border to neighbouring countries to avoid the new regulations. It has not been possible to follow this up or obtain an idea of numbers within the scope of the study.

The regulations stipulate that if a drilling licence is rejected, WARMA informs the driller within one month. However, interviewees indicate that this is not always adhered to. Any delays in licencing are not only stressful for the drilling company, but may result in them operating illegally as they try to keep their business operational in the interim.

Prior to the promulgation of the SIs, submission of borehole construction reports to WARMA was undertaken as good industry practice but was not a requirement. Since March 2018, drilling contractors have been obliged to submit their reports, and according to WARMA, in general, they are doing so.

Application for permits, registration of boreholes and registry of boreholes (SI 20)

One interview stated that ensuring compliance with regulations within Zambia in general is not easy. Another said *"I feel obliged… [and] want not to make things worse"* (reflecting on the importance of water resources management for the country). Another interviewee stated that most of the drillers in Lusaka are complying, as evidenced by when you ask them to drill, they will respond saying "*give us time to register [for a drilling permit]*".

It took some time for the required process for borehole permits to be fully understood by the drillers, who, according to interviewees, now often (but not always) apply for permits on behalf of the clients for whom they drill. Drillers require a licence in order to be able to process the permits for clients, so without one they cannot proceed.

With a few exceptions, timely and short turnaround of permitting by WARMA was reported by interviewees. It was noted however, that if drilling permits are not issued promptly, there is a danger that the opportunity to drill could be lost, as money set aside to drill may suddenly be diverted for other pressing needs. This is a particular concern in rural areas where manual drilling for self-supply sources is practised: "*people do everything to get water, and so a week for a permit is too long*".

One interviewee explained that drilling permits have been denied in some places where there are water quality issues or contamination or where there is insufficient water.

Coverage and priorities

Several interviewees were of the opinion that there is drilling taking place in the country without borehole permits, and in some cases, that drillers are operating without drilling licences. However, WARMA presently do not have the capacity to enforce the regulations fully. As they are much more visible, regulating the mines and other industry, as well as large farms, is much easier for WARMA to do than trying to cover the millions of smallholder farms, small businesses and domestic users.

Experiences of WARMA and their approach

Interviewees generally expressed considerable goodwill towards WARMA, commending them, e.g.:

- "The job that was given to WARMA is tremendous and they are doing what they can."
- "WARMA has really tried, especially in urban areas".
- "WARMA are trying their best, and we can see that they are struggling".

However, a number of concerns were also raised, as follows:

- WARMA behaviour: At times, WARMA staff *"behave too much like policemen"*. Threats of fines are commonly used when in the field. Interviewees mentioned that water users, including the private sector, should be considered more as partners. *"Regulation is not just the responsibility of the regulators."* Behaviour by WARMA staff towards water users and drilling contractors varies. One interviewee explained that if the same officers return (and are level-headed), they do have a better understanding of the issues faced and can support those regulated to fulfil their obligations. One interviewee recommended that *"WARMA should operate in an educative rather than punitive way"*. Another explained that not all WARMA staff completely understand the regulations, and what is behind them, or sometimes WARMA staff have more information than those who are regulated which can result in different understanding of the regulations between WARMA staff and water users. In summary, *"it is essential that everybody has all of the information – this would avoid a back and forth … we want to be regulated fairly, with information clearly transmitted [so that there are] no arguments or ambiguities"*. Two interviewees recommended more be done to ensure that government staff, including senior government staff, are aware of and fully understand the regulatory requirements.
- Unrealistic demands on water users & WARMA record keeping: Stakeholders interviewed mentioned water users being asked for reports on facilities that were constructed in the past, which they no longer have, and thus not being able to register. Farmers who paid lower fees before the new regulations were put into place, are now being asked by WARMA to pay more, allegedly because their old permits are not included in the new system. Another interviewee explained that record-keeping at WARMA is poor: "*they lack information but expect the organisation to have important information*".
- Concerns about taxation without visible results: The regulations have been labelled as the "borehole tax". The comments in response to the announcement of the regulations in the newspaper in 2018 are illustrative of negative sentiments within the public towards the new regulations, as well as frustrations about inadequate water supply service delivery. One interviewee stated that *"the payment for borehole registration is not accepted throughout the country"*. Some interviewees pointed out that while WARMA has started to also collect revenue for groundwater use, as yet, relatively little valuable data from this process has been shared. Data on groundwater water levels, for example, is important.
- Delays in permitting and licencing:
  - There have been cases where WARMA needs time to undertake a survey, before which a five-year water permit cannot be issued. In such cases, farmers have been asked to apply for a 12-month temporary permit, but rather than this being extended once the survey is complete, they have been requested to register again, and pay the full fee again. In such cases, the farmer considers that they are being penalised for the time that WARMA needs to undertake the survey. While adequate time is clearly needed to assess any infringements of new investments on existing water users, it is questionable for straight forward renewals.
  - Class C Drilling License provides for the hiring of drilling equipment, although at the time of writing this publication, there were problems with the incorporation of hired equipment into the WARMA database. There have been challenges, and there seems to be a lack of consistency with respect to the licencing of Category C drillers, who hire rigs rather than own them. Delays and licence rejection has caused distress, particularly as without a drilling licence, a driller is not supposed to work at all.

