



REPUBLIC OF ZAMBIA

## OFFICE OF THE AUDITOR GENERAL



Performance Audit Report of the Auditor  
General on the Sustainable Management of  
Water Resources in Zambia  
**2019 - 2022**

DECEMBER 2022



REPUBLIC OF ZAMBIA

## **OFFICE OF THE AUDITOR GENERAL**

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PERFORMANCE AUDIT REPORT OF  
THE AUDITOR GENERAL ON THE  
SUSTAINABLE MANAGEMENT OF WATER  
RESOURCES IN ZAMBIA  
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## ACRONYMS

7NDP	Seventh National Development Plan
8NDP	Eighth National Development Plan
DO	Dissolved Oxygen
LAs	Local Authorities
EMA	Environment Management Act
INTOSAI	International Organisation for Supreme Audit Institutions
ISSAIs	International Standards for Supreme Audit Institutions
MoU	Memorandum of Understanding
MPAs	Ministries, Provinces and Agencies
MLGRD	Ministry of Local Government and Rural Development
MWDS	Ministry of Water Development and Sanitation
NHCC	National Heritage Conservation Commission
OAG	Office of the Auditor General
SDGs	Sustainable Development Goals
WARMA	Water Resource Management Authority
WRPAs	Water Resources Protection Areas
WRM	Water Resource Management
WUAs	Water Users Associations
ZEMA	Zambia Environmental Management Agency

## DEFINITION OF KEY TERMS

Term	Definition
Authority	Refers to WARMA
Aquifer	Any geological formation which absorbs, stores and transmits ground water <sup>1</sup>
Aquatic	Relating to water life or body <sup>2</sup> .
Aquatic Environment	An interacting system of resources such as water and biota. <sup>3</sup>
Building Plan	A set of architectural / engineering drawings needed to explain the building construction proposal, to be submitted to the authority for the purpose of seeking approval or intimation. <sup>4</sup>
Development Permit	A planning permission granted for the development of land <sup>5</sup>
Biodiversity	The variability among living organisms from all sources, including genetically modified organisms, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part of. <sup>6</sup>
Catchment	A geographical area which naturally drains into a water resource and from which the water resource receives surface or ground flow that originates from rainfall. <sup>7</sup>
Conservation	The sustainable management and use of nature and natural resources for their inherent value and for the benefit of human beings and other living things. <sup>8</sup>

<sup>1</sup> Water Resources Management ACT No. 14 of 2009

<sup>2</sup> Heritage Conservation Policy of 2018

<sup>3</sup> International Journal of Environment and Waste Management - Special Issue on: "Aquatic Environment"

<sup>4</sup> <https://dreamcivil.com/building-plan/>

<sup>5</sup> Urban Regional Planning Act No 3 of 2015

<sup>6</sup> Water Resources Management ACT No. 21 of 2011

<sup>7</sup> Water Resources Management ACT No. 21 of 2011

<sup>8</sup> Environmental Management ACT No. 12 of 2011

Ecology	An amount of seasonal water needed for environmental and ecosystem maintenance and sustainability, including the quantities and carrying capacities of ecosystems. <sup>9</sup>
Ecosystem	The biological community of interacting organisms and their physical environment. <sup>10</sup>
Effluent	Waste water or fluid of domestic, agricultural, trade, industrial or other origin, treated or untreated and discharged, directly or indirectly, into the aquatic environment. <sup>11</sup>
Environmental Impact Assessment	A systematic examination conducted to determine whether or not an activity or a project has or will have any adverse impacts on the environment. <sup>12</sup>
Ground Water	Any water resource found under the surface of the ground. <sup>13</sup>
Ground Water Recharge	The entry of water from the unsaturated zone into the saturated zone below the water table surface <sup>14</sup>
Ground Water Recharge Zones	Water areas which sustain the quantity and quality of groundwater that replenishes the aquifers. <sup>15</sup>
Headwaters	The source from which a river or stream begins its course <sup>16</sup>
Local Authority	A city council, municipal council or district council as established under the Local Government Act. <sup>17</sup>
Natural Heritage	Any rare naturally occurring feature <sup>18</sup>
Permit	An authorisation for the right to use of water for the purposes specified in this Act, for the construction of any water works or for the sinking, altering or deepening of any borehole in a water shortage area. <sup>19</sup>
Pollution	Any direct or indirect contamination or alteration of the biological, chemical or physical properties of water, including changes in colour, odour, taste, temperature or turbidity or any discharge of any gaseous, liquid, solid or other substance into any water resource. <sup>20</sup>

<sup>9</sup> Water Resources Management ACT No. 21 of 2011

<sup>10</sup> Water Resources Management ACT No. 21 of 2011

<sup>11</sup> Water Resources Management ACT No. 21 of 2011

<sup>12</sup> Environmental Management Act No. 12 of 2011

<sup>13</sup> Water Resources Management ACT No. 21 of 2011

<sup>14</sup> Report on Mapping of Candidate Water Resources Protection Areas in Zambia - 2021

<sup>15</sup> Report on Mapping of Candidate Water Resources Protection Areas in Zambia - 2021

<sup>16</sup> <https://www.trenchlesspedia>

<sup>17</sup> Water Resources Management ACT No. 21 of 2011

<sup>18</sup> Heritage Conservation Policy of 2018

<sup>19</sup> Water Resources Management ACT No. 21 of 2011 vi

<sup>20</sup> Water Resources Management ACT No. 21 of 2011



River Buffer System	It is a system that protects the rivers and streams by filtering storm water, absorbing and trapping pollutants, providing shade to keep waters cool and provide habitat for wildlife. <sup>21</sup>
Riparian	Land on or along the boundary of the whole or any portion of, which a water resource exists. <sup>22</sup>
Surface Water	All water found on or below the bed of a water resource and includes water in storage works, drainage works or permanent pools. <sup>23</sup>
Sustainable	The human use of a water resource so that it may yield the greatest continuous benefit to the present generations while maintaining its potential to meet the needs and aspirations of future generations. <sup>24</sup>
Sustainable Management	Protecting and managing the use of the environment, in the manner that, while enabling human beings to provide for their health, safety, social cultural and economic wellbeing – (a) Safeguard the life supporting capacity of air, water, soil and ecosystems; (b) Maintains the life support capacity and quality of air, water, soil and ecosystems, including living organisms, to enable future generations to meet their reasonably foreseeable needs; and (c) Avoids the creation of adverse effects wherever practicable, and where adverse effects cannot be avoided, mitigates and remedies the adverse effects as far as is practicable. <sup>25</sup>
Water Recorder	Used to monitor water depth and level in wells, ponds, streams, and estuaries. <sup>26</sup>
Water Resource Protection Area	A catchment, sub catchment or geographic area that is declared, by the Minister, as a water resource protection area under section twenty-nine.
Wellfield	Land above and surrounding wells drilled into an aquifer <sup>27</sup>

<sup>21</sup> <https://www.americanrivers.org/2016/08/riverside-buffers-merrimack/#:~:text=Riverside%20buffers%20protect%20the%20rivers,and%20provide%20habitat%20for%20wildlife.&text=Guest%20post%20by%20Merrimack%20River,series%20spotlighting%20the%20Merrimack%20River.>

<sup>22</sup> Water Resources Management ACT No. 21 of 2011

<sup>23</sup> Water Resources Management ACT No. 21 of 2011

<sup>24</sup> Water Resources Management ACT No. 21 of 2011

<sup>25</sup> Environmental Management Act No. 12 of 2021

<sup>26</sup> <https://microdaq.com/data-loggers/water-level.php>

<sup>27</sup> Report on Mapping of Candidate Water Resources Protection Areas in Zambia - 2021

## PREFACE

I am pleased to publish and submit the Performance Audit Report on the Sustainable Management of Water Resources. The Office of the Auditor General is mandated to carry out Performance Audits in Ministries, Provinces and Agencies (MPAs) and to report the results to the President and Parliament for debate. With this mandate, my office conducted a performance audit for the purpose of establishing whether the management of water resources was efficient and effective to ensure the sustainability of water resources.