7. Regulatory Outcomes

Attitudes and behaviour

While recognising that there have been some challenges with respect to the new regulations, the majority of stakeholders interviewed were positive about them, with the following quotations as examples of what was said:

- "Three years ago, there was no follow-up with respect to drilling … the regulations have helped WARMA to undertake due diligence";
- "Drilling licences is a big achievement. Before that everybody was calling themselves a driller." "Some drillers left Zambia for Congo, as they were not able to get licences."
- "People fear doing the wrong thing, and so the regulations have helped people to do the right things."
- "[We are] motivated to adhere to the regulations as it is good business to show compliance and look after the environment. The [private sector] needs to be part of the governance. The company has its own requirements, which includes adhering to the SIs and also wants to be respected by the communities."

Assertions made by interviewees, which cannot be confirmed by this study, or data, include:

- Drilling quality was highly compromised before (including many private boreholes that were open hole, i.e. not cased to the bottom. One interviewee perceives this to have improved with drillers casing fully, and also sealing the borehole. There are now standards to be followed, which was not the case before, when, for example, customers could be duped and supplied with non-cased boreholes.

Water User Satisfaction surveys were undertaken by WARMA in 2018 and 2019, but the data is not available in the public domain.

Data

Fees and charges collected

WARMA is one of the few public agencies in Zambia that does not have to return all revenue to the central government, which then issues grants. WARMA retains the money it collects. The WARMA website (http://www.warma.org.zm/) contains annual reports for 2016 and 2017, which include financial information on the income from Water Use Charges, support from cooperating partners and a financial statement. In 2017, total income was ZMW 31.3 million (USD 1.4 million at April 2019 exchange rate), split more or less equally between 'grant income' and 'water use charges and other income' (WARMA, 2017).

Register of Constructors, Drillers and Engineers

Maintaining a register of Constructors, Drillers and Engineers is a legal requirement for WARMA, as stipulated in the WRM Act (2011). A list of registered drilling companies (dated 2019), including licence number, telephone number and location, can be downloaded from the WARMA website[16]. The list downloaded on 18 May 2021 contained 105 drilling companies. No list of licenced hydrogeologists (engineers) was available from the website.

National register of boreholes

Petulo (2019), reported that, by April 2019, WARMA had collected the following data on boreholes:

- Physical registrations – 28,193
- Online borehole registrations – 1,003
- Applications to drill processed – 11,586
- Applications rejected – 44

As of December 2019, the Groundwater Information Management System (GrIMS) database managed by WARMA had captured about 31,000 water points, of which 15,000 have general and basic hydrogeological information (WARMA and BGR, 2019).

According to UNICEF (Anon, 2021b), in 2020, an additional 2,052 boreholes were registered, 73 drilling companies licenced, 10,278 drilling permits issued, and 7,992 borehole completion reports were entered into the WARMA's database in 2020. This is reported to bring the cumulative number of boreholes registered and drilling permits issued since 2018 to 41,315 and 30,954, respectively.

No further information on data collected is readily available in the public domain. The process of digitising the data collected is ongoing. UNICEF have provided support to WARMA in the form of interns to transfer paper records into an electronic system using MS Excel. In some cases, this includes trying to verify coordinates by calling those who registered and matching data with receipts. The Catchment Offices have recorded data in books, which are currently being transferred into MS Excel.