The country's wetlands and aquifers have come under severe pressure from development activities as the demand for housing and water increases. Ground water contributes significantly to domestic and municipal water supplies, with its importance being very visible in rural areas where it is commonly accessed from boreholes or dug wells<sup>28</sup>. The audit of water resources is therefore very important and timely as it will provide information for enhanced decision making in the management of water resources.

Government has shown commitment to the management of water resources as indicated in the Eighth National Development Plan (8NDP) through Strategy 8<sup>29</sup> which states "Enhance management and productive use of water resources." This is in line with Sustainable Development Goal (SDG) No. 6 – Clean Water and Sanitation whose objective is to ensure availability and sustainable management of water and sanitation for all. When implemented, the recommendations of the audit will lead to the improved management of water resources.

I wish to take this opportunity to thank the management and staff of the Ministry of Water, Sanitation and Environmental Protection, Water Resource Management Authority and key stakeholders for the co-operation accorded to my team during the audit.



Dr Dick Chellah Sichembe

### **AUDITOR GENERAL**

<sup>28</sup> Achievements and lessons learnt in the Implementation of Groundwater Regulations in Zambia (WARMA Production) - 2022

<sup>29</sup> Strategic Development Area 1: Economic Transformation and Job Creation – Development Outcome 1

## EXECUTIVE SUMMARY

### 1. Mandate

In accordance with the provisions of Article 250 of the Constitution of Zambia (Amendment) Act No.2 of 2016, Public Audit Act Cap 378 and Public Finance Management Act No.1 of 2018, the OAG is mandated to carry out Performance Audits in Ministries, Provinces and Agencies (MPAs) and report the results to the President and Parliament for debate. With this mandate, the OAG undertook a performance audit for purposes of assessing the efficiency and effectiveness of Government programmes and operations in the management of water resources in Zambia.

### 2. Background

Water Resources Management (WRM) is the process of planning, developing and managing water resources, in terms of both water quantity and quality across all water uses. WRM seeks to harness the benefits of water by ensuring there is sufficient water of adequate quality for drinking and sanitation services, food production, energy generation, inland water transport and water-based recreational activities. WRM sustains healthy water-dependent ecosystems and protects the aesthetic and spiritual values of lakes, rivers, and estuaries. It also entails managing water-related risks, including floods, drought and contamination.<sup>30</sup>

### 3. Audit Objective and Scope

The objective of the audit was to assess whether the Ministry of Water Development and Sanitation (MWDS) through the Water Resource Management Authority (WARMA) had put in place efficient and effective measures that ensure sustainable management of water resources. The audit was also extended to Ministry of Local Government and Rural Development, Ministry of Tourism and Ministry of Green Economy and Environmental Protection. The audit period was from January 2019 to December 2022.

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<sup>30</sup> <https://www.worldbank.org/en/topic/waterresourcesmanagement#1> World Bank Website – Report on Water resource Management.

## 4. Key Audit Findings

The major findings from the audit included the following:

### 4.1. WARMA

- WARMA delayed developing the National Water Resource Strategy and Plan for four (4) years from the year 2018 when they started developing the document to 2022 when the document was launched.
- The Authority operationalised four (4) out of the required six (6) Catchments namely; Zambezi, Chambeshi, Luangwa and Kafue while two (2) namely; Luapula and Tanganyika catchments were not operationalized.
- WARMA did not identify the fifteen (15) targeted ground water resource areas, instead only six (6) were identified.
- WARMA did not recommend water resources for protection and consequently, there were no gazetted water resources protection areas in the country.
- WARMA carried out identification and mapping of water resources between 2017 and 2019 and had two (2) potential groundwater recharge zones delineated for Lusaka region and upper Kafubu catchment<sup>31</sup> while other zones had not been delineated.
- Forest 26 (a water recharge area) was well secured against illegal access by wire fencing while water resources such as wetlands, dambos and headwaters were not protected in other areas. Further, WARMA did not conserve water resources to control human activities that have a negative impact on water resources.
- The Authority only carried out less than (1) % of the required water quality assessments in Zambezi, Luangwa and Kafue Catchments while it assessed less than 5% in Luapula, Tanganyika and Chambeshi Catchments.
- The Authority in conjunction with other stakeholders completed the development of the Ambient Water Quality Standards (DZS 1182) and Guidelines (DZS 1183) for raw water whose aim was to protect water against deterioration from pollution.
- WARMA did not collaborate with stakeholders such as the Ministries of Green Economy and Environment Protection, Tourism, Local Government and Rural Development and Lands to ensure protection of water resources.
- The Authority did not plan to monitor the activities in water resources areas.
- WARMA did not ensure collaboration, sectoral linkages and joint programmes with other stakeholders such as Ministry of Tourism -NHCC, Ministry of Green Economy -Forestry Department, ZEMA, Local Authorities and Ministry of Lands with regards to the management of water resources.

<sup>31</sup> Report on Mapping of Candidate Water Resources Protection Areas in Zambia for 2021

- WARMA's community sensitisation activities included one (1) out of 116 districts while radio and television sensitisation programmes included eight (8) out of 116 districts.

#### **4.2. Forestry Department**

The Forestry Department did not consistently carry out monitoring and control activities in the forests.

#### **4.3. National Heritage Conservation Commission**

NHCC Copperbelt was unable to carry out monitoring activities of the water resource related heritage.

#### **4.4. Ministry of Local Government and Rural Development**

The LAs did not prepare Integrated Development Plans (IDPs) which indicated priority areas such as water resources.

### **5. Conclusion**

In conclusion, the MWDS were not effective as water resources were encroached upon, not delineated, still being polluted, structures required to help with the management of water resources were not operationalised and there was no collaboration between WARMA and its stakeholders in the management of water resources.

### **6. Recommendations**

The audit recommends that MWDS through WARMA should put measures in place that will lead to the:

- i. Operationalisation of the whole system from having Catchment, Sub catchment and Water Users' Association Plans to having functional water users' associations to ensure real time monitoring of water resources;
- ii. Implementation of the existing Statutory Instrument in order to ensure the protection of known water resources from human activities;
- iii. Implementation of activities that will ensure protection of water resources from pollution both at individual and corporate levels;
- iv. Introduction of activities which will be a solution to the polluted and encroached upon water resources to ensure sustainable water resources; and
- v. Strengthening of stakeholder linkages which will result in coordination of activities to ensure the sustainability of water resources.

## CHAPTER ONE: INTRODUCTION

### 1.0 Introduction

This chapter highlights the mandate of the Office of the Auditor General (OAG), background and motivation of the audit. The title of the audit is the “Sustainable Management of Water Resources in Zambia for the period 2019-2022”. The Ministry of Water Development and Sanitation (MWDS) and its statutory body Water Resources Management Authority (WARMA) is responsible for the management of water resources in Zambia.