Borehole logs and the GeoDIN dtatabase

WARMA has a groundwater database entitled GeoDIn, into which a sub-database for permits has been incorporated. It was upgraded to meet the registration requirements of the SI's. As stated above UNICEF has supported WARMA with interns to input the backlog of data, but one interviewee expressed concerns that the data may not be adequately quality-assured due to a lack of experience by the interns.

Other data – water quality and quantity

With the mandatory submission of construction reports, WARMA is able to pick up issues that would not have otherwise been seen, such as saline water, or lead contamination.

There is also a latent demand for data among drillers and water users which WARMA has yet to meet. Data on water levels would be very useful for the drilling sector (particularly the manual drillers). In the case of the mining industry, *"we need more information about water quality in the areas around the operations as this makes it easier if there is an issue …. What was the downstream situation before? The background information is important. NGOs will grill for precise information."*

The regulations should now provide WARMA with information in groundwater withdrawals in a certain area as well as groundwater levels.

Ideas for improvements

A number of ideas were raised regarding data, including streamlining data and reducing barriers for data submission; future submission of borehole data in digital format, including the import of bulk data, which would reduce staff time to enter and enable more investment on checking data quality; incentivising the provision of data, particularly for existing boreholes and surface water structures rather than simply penalising for non-compliance, with suggestions of waiving fees for users who already have infrastructure which has not already been registered or finding ways to support free registration.

8. Challenges and Contentious Issues

A number of challenges, or 'thorny issues' have become apparent since the regulations came into force relating to drilling and the drillers, water users and WARMA itself as described below.

Water Users

7. **Inadequate municipal services, particularly in urban areas, and the response by households to self-supply is a reality, but has the potential to create tensions with respect to groundwater permitting (SI 20).** Urban service delivery has not kept up with newcomers, especially in Lusaka, which is growing rapidly (World Bank, 2011). Further, the high housing deficits have resulted in parcels of land being opened up for sale, but without electricity and water utilities involved. The same is happening in areas that are adjacent to urban settlements, where plots of land are being bought from traditional authorities and built upon. With water supply services lacking, or inadequate, people are

[16] http://www.warma.org.zm/information-center/download/

supplying themselves – householders are drilling their own boreholes on their own plots. WARMA is trying to discourage the drilling of private boreholes in urban areas that are served by piped water supplies, but it is very difficult to justify the rejection of a drilling permit when piped supplies are insufficient.

8. **Upholding drilling standards is very important, but is a challenge in urban areas, with minimum distance between boreholes and between boreholes and pollution sources and casing difficult to enforce.** The plot sizes in urban areas (i.e., 30m x 20m, or 20m x 20m) are too small to enable the distance requirements between boreholes and pollution source as specified to be met if neighbouring households each have their own borehole and/or septic tank. The requirement may have to be reviewed, with a much stronger emphasis then placed on the development of reliable piped supplies in urban areas, or other legal instruments may be required to resolve conflicts in case they arise. The manner of allocating water between users who have competing needs for water is part of the WRM 2011, Act, but the subsidiary regulations for this are not yet promulgated.

9. **Agricultural water payment rates per cubic metre are higher for the smallholder than for large-scale farmers, raising questions about equity and incentives to save water.** In the case of water for agriculture, the permit fee for withdrawals of up to 100m^3 is 1,666.67 fee units (currently ZMW 500 or USD 22.5[17]). This is a tenth of the permit fee for withdrawals above this threshold. In contrast, the tariff for use per cubic metre for up to 100m^3 is 16.67 fee units (currently ZMW 5 or USD 0.22/m^3), whereas the tariff for those using above 100m^3 day is only 0.01599 fee units (currently ZMW 0.0048 or USD 0.00022) per cubic metre. Thus, for all types of water sources, smallholder farms who apply for permits to use less than 100 m^3 per day will pay 1,042 times as much per cubic metre as large-scale farmers. Further, financial incentives to save water when large quantities are used are negligible.

10. **There is potential double counting of water use in some cases**: Interviewees pointed out that some water users pay for groundwater withdrawals and have to pay again for the storage of that same water as surface water. This 'double payment' is considered as unfair by some interviewees.