### 1.1 Mandate

In accordance with the provisions of Article 250 of the Constitution of Zambia (Amendment) Act No.2 of 2016, Public Audit Act Cap 378 and Public Finance Management Act No.1 of 2018, the OAG is mandated to carry out Performance Audits in Ministries, Provinces and Agencies (MPAs) and report the results to the President and Parliament for debate. With this mandate, the OAG undertook a performance audit for purposes of assessing the efficiency and effectiveness of Government programmes and operations in the management of water resources in Zambia.

### 1.2 Background

Water Resources Management (WRM) is the process of planning, developing and managing water resources, in terms of both water quantity and quality across all water uses. WRM seeks to harness the benefits of water by ensuring there is sufficient water of adequate quality for drinking and sanitation services, food production, energy generation, inland water transport and water-based recreational activities. WRM sustains healthy water-dependent ecosystems and protects the aesthetic and spiritual values of lakes, rivers, and estuaries. It also entails managing water-related risks, including floods, drought and contamination.<sup>32</sup>

The global population is growing fast, therefore, there is a large amount of pressure on the need for water resources and estimates show that with current practices, the world will face a 40% shortfall between forecast demand and available supply of water by 2030. Furthermore, chronic water scarcity, hydrological uncertainty and extreme weather events

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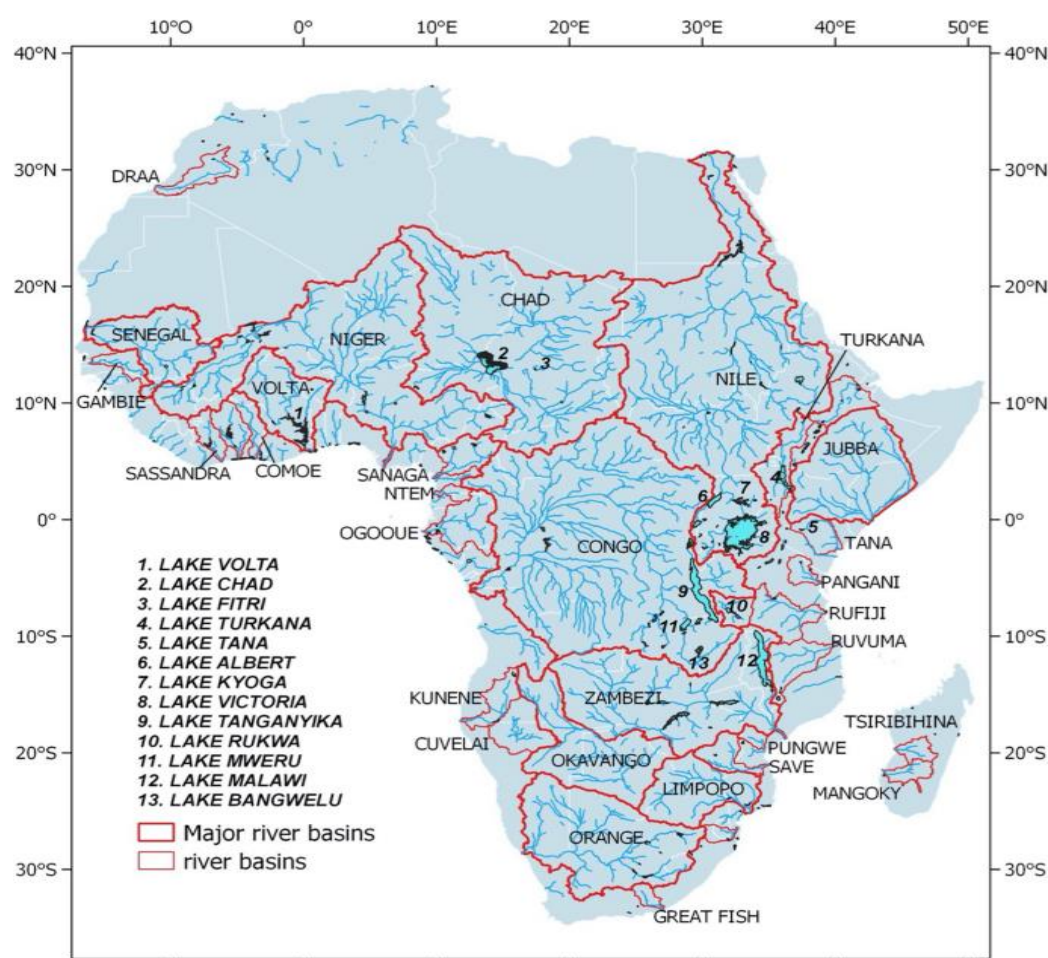
<sup>32</sup> <https://www.worldbank.org/en/topic/waterresourcesmanagement#1> World Bank Website – Report on Water resource Management.



(floods and droughts) are perceived as some of the biggest threats to global prosperity and stability.<sup>33</sup>

According to research conducted by World Bank in October 2022, there are 276 trans-boundary basins, shared by 148 countries, which account for 60% of the global freshwater flow. Similarly, 300 aquifers systems are trans-boundary in nature, with 2.5 billion people worldwide dependent on groundwater. The African continent hosts some of the largest freshwater systems worldwide.<sup>34</sup> See Figure 1.1 below.

**Figure 1.1: Water Resources in Africa**



**Source: Water Resources in Africa under Global Change- Monitoring Surface Waters from Space (April, 2022)**

<sup>33</sup> <https://www.worldbank.org/en/topic/waterresourcesmanagement#1> World Bank Website – Report on Water resource Management.

<sup>34</sup> <https://link.springer.com/article/10.1007/s10712-022-09700-9> - Water Resources in Africa under Global Change: Monitoring Surface Waters from Space- Published: 20 April 2022

African water resources are characterised by the multiplicity of trans-boundary water basins. They cover 64% of the continent's land area and contain 93% of its total surface water resources. There are about 80 trans-boundary river and lake basins in Africa and over 38 trans-boundary aquifers. Groundwater is the main source of drinking water for more than 75% of the African population. In the Sudano-Sahelian<sup>35</sup> and Southern African sub-regions, renewable water resources constitute only about 6% and 9% respectively.<sup>36</sup>

Zambia has a number of rivers, lakes, streams and swamps. Its five (5) main river basins are Zambezi, Kafue, Chambeshi, Luangwa and Luapula while the natural lakes include Bangweulu, Mweru Wantipa, Mweru and Tanganyika. Zambia also has vast ground water resources that are unevenly distributed across the country. The northern part of the country generally has higher levels of rainfall and water resources, while the southern part of the country has lower rainfall levels and is more prone to drought.<sup>37</sup>

Unsustainable exploitation of natural resources and poor environmental management have contributed to increased incidences of adverse climate change impacts such as droughts, floods and extreme temperatures.<sup>38</sup> The country's wetlands and aquifers have come under severe pressure from development activities as the demand for housing and water increases. Groundwater contributes significantly to domestic and municipal water supplies, with its importance being very visible in rural areas where it is accessed from a variety of sources, most commonly via boreholes or dug wells. Chart 1.1 shows 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.<sup>39</sup>

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<sup>35</sup> Constitutes countries which include, Nigeria, Cameroon, Chad, Central African Republic, South Sudan and Ethiopia