Drilling and drillers

11. **Manual drilling is covered by the new SIs but gaps remain, and it is not realistic for all individual manual drillers to currently register.** Although manual drillers are covered by Category D, SI 19, there is a lack of clarity as to whether they are covered by any of the classes established by the Engineering Institution of Zambia (i.e. engineer, technologist, technician, craftperson). There seems to be a lack of cohesion between the WRM and Engineering legislation. Further, there are requirements by the National Council for Construction for those who undertake civil works, but it is a considerable process to go from being an artisan to forming a company that fills in tax returns. It was also expressed that the licence fee of ZMW 2,000 ($90) per year is high for individual manual drillers.

    Resolving this issue is ongoing, with WARMA exploring the development of a curriculum based on skills which could provide the basis for certification for the manual drillers. Meanwhile, in one part of the country, a manual drillers cooperative has been established to enable the individual drillers to register as a group, with an NGO undertaking the necessary paperwork for licencing, permit applications and submitting drilling completion reports.

12. **Drilling standards – the issue of fully casing the borehole remains disputed by some drillers.** The requirement to fully case all boreholes is contested by some within the drilling industry, who claim that it is not always realistic.

13. **Distinguishing between local and foreign drillers is a legal challenge.** Over the years, there has been an influx of foreign-owned drilling companies into Zambia, primarily from India. The reasons for this are beyond the scope of this study[18]. Zambian-owned companies are few[19], and interviewees have reported that there are many Zambians with drilling skills, but lacking the financial capital to invest in their own equipment. In an effort to make it easier for Zambian drillers to enter the market, SI 19 has set different licence fees between Zambian and non-Zambian drilling companies, and categories C and D are only open to Zambians. However, such differentiations are not provided for under the Companies Act, 2017 or the Zambia Development Act, 2006 which provide investment incentives and guarantees for foreign investors. There is need to harmonise contradictions in this regard.

14. **Dry boreholes are a drilling reality, but this is not fully considered by the new regulations.** As drilling permits have to be applied for in advance, some interviewees argue that they face a problem in situations where the initial borehole has proved to be dry, and a new site or multiple sites need to be selected. It is not practical and is costly for the driller to wait for a new licence to be issued to drill replacement boreholes.

WARMA

15. **Digitisation of the application process and data submitted is extremely important going forwards.** With much of the requested data still being submitted in paper format, there is a backlog with respect to digitisation, which WARMA struggled to keep up with. Some interviewees expressed frustration at the application

[17] See Table 1 for exchange rate used.

[18] Reasons may be related to the high foreign direct investments in the mining sector (World Bank, 2015), and the high demand for private boreholes. The service sector more broadly is also dominated by foreign firms and Zambia is considered as having a favourable business climate with some constraints (World Bank, 2018).

[19] One stakeholder estimated there to be five Zambian owned drilling companies in the country. In 2019, there were 105 registered drilling companies.

process, which is now partially digitised, but nevertheless difficult to use for submitting bulk data. According to WARMA, to ease the process of application, the improved services are scheduled to be launched in 2021 with the Government Service Bus (GSB) under the Smart Zambia Institute. It is envisaged that in the future, all applications (notice to drill, registration of boreholes and licencing of drillers) will be done online through a simple form to accelerate the process (Anon, 2021a).

16. **WARMA remains under resourced, particularly in terms of staffing.** Practically all interviewees stated that WARMA require more financial and human resources to be able to fulfil their mandate properly. While the Government does not meet the full costs of WARMA management, under the WRM Act, 2011, WARMA is supposed to generate reasonable return on costs from the income generated. Unlike most other government agencies in the country, revenues generated by WARMA are not returned to central government. However, this high emphasis on generating revenue, coupled with limited transparency and accountability, as evidenced by the lack of annual reports available in the public domain from 2018 onwards and the fact that the subsidiary regulations for the full enactment of the Water Act, 2011 are not in place, provides opportunities for vested interests to influence policy making and resource allocation. Looking beyond the water sector, World Bank (2018) notes that such features generally inhibit pro-poor growth in the country. Put simply, there is a risk that WARMA places a greater emphasis on income generation for the authority than on the policies and investments foreseen in the WRM Act, 2011. Further, there is a risk that excessive logistical costs could defeat net revenue generation.