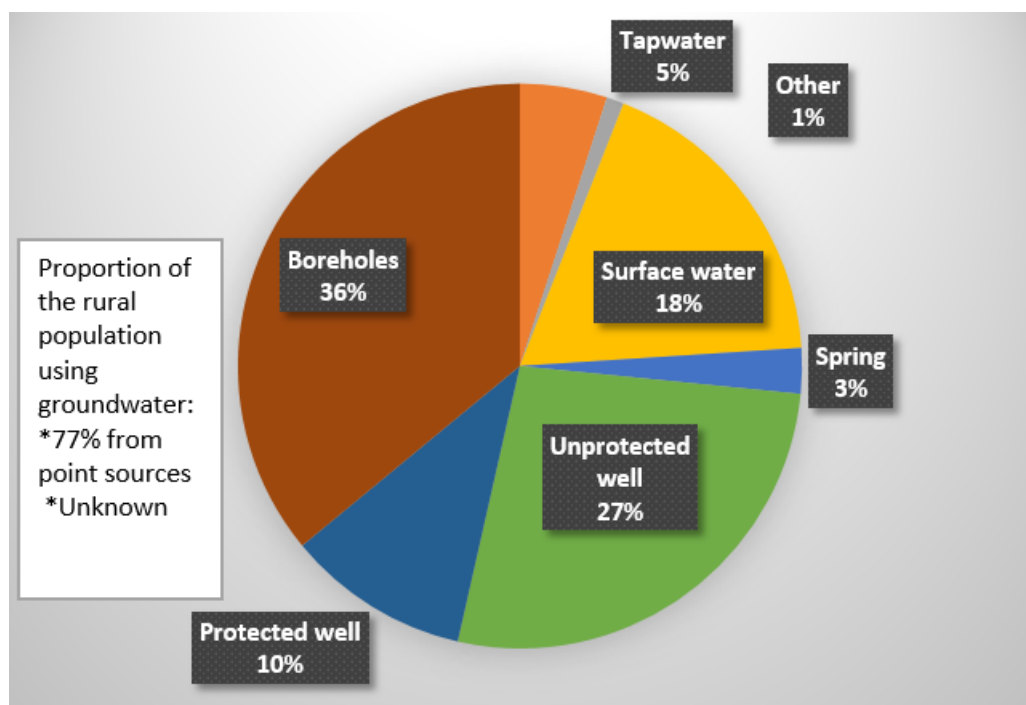
<sup>36</sup> 2012 Status Report on the Application of Integrated Approaches to Water Resources Management in Africa.

<sup>37</sup> PMRC Water Resources Series: Efficient Water Resource Management for Sustainable Social and Economic Development.

<sup>38</sup> 8<sup>th</sup> National Development Plan 2022-2027

<sup>39</sup> Achievements and Lessons Learned in the Implementation of Groundwater Regulation in Zambia (WARMA Publication) 2022

**Chart 1.1: Proportion of the Rural Population and Main Types of Drinking Water Supply in 2015**

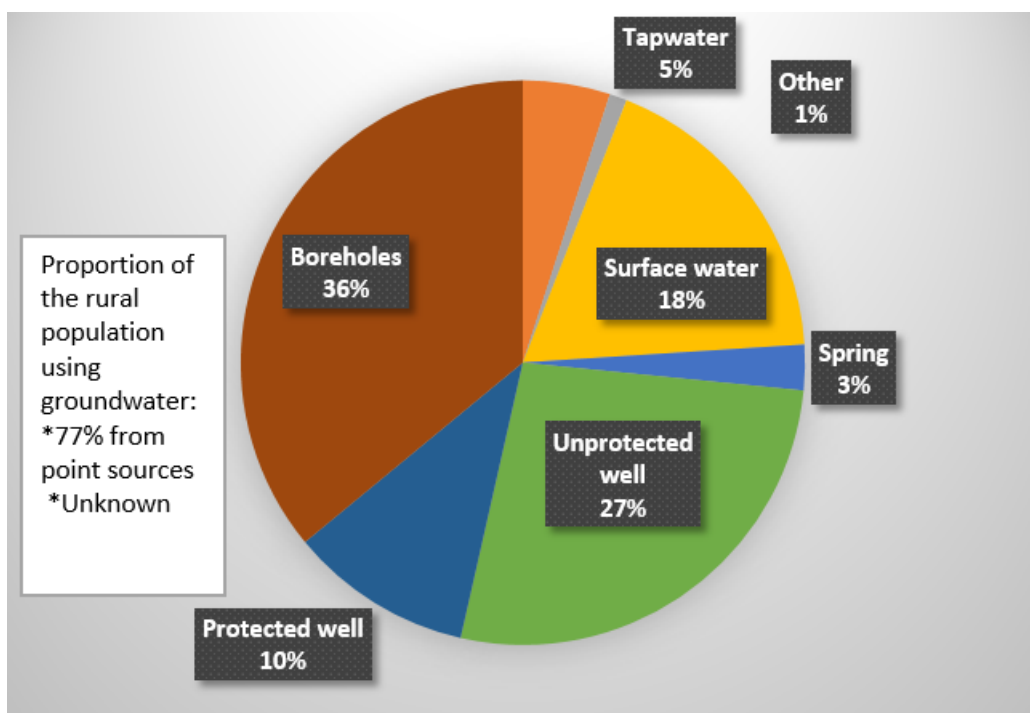


**Source: WARMA Ground Water Report (Living conditions Monitoring Survey statistics, 2015)**

In the case of urban areas (Chart 1.2), boreholes, wells and groundwater also contribute to tap water through municipal piped supplies (JICA, 2014), but prior to the promulgations of the ground-water regulations in 2018, there was no comprehensive overview of the use of groundwater contribution in piped supplies.

Chart 1.2 below shows the proportion of the urban population and type of main drinking water supply in 2015.

**Chart 1.2: Proportion of the Urban Population and Type of Main Drinking Water Supply in 2015**



**Source: WARMA Ground water Report (Living conditions Monitoring Survey Statistics, 2015)**

While there is piped water supply in some Zambian towns, water is not generally available 24 hours/day (JICA, 2015). 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.<sup>40</sup> Without proper management of water resources, there is a risk of over abstraction of water which could result in various climatic issues.

<sup>40</sup> Achievements and Lessons Learned in the Implementation of Groundwater Regulation in Zambia (WARMA Publication) 2022

In order to ensure water resources management, Government established WARMA under the MWDS. The Government has also committed to implementing this in the Eighth National Development Plan (8NDP) through Strategic Development Area 1; Economic Transformation and Job Creation, Development Outcome 1: Industrialised and Diversified Economy and Strategy 8:<sup>41</sup> Enhance management and productive use of water resources. Sustainable investment in water resources development and management will help meet the rising demand and productive use of water, while safeguarding water security. Interventions will include water harvesting as well as ground and surface water resources management. By accomplishing the NDPs, Government will also be achieving SDG 6: Clean Water and Sanitation.

### 1.3 Motivation

#### 1.3.1 Media Reports

There has been debate by the public on Government's decision through a court ruling to allow mining in the Lower Zambezi National Park which lies between two seasonal rivers which flow directly into the Zambezi River. This has unsettled many citizens and the civil society movement as they have come out strongly to protect the Lower Zambezi National Park<sup>42</sup>. Further, based on social media reports, several illegal dams were unearthed in three (3) out of the nine (9) farms in Kaleya Settlement in Chikankata District, Southern Province. Some farmers were reported to have extended and altered their dams without approval from WARMA. The report also indicated that WARMA recorded all the illegal dams in the settlement stating that the owners were to be penalised. Further, the WARMA Legal Counsel told Zambia National Broadcasting Corporation (ZNBC) News that the illegal dams blocked the free flow of water into the Kaleya Dam which is the main source of water for farmers and residents of the area. In addition, a Water Recorder revealed that the Kaleya River was almost drying as a result of illegalities within the area<sup>43</sup>

#### 1.3.2 Population Growth and Urbanisation

Zambia's population has been on the rise rapidly over the last decade and currently stands at 20,017,675 citizens. In many urban areas, water scarcity is already a reality.<sup>44</sup> As the population increased, the percentage of people without access to clean water increased.