9. Lessons Learned

Based on the findings of this study, the authors draw out three important lessons for other countries which are embarking on the process of trying to regulate groundwater:

1. **Developing groundwater regulations takes time, needs to be government-led and requires the consultation of diverse stakeholders.** Zambia's initial groundwater regulations are firmly rooted in the National Water Policy, 2010, which paved the way for the Water Act, 2011. It took three years to develop and to promulgate the SIs. The process involved consultation with a wide range of stakeholders which was led by WARMA. To quote one interviewee, "[I] would recommend that other countries that want to bring in regulations follow a similar process of consultation". Clarifying who does what, particularly with several partners keen to support the process, but also with their own agendas, is essential.

17. **Within the planning process, consider what happens after promulgation.** WARMA and other stakeholders in Zambia learned the hard way about what happens when regulations are promulgated, and the institution is not ready in terms of staffing, administrative procedures and suitable IT systems. The organisation is still in the process of trying to process the large quantity of data it has received. Planning for and investing in the nuts and bolts of operations is an essential feature of regulating groundwater. WARMA needs to develop its capacity to meet the demand imposed by its mandate under the WRM Act.

18. **Communications about regulations and stakeholder engagement is an ongoing task.** While there is awareness of the new requirements, there are also concerns that not all water users are aware and there are pockets of negative attitudes towards the regulations within society at large. However, the desire among stakeholders to continue to engage with and support WARMA is apparent. Continuous communications between WARMA and the public, as well as provision of platforms whereby issues can be tabled and heard, are essential. The interviews and verification workshop held for this study found an eagerness among stakeholders to build on what has been achieved so far, and improve further. Maintaining the momentum of such goodwill requires regular communication between the regulator, regulated and partner organisations.

Recommendations

Given that only an estimated 1.5% of Zambia's renewable water resources are currently used, and that there is a need to raise access to water for drinking and domestic use, alongside increasing water use in irrigation, particularly that of smallholder farmers, one may question the need to regulate water resources now, and argue that the focus should rather be on supply issues, including supporting self-supply and farmer-led irrigation. However, given that Zambia's water resources are not distributed evenly and population is growing rapidly alongside water demands, coupled with future climate change, the authors argue that integrated water resources management, as set out in the WRM Act, 2011 is needed now, and not at some unknown time in the future. Now is the time to learn about regulations; now is the time to fine-tune them and now is the time to develop not only governance mechanisms but also cultures that can manage the resources as water becomes scarcer.

The authors of this study recognise that the new SIs (18, 19 and 20) represent a great step forward, but are concerned that key aspects to regulate groundwater are not in place. Specifically, subsidiary regulation on groundwater pollution and protection are lacking. While the three new SIs generate revenue for WARMA, the process of translating the WRM Act, 2011 into regulations is not yet complete, leaving very important gaps in relation to IWRM. Subsidiary regulations which address local governance of water resources at catchment and sub-catchment levels and support water users' associations have not been issued, and so the holistic, integrated approach envisaged by the WRM Act, 2011 cannot be realised. Remaining with these three SIs only bears risks of the regulation becoming a punitive, rent-seeking activity for WARMA which may actually contribute towards widening the inequalities that so plague the country. **It is recommended that WARMA, national stakeholders and partners accelerate efforts to ensure that all subsidiary legislation is developed for all aspects of the WRM Act, 2011, with process planning efforts that extend beyond their promulgation.**

The stakeholder consultation and engagement, and communication efforts undertaken by WARMA to date are highly commendable, and have no doubt contributed to the goodwill towards WARMA that is apparent within the water sector. The recognition of the economic value of water is enshrined in the laws of Zambia, with commercial water users obliged to contribute to the associated costs of its governance and management through licences, permits and fees, and domestic users through permits only. However, it is essential that this is fully understood by the population at large. Not all water users understand the regulations, or their obligations. It is thus recommended that WARMA invests more in regular communication with those that are being regulated, including listening to and documenting their concerns and ideas. As part of improved communications, WARMA should consider forming strategic partnerships with organisations that represent different stakeholder groups to reach them[20].

Closely related to communication is record keeping, data sharing and transparency. The provisions in the Act of fines and imprisonment for non-adherence to the SIs are clear and can serve as a "stick" for WARMA to use for enforcement. In reality, the message *"you have to pay"* is not particularly positive. WARMA could be making better use of incentives to encourage stakeholders to comply, which would also improve the image of the organisation. It is important to build on the current goodwill of some of those regulated and demonstrate clearly the extent to which compliance has positive outcomes for the country. To quote one interviewee "*WARMA should be a lean organisation…. which can demonstrate the value that it is adding*." It is recommended that WARMA proactively demonstrates the value to those being regulated by sharing the valuable data that is being generated, alongside improving transparency towards the public with respect to the revenues generated and how these have been re-invested – publicly available annual reports would be a major step forward.

Given the poverty that many of Zambia's population face, alongside rapid population growth, rising groundwater demands and the future impacts of climate change, there is need to strike a balance between encouraging investments for development (e.g. to improve food security and reduce climate vulnerability), growing Zambia's economy and reducing inequalities, with ensuring that groundwater is sustainable in the long term and for future generations. In prioritising where to invest staff time and resources, it is recommended that WARMA focuses its attention on water users that use large volumes, such as mining, other industries, commercial farms and mechanised drillers, rather than rural domestic users, smallholder farms and small enterprises that use relatively low water volumes.

There were no allegations of corruption in enforcement of the regulations made to the authors of this report by any of the interviewees. With the complexity of the process, there is a risk of corrupt practices starting, or becoming entrenched in the future. If, for example, stakeholders cannot fill the necessary forms themselves, and if nobody assists, they could end up offering a bribe. Any system whereby individuals in one group have power over others risks abuse of power. While there are mechanisms for appeal, these are burdensome and beyond the reach of certain segments of society. The authors thus recommend that accessible mechanisms for safeguarding and oversight are developed and introduced, so that those regulated are able to report potential abuses without having to take costly, legal action immediately. These safeguards could include user-friendly platforms that enable those regulated to register complaints.

Specifically, to the three SIs, the recommendations are as follows:

- The extensive difference between the per cubic metre cost for using less than 100 m^3 per day and over 100 m^3 per day should be reconsidered in light of the importance of improving food security and drought resilience, particularly through increased irrigation by smallholder farms and to incentivise water savings for bulk water users.
- The SIs derived from the WRM Act 2011 and some omissions and gaps in the SIs are a reflection of the Act. Section 90 of the Act defines the term 'engineer', which is also intended to cover geologists, hydrogeologists, geoscientists and groundwater consultants. Given that not all hydrogeologists and geoscientists consider themselves to be engineers, that they are not specifically mentioned, creates an ambiguity about whether they are in fact covered by the Act. They may also be missed in the constitution of the Board of WARMA. Except for the Second Schedule of SI 19 the term hydrogeologist is absent from the WRM Act, 2011 and from the SIs.
- There is no SI regulating the activities of groundwater consultants except registration with WARMA. The consultants are in the forefront of groundwater development, siting and supervising borehole drilling. There should be a regulation to govern their activities.
- SI No. 20 does not include the minimum requirement for very important aspects of borehole construction such as:
  - siting technique
  - gravel pack material
  - grouting material
  - pumping test
  - borehole disinfection
  - site restoration

  These should be considered for amendment.
- The Second Schedule of SI 20 should include the minimum distance to existing buildings, streams, canals and other temporary and permanent bodies of water.
- SI 20 should include a form for borehole completion report. This will facilitate uniformity in reporting, ease of entry and analysis by WARMA. The WARMA number for every borehole should be included in the Notice of Grant to Drill to accentuate the national borehole numbering system and to be used in the borehole completion report.

[20] As an example, the National Farmers Union is a way to reach 1.6 million small-scale farmers, who probably present the largest single group using significant quantities of water. Monthly meetings between the National Farmers Union and ZESCO were cited as good practice from another sector. The WATSAN might provide an avenue to NGOs.

- Section 93. (1) of the WRM Act 2011 requires that WARMA protects groundwater from pollution and degradation. The general protection of groundwater quality and resources is not addressed by the SIs. In SI 20, there is 'brackish' and there is 'pollution' in the interpretation but pollution is not addressed in the rest of the SI. Item 7 of the SI only requires 'anybody with a defective borehole to report to the Authority within fourteen days of discovering brackish water or any substance'. Revisions to the SI should consider including the prevention of practices that may lead to groundwater contamination such as injection of human waste, industrial or mining effluence into the ground and monitoring of the use of pesticides and fertilisers that can contaminate groundwater. Groundwater in vulnerable areas such as the mines and the urban centres requires particular attention. The borehole data being collected need to be analysed to monitor groundwater degradation and over-abstraction which have been reported urban areas.