<sup>41</sup> Strategic Development Area 1: Economic Transformation and Job Creation – Development Outcome 1

<sup>42</sup> <https://www.business-humanrights.org/de/neuste-meldungen/zambia-citizens-petition-govt-ina-bid-to-stop-controversial-mining-from-proceeding/>

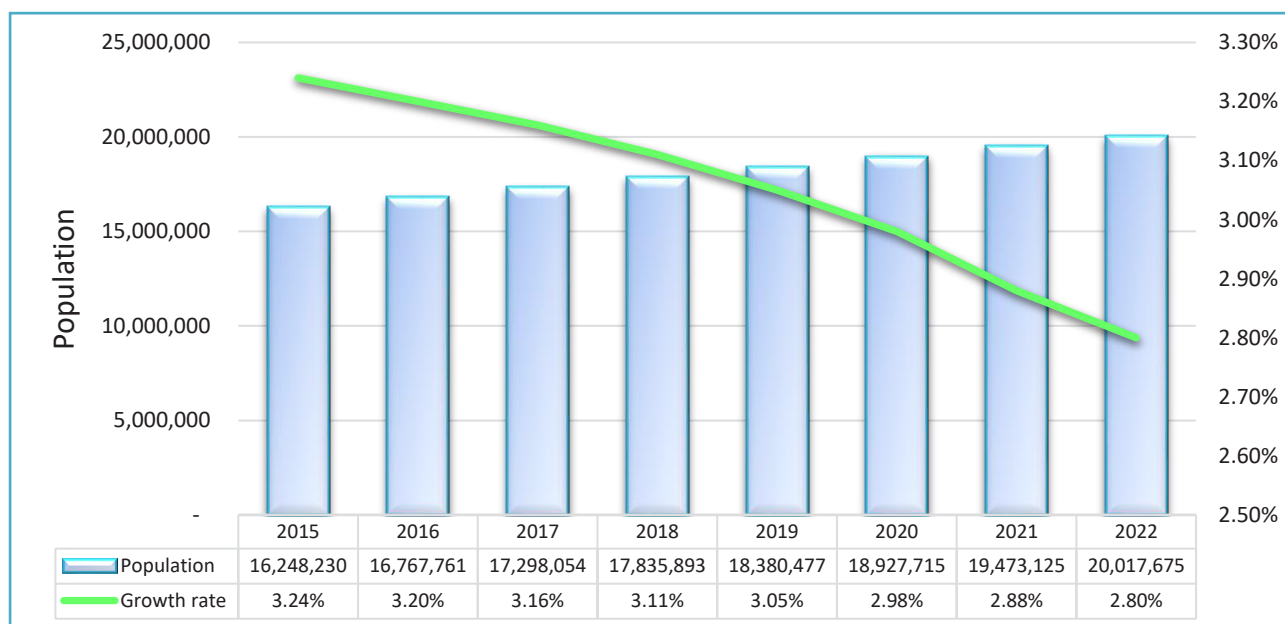
<sup>43</sup> <https://www.znbc.co.zm/news/illegal-dams-discovered/>

<sup>44</sup> <https://www.macrotrends.net/countries/ZMB/zambia/population-growth-rate#:~:text=The%20current%20population%20of%20Zambia,a%203.05%25%20increase%20from%202018.>

Further, the increase in urbanisation resulted in an increase in pollution and damage to water resources.<sup>45</sup>

Chart 1.3 below shows population growth and growth rate for Zambia between the years 2015 to 2022.

**Chart 1.3: Population Growth Rate for Zambia between the Year 2015 and 2022**



Source: <https://www.macrotrends.net/countries/ZMB/zambia/population>

As can be seen from Chart 1.3 above, the increase in population has given rise to a demand for developmental and economic growth in order to sustain the livelihoods of citizens leading to higher levels of urbanisation. High urbanisation is a threat to water resource development in that it leads to increased demand for water, as individuals are more concentrated in one area, which may have limited water supply.

The supply and demand dynamics of Zambia's water sector hinge on two main factors; popular awareness and understanding of the availability of resources and risk management. These factors are the basis on which Zambia can balance the use of water resources for human livelihoods while ensuring the increased population and high urbanisation does not negatively affect conservation of water resources for sustained social and economic development.<sup>46</sup>

<sup>45</sup> <https://healingwaters.org/how-does-population-growth-affect-water-scarcity/#:~:text=As%20the%20population%20increases%2C%20the,population%20growth%20in%20the%20future>



### 1.3.3 Government Interventions

Zambia's natural environment and ecosystems have come under threat on account of poor environmental management practices including air, water and land pollution, as well as poor sanitation and waste management. Water pollution is widespread with the manufacturing, mining and agriculture activities and inefficient sewerage treatment facilities being the major polluters of both surface and ground water, thereby limiting access to safe water.<sup>47</sup>

Government has recognised the need for appropriate technologies and approaches for effective water resource management hence, during the 8NDP- 2022 to 2026; Government intends to enhance mitigation and adaptation to climate change while promoting sustainable management of the environment, ecosystems and natural resources to promote green growth and environmental sustainability. Environmental education and awareness will be implemented alongside all interventions in this Strategic Development Area.<sup>48</sup> To this effect in 2022, Government allocated K971,923,264 for Environmental Protection and K2,352,235,641 on water and sanitation activities<sup>49</sup>.

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<sup>46</sup> 8<sup>th</sup> National Development Plan

<sup>47</sup> *ibid*

<sup>48</sup> 8<sup>th</sup> National Development Plan

<sup>49</sup> Presidential Budget Speech 2022

## CHAPTER TWO: AUDIT OBJECTIVES AND QUESTIONS

### 2.0 Introduction

The chapter outlines the main and specific audit objectives and audit questions to be answered to achieve the audit objective. It further explains the scope and limitation of the audit.

### 2.1 Main Audit Objective

To assess whether the Ministry of Water Development and Sanitation (MWDS) through WARMA had put in place efficient and effective measures to ensure sustainable management of water resources.

### 2.2 Sub-Objectives

In order to achieve the main objective, the audit developed the following sub-objectives:

- 2.2.1 To determine whether WARMA is protecting and ensuring the sustainability of water resources;
- 2.2.2 To assess whether WARMA monitor water resources and enforce the law to ensure the protection of water resources; and
- 2.2.3 To assess how WARMA collaborate with stakeholders and whether the stakeholders protect water resources under their jurisdiction.

### 2.3 Audit Questions

The following audit questions were developed and answered during the audit:

- 2.3.1 To what extent has WARMA managed water resources and the surrounding areas to ensure their sustainability?
- 2.3.1 How does WARMA monitor water resources and enforce the law to ensure sustainability?
- 2.3.2 To what extent do stakeholders manage water resources to ensure water resources protection under their jurisdiction?
- 2.3.3 To what extent is there collaboration of different stakeholders to ensure sustainability of water resources?

## **2.4 Audit Scope**

The main auditee was WARMA, an agency of the Ministry of Water Development and Sanitation. Other stakeholders included the Ministry of Tourism - National Heritage Conservation Commission (NHCC), Ministry of Green Economy and Environment-Forestry Department and Ministry of Local Government and Rural Development, Zambia Environmental Management Agency (ZEMA) and selected Local Authorities (LAs). The audit covered the period from January 2019 to December 2022 in order to ensure that the most recent activities to do with WARMA's management of water resources were assessed.

## **2.5 Audit Limitation**

The audit team visited two (2) out of six (6) catchment areas namely Kafue and Luangwa Catchments and eleven (11) out of 116 districts namely Lusaka, Livingstone, Chisamba, Chibombo, Kabwe, Ndola, Mpongwe, Monze, Luanshya, Chipata and Solwezi due to inadequate resources.

## CHAPTER 3: AUDIT METHODOLOGY

### 3.0 Introduction

This chapter describes the methodology used during the audit. The methodology includes an explanation and justification of the audit design. It further explains the sample population, sample size, sampling techniques, data collection and analysis methods.

### 3.1 Audit Standards

The audit was conducted in accordance with the International Standards for Supreme Audit Institutions (ISSAIs) and guidelines in the OAG's Performance Audit Manual. The Standards require that the audit is planned in a manner which ensures that an audit of high quality is carried out and that sufficient audit evidence is obtained to support the findings.

### 3.2 Audit Research Design

The audit utilised a research design that was a mixture of qualitative and quantitative approaches. The two (2) approaches were used because of the relevance to the audit as they provided a basis for data analysis by comparing interpretations.

### 3.3 Sample Population and Size

The target sample population was 6 (six) catchment areas and 116 districts. A total sample size of two (2) catchments<sup>50</sup> and eleven (11) districts namely Lusaka, Livingstone, Chisamba, Chibombo, Kabwe, Ndola, Mpongwe, Monze and Luanshya, Chipata and Solwezi were selected for the audit. Fourteen (14) water resources in the five (5) districts were visited. See Appendix I.

### 3.4 Sampling Techniques

The catchment areas visited were purposively selected based on the profile of risk in terms of occurrence of encroachment and pollution to water resources. The two catchments visited were representative of other catchments that were not visited due to the similarities in nature.

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<sup>50</sup> Upper Kafue and Luangwa Catchments

### **3.5 Methods of Data Collection**

The data collection techniques used in the audit included structured interviews and physical site inspections that enabled the collection of primary data while document reviews helped in the collection of secondary data. The details of the techniques used are as explained below:

#### **3.5.1 Interviews**

Structured and semi structured interviews were conducted with representatives of the Ministries of; Water Development and Sanitation; Green Economy and Environment- Department of Forestry; Tourism-the National Heritage Conservation Commission; Lands and Natural Resources; Local Government and Rural Development- Local Authorities and Water Resources Management Authority and Zambia Environment Management Agency to confirm information gathered through document review. The detailed list of people interviewed are as shown at **Appendix II**.

#### **3.5.2 Site Visitations**

Site visitations helped to verify the information obtained through interviews and document reviews. Further, site visitations were used to ascertain the conditions of water resources and whether there was adherence to the set standards and guidelines for water resources. See **Appendix II**.

#### **3.5.3 Document Review**

Various documents were reviewed to obtain reliable audit evidence to draw reasonable conclusions and recommendations. See **Appendix III**.

#### **3.5.4 Data Analysis**

Qualitative data collected through interviews and documents review was analysed using content analysis. Quantitative data collected was also analysed and presented through tables and graphs and where appropriate using Microsoft Excel.

## CHAPTER FOUR: DESCRIPTION OF THE AUDIT AREA

### 4.0 Introduction

The chapter describes the mandate, roles and responsibilities, funding arrangements and organisational structure of the MWDS and WARMA. It also highlights key stakeholders and systems description in the Management of Water Resources.

### 4.1 Mandate

The MWDS obtains its mandate from Gazette Notice No. 7039 of 2021 to: Formulate and review policies on water development and management; Review and develop legislation on water development and management; Conduct research on water development and management and facilitate the development and rehabilitation of water resources, water supply and sanitation, among others.

### 4.2 Roles and Responsibilities

The MWDS is charged with the overall responsibility for the development and management of water resources, provision of clean water supply and adequate sanitation for all. The following are the specific responsibilities:

- Construct, rehabilitate and maintain water resources infrastructure in order to harness water resources for use;
- Formulate and review water resources development strategy and action plans in order to facilitate resources mobilisation and attainment of set objectives;
- Conduct exploratory research and surveys on the availability of water resources in order to facilitate their development;
- Provide technical guidance and support to stakeholder institutions on matters relating to water resources development in order to ensure effective utilisation;
- Collaborate with stakeholders in planning and implementation of water resources development programmes in order to ensure a harmonised approach to programme execution;
- Conduct research on water development related issues to facilitate evidence-based planning and decision making; and



- Maintain a comprehensive geospatial database on dams and exploratory boreholes to facilitate storage and retrieval of information for decision-making.<sup>51</sup>

### 4.3 Organisational Structure

The MWDS is headed by a Minister who is assisted by the Permanent Secretary and has five (5) departments that are headed by Directors. These include:

- i. Human Resources and Administration;
- ii. Water Resources Development (DWRD);
- iii. Planning and Information;
- iv. Finance; and
- v. Water Supply and Sanitation.

The DWRD is responsible for the management of water resources and has three (3) sections namely Surface water, Ground Water and Trans boundary Waters that are headed by Assistant Directors. The DWRD extends its functions through WARMA.

### 4.4 Water Resources Management Authority

WARMA is a statutory body established under the Water Resources Management Act No.21 of 2011. Its main purpose is to regulate the management and development of water resources in the country and ensure equal access to water for various stakeholders. WARMA is also tasked to effectively manage surface and ground water and its responsibilities include:

- Exercise control over all water resources in Zambia;
- Monitor & regulate water use to ensure equitable allocation;
- Define Water Resources Management Regulations and disseminate them to the public;
- Plan, review and approve water use plans in catchments and sub-catchments;
- Water resources management;
- Support the operations of Catchment Councils and Sub Catchment Councils; and
- Facilitate the establishment and support of Water User Associations.

WARMA is headed by a Director General and has four directorates. See the Organogram in Appendix III

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<sup>51</sup> mwds.gov.zm

#### 4.5 Funding Details

During the period 2019 – 2022, a total budget of ZMW 8,658,668,501 was allocated for various water development undertakings in the Ministry out of which ZMW 236, 773,599 was allocated to WARMA representing 2.73%. See Table 4.1 below.

**Table 4.1: Total Authorised Budget for WARMA**

Year	2019	2020	2021	2022	Totals
<b>Total Authorised Budget (ZMW)</b>	48,555,617	53,536,525	66,257,493	68,423,964	<b>236,773,599</b>
<b>% increase from previous year</b>	-	9.30	19.20	3.17	

Source: WARMA budget for the period 2019 to 2022.

Government has attached importance to water resource management as can be seen from Table 4.1 above. The funding increased by 9.3% from ZMW48,555,617 in 2019 to ZMW53, 536,525 in 2020. It further increased by 19.2% to ZMW66,257,493 in 2021 and increased again by 3.17% to ZMW68, 423,964 in 2022.

#### 4.6 Key Stakeholders

The key stakeholders and their roles are detailed in table 4.2 below.

**Table 4.2 Stakeholders and their Roles**

	STAKEHOLDER	ROLES
1.	National Heritage and Conservation Commission	Protect, conserve and manage Zambia's immovable and movable natural and cultural heritage sites including water resources to ensure their sustainable utilisation.
2.	Ministry of Green Economy and Environment - Forestry Department	<ul style="list-style-type: none"> <li>Enforces law and order regarding management of water resources in forests and their exploitation.</li> <li>Spearheads sustainable management of the forest resources across the country by adopting and promoting methods for the sustainability, conservation, preservation of ecosystems and biological diversity in forest areas and open areas.</li> </ul>

	STAKEHOLDER	ROLES
3.	Ministry of Lands and Natural Resources – Lands Department	Allocates land and ensures that new parcels of land required for development are properly planned by Local Authorities (Municipal and City Councils), Provincial Planning Authorities and not allocated in open areas reserved as water protected areas.
4.	Zambia Environmental Management Agency	Manages protected areas by ensuring sustainable management of natural resources, protection of the environment, prevention and control of pollution by safeguarding human welfare, animals and plants.
6.	Ministry of Local Government and Rural Development	Ensures that, during planning for land allocation and development, environmentally sensitive areas are zoned out or marked as open spaces for protection against encroachment and development.

Source: Performance Audit Stakeholder Analysis- 2022

#### 4.7 System Description

This segment describes the process for water resource management.

Water resources management refers to planning the sustainable development of water resource and providing for the implementation of any catchment, management plan and national water resource strategy and plan. It is also the promotion of rational and optimal utilization, promotion, conservation and control of water resources.

The Authority protects and manages the water resources as described below:

The process of managing water resources involves WARMA's identification, mapping and delineation of water sources, after which the Authority is supposed to recommend to the Minister for gazettion of water resources as Water Resources Protection Areas (WRPAs). The Authority is supposed to ensure that riparian areas the water resources are protected from any illegal activities by use of the Statutory Instrument No. 1 of 2000. To assess the quantity and quality of ground and surface water, the Authority uses ground and surface water monitoring stations that are dotted around the country.

Once the identification and mapping are done, the Authority recommends to the Minister to have the identified water resources declared as Water Resource Protection Areas

(WRPAs). After the declaration, the Authority should ensure that water resources are conserved, preserved and protected.

To ensure the conservation, protection and preservation of water resources, they are managed at national level by the MWDS through WARMA.

At regional and provincial levels, water resources management is supposed to be carried out through six (6) catchments, which are further divided into sub-catchment councils.

The catchment councils comprises not more than three representatives from the provincial administration situated in the catchment and nine other representatives. The functions of the catchment council include:

- Regulate and supervise the use of water;
- Consolidate data forwarded to it by sub-catchment councils;
- Prepare and periodically update the catchment management plans;
- Harmonise sub-catchment plans and local management plans and facilitate the implementation of plans;
- Report to the Authority catchment matters;
- Carry out public awareness campaigns on water resources and environmental management;
- Undertake catchment protection and resource quality monitoring and evaluation; and
- Propose catchment management strategies to the Authority, among others.

In addition, the sub-catchment councils are supposed to be comprised of a representative of each of the Local Authority (LA) in the area, not more than two (2) persons representing the traditional authorities and not more than nine other stakeholders. The following are some of the functions of sub-catchment councils:

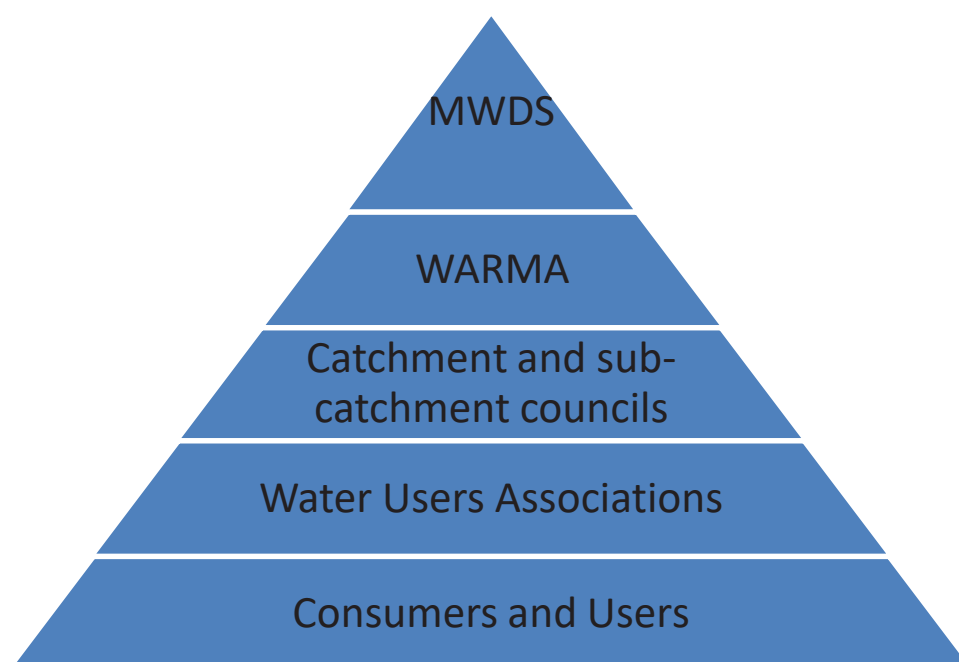
- Prepare allocation plans;
- Undertake investigations and submit recommendations to the catchment council;
- Regulate the use of water;
- Monitor water quantity and quality;
- Develop and implement sub-catchment management plans;
- Harmonise local management plans;
- Provide technical support to water users associations in the sub-catchment; and
- Carry out public awareness campaigns on water resources and environmental management, among others

The other level of water resources management is the Water Users Association (WUAs). It comprises not more than ten (10) members that are supposed to be nominated by water users on an appropriate authority in the area. The functions of the WUAs include:

- Undertaking of projects that ensure catchment protection;
- Promote the participation of communities in the management of water resources; and
- Propose local water management plans to the sub-catchment councils, among others.

Water resources management and governance levels in the country are summarised in figure 4.1 below.

**Figure 4.1: Governance Levels and Structures in WRM in Zambia**



**Source: WARMA 2017 – 2021 Strategic Plan**

## CHAPTER FIVE: AUDIT CRITERIA

### 5.0 Introduction

This chapter introduces the criteria used to assess the activities undertaken by MWDS through WARMA and other stakeholders to protect the water resources

### 5.1 Sources of Criteria

The sources of audit criteria included:

- Water Resources Management Act No.21 of 2011;
- Urban and Regional Planning Act No. of 2015;
- Public Finance Management Act, No. 1 of 2018;
- Statutory Instrument No. 1 of 2000 on Buffer Zones;
- Forestry Act No 4 of 2015;
- National Heritage Conservation Commission Act, Chapter 173;
- National Policy on Environment 2007;
- National Forestry Policy 2009;
- Heritage Conservation Policy 2018;
- National Water Policy 2010;
- National Policy on Wetlands 2018;
- MWDS Strategic Plan 2017 – 2021;
- WARMA Strategic Plan 2018 -2021;
- WARMA Annual Work Plans and Budgets for 2019 to 2022;
- Identified Candidate Water Resources Protection Areas in Zambia 2021;
- WARMA Report on Mapping 2021;
- WARMA Trends Report 2011 – 2019;
- WARMA Inspectorate Hand Book – 2022;
- Zambia Country Forest Note Towards a Sustainable Way of Managing Forest Report 2019; and
- Efficient Water Resource Management for Sustainable Social and Economic Development Report 2014.



## 5.2 Detailed Audit Criteria

The section outlines the detailed criteria used to assess the performance of the institutions.

### 5.2.1 To what extent has the MWDS through WARMA managed water resources and the surrounding areas to ensure their sustainability?

To ensure sustainability of water resources, WARMA shall:

- Formulate a national water resources strategy and plan for the management, use, development, conservation, preservation, protection, control and regulation of water resources<sup>52</sup>. The MWDS also planned to prepare the Water Resource Strategy and Plan by December 2021<sup>53</sup>;
- Promote and implement the development of an integrated catchment management system and improve accessibility and utilisation of water resources for various uses;
- Develop three (3) Statutory Instruments to operationalise the decentralisation of Catchment Councils, Sub catchment Councils and WUA<sup>54</sup>;
- Develop an operational plan to operationalise the six catchments across the country by April 2020<sup>55</sup> and ensure that six (6) catchments are fully functional by end of 2021<sup>56</sup>;
- Prepare catchment and sub-catchment management plans<sup>57</sup>;
- Identify and protect potential sources of freshwater supply<sup>58</sup>, identify fifteen (15) ground water recharge zones in all the six (6) catchments<sup>59</sup> and identify twenty (20) headwaters<sup>60</sup>;
- Delineate or map identified sensitive water resources areas and groundwater potential or recharge zones<sup>61</sup>;
- Conserve, preserve and protect the environment, in particular, wetlands, quarries, dambos, marshlands and headwaters<sup>62</sup>;

<sup>52</sup> Water Resources Management Act No 21 of 2011 para 31 (1)

<sup>53</sup> MWDS 2018 – 2021 Strategic Plan, Objective 2

<sup>54</sup> WARMA 2020 Annual Report

<sup>55</sup> WARMA Work plan and Budget – 2020 activity 1.5.1

<sup>56</sup> Strategic Plan -2017 to 2021 on Strategic Objective 3, Intermediate Result 3.9

<sup>57</sup> Water Resources Management Act No 21 of 2011 para 32 (1)

<sup>58</sup> Water Resource Management Act No.21 of 2011 para 8(2)a

<sup>59</sup> WARMA Work plan and Budget – 2020 activity 1.4.5

<sup>60</sup> WARMA 2020 Work plan and Budget

<sup>61</sup> 2020 Candidate Report

<sup>62</sup> Water Resource Management Act No 21 of 2011 8(2)b

- Prevent activities within a distance of fifty (50) meters of a bank of any public stream<sup>63</sup>, and delineate watersheds based on the ecological connectivity among forests, water resources and wildlife conservation<sup>64</sup>;
- Protect ground water, in collaboration with any appropriate or conservancy authority, by preventing the pollution of aquifers through the regulation of toxic substances that permeate the ground<sup>65</sup>;
- Recommend to the Minister the declaration of water resource protection areas around groundwater, re-charge areas and abstraction sources<sup>66</sup>;
- Develop a program of carrying out both surface and ground water quality sampling and monitoring in all the six Catchments on a quarterly basis<sup>67</sup>;
- Recommend through the Minister to gazette and protect ground water recharge zones<sup>68</sup>; and
- Mobilise resources for the management and conservation of water resources in the public interest<sup>69</sup>.

## **5.2.2 How does the MWDS through WARMA monitor water resources and enforce the law to ensure sustainability?**

### **5.2.2.1 WARMA**

To ensure sustainability of water resources, WARMA shall:

- Monitor the resource quality and control the pollution of any water resource<sup>70</sup>;
- Check for changes/other activities in the river buffer-zones; Check for any disturbance to recharge zones e.g. settlements, cultivation, soil/mud mining, deposition of any materials by human activities.<sup>71</sup>;
- Conduct compliance monitoring for all and other identified sites.<sup>72</sup>; and
- Confiscate any tool or equipment used in the commission of the offence or destroy any unlawful obstructions or works carried out or crops grown without payment of any compensation to the offender<sup>73</sup>.

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<sup>63</sup> SI No. 1 of 2000

<sup>64</sup> National Strategy for Reduced Deforestation and Degradation 1.1.1

<sup>65</sup> Water Resources Management Act No. 21 of 2011

<sup>66</sup> Water Resources Management Act No. 21 of 2011

<sup>67</sup> WARMA Trends Report para 1

<sup>68</sup> Ibid

<sup>69</sup> Water Resource Management Act No.21 of 2011 26(f)

<sup>70</sup> WRM Act No 21 of 2011 47 (2)

<sup>71</sup> WARMA Inspectorate Hand Book (9) (i)

<sup>72</sup> WARMA 2020 Work Plan and Budget

<sup>73</sup> SI No 1 of 2000 on buffer zone

### 5.2.2.2 Forestry Department

To ensure sustainability of water resources, the Forestry Department shall conduct monitoring and evaluation activities to regulate and monitor the harvesting of forest wood resources in concession areas.<sup>74</sup>

### 5.2.2.3 National Heritage Conservation Commission

To ensure sustainability of water related heritage sites, the NHCC shall provide protection to the natural heritage sites.<sup>75</sup>

### 5.2.2.4 Ministry of Local Government and Rural Development – Provincial Planning offices

To ensure sustainability of water resources, the Provincial Planning Offices shall:

- Monitor and review the integrated development plan, including key performance indicators<sup>76</sup>; and
- Indicate priority areas for protection of ecologically sensitive areas, heritage and cultural sites<sup>77</sup>

## 5.2.3 To what extent do stakeholders manage water resources to ensure water resources protection in their jurisdiction?

### 5.2.3.1 Ministry of Green Economy and Environment- Department of Forestry

To ensure sustainability of water resources, the Ministry of Green Economy and Environment shall:

- Ensure that all land comprised in a National Forest shall be used for the management of major water catchments and head waters, subject to the Water Resources Management Act 2011<sup>78</sup>;
- Manage the impact of human activities on the environment that include inadequate management of water resources and water pollution<sup>79</sup>;

<sup>74</sup> National Forestry Policy 2009 Chapter 6 Plan of action, monitoring and evaluation, 6.1 Monitoring and evaluation, Pg.41

<sup>75</sup> The National Heritage Conservation Commission Act, Chapter 173, Section 48 (c)

<sup>76</sup> Urban and Regional Planning Act No. 3 of 2015

<sup>77</sup> Ibid

<sup>78</sup> The Forests Act No. 4 of 2015, 81, Part Iii Forest Management and Development, *National Forest, No.12, (d)*

<sup>79</sup> National Policy on Environment - 2007

- Conduct patrols and serve eviction notices to illegal settlers within the forest reserves.<sup>80</sup>;
- Facilitate the formation of a joint forest management committee for the forest reserves which shall comprise a person appointed by the Chief in that area, a representative of the Forestry Department, and one representative each from the Departments of Agriculture, Water, Lands and Fisheries in the area.<sup>81</sup>;
- Ensure that all land comprised in a Local Forest shall be used for the conservation and development of forests for the management of major water catchments and head waters, the protection of ecosystems, particularly the protection of land and water supplies of local strategic importance<sup>82</sup>; and
- Formulate a National Forestry Master Plan which should include the designation of nature reserves and areas of stabilisation of watersheds<sup>83</sup>;

### 5.2.3.2 National Heritage Conservation Commission

To ensure sustainability of water resources, the NHCC shall:

- Promote research and development in order to enhance generation of information for effective management and utilization of natural heritage resources<sup>84</sup>;
- Enforce the law to protect natural heritage from illegal activities<sup>85</sup>;
- Strengthening stakeholder coordination