Annex: Events leading to the promulgation of the Statutory Instruments

Date	Event	Remarks
May 2015	Stakeholder Workshop on the scope, methodology and timeframes for the development of regulations	Outcomes were agreement on: Full scope of regulations[21] Approach, methodology & work plan for development of the regulations.
June 2015	Stakeholder Workshop on Development of Technical Content of Subsidiary Legislation	Approach and methodology for subject matter specialists to develop substantive content (specifications, prescriptions, threshold values).
June 2015	Publication of Technical Guidelines for the Implementation of Selected Subsidiary Legislation under the Water Resources Management Act No. 21 of 2011	Publication of Technical Content of the regulations. Stakeholder consultations to provide input
15 March 2016	Process Planning and Stakeholder Mapping for Development of Groundwater Regulation	Attended by eighteen stakeholders
12 April 2016	**Workshop Review of First Draft Water Pricing Strategy, Lusaka**	Review by technical specialists. The stakeholders endorsed the principles, strategies and structure of the tariff.
3 & 10 March 2017 5 March2017 16 March 2017 17 March 2017	Public consultations on Pricing Strategy for Raw Water Use Charges and Fees	Farmer groups Mining companies Hydropower Companies Municipal and industrial water users
April 2017	Publishing of Report on the Consultative Stakeholders Meetings for the proposed Raw Water Pricing Strategy and Tariffs (WARMA, 2017a)	
May 2017	Publishing of Raw Water Tariff Final Draft (post public consultation) (WARMA, 2017b)	
April – June 2017	WARMA and Ministry of Justice legal drafting of the regulations	Converting technical content of the regulations into legal language
August 2017	Publishing of regulatory impact assessment of proposed regulations (WARMA, 2017c)	
August 2017	Consultative meetings between WARMA, Ministry of Justice, and Business Review and Regulatory Agency (BRRA) on regulatory impact assessment (RIA) of proposed regulations	RIA is a prerequisite to the approval of the SIs
January 2018	Publication of Pricing Strategy for Raw Water Use Charges and Fees by Ministry of Water Development Sanitation and Environmental Protection	
February 2018	WARMA and Ministry of Justice final drafting of the regulations	
11 March 2018	Publication of SIs 18, 19, 20.	
11 March 2018	Newspaper coverage of launch of SIs (Lusaka Times, 2018a)	

[21] Comprising 8 packages including Charges and Fees; Licencing of Drillers and Constructors; Groundwater and Boreholes

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About the Authors

Dr Kerstin Danert has worked in rural water supplies in sub-Saharan Africa for over 20 years, starting in Uganda. She undertakes research, facilitation and training and develops guidelines, particularly in relation to groundwater, domestic water supplies, drilling professionalism, manual drilling and sustainable service delivery. The International Association of Hydrogeologists (IAH) presented her the Distinguished Associate Award in 2017. She launched her own company, *Ask for Water* GmbH in January 2020.

Dotun Adekile is an independent groundwater consultant based in Nigeria. He has in the last 40 years been involved in the design and construction of rural and urban water schemes, documentation to support sustainable groundwater development and training of personnel in borehole sting, drilling, procurement and supervision.

Dr. Murtaza Malik is currently Chief of WASH with UNICEF Rwanda. He has previously worked with UNICEF in Zambia, Zimbabwe, Pakistan and Iraq. Prior to joining UNICEF, he worked in management positions with the Government of Pakistan, GIZ, and UNDP. He possesses over 30 years of experience in management of water, environment, sanitation and emergency preparedness and response programmes.

Levy Museteka has worked in the water sector in Zambia for the last fifteen years with progressive professional experience in hydrochemistry and hydrogeology. He has been involved in a number of groundwater research studies in Zamia. He also possesses experience in conception, development and implementation of groundwater regulations.

Douglas Abuuru is a WASH Specialist with UNICEF Zambia. He previously worked in Somalia. Prior to joining UNICEF, he carried out WASH humanitarian work with NGOs in the Sudan, Kosovo and Somalia. He previously worked in a Groundwater Consulting firm as a Senior Geophysicist supporting hydrogeological and geotechnical investigations in Kenya and Tanzania. He possesses over 25 years of experience in management and implementation of WASH programs in development and humanitarian work.

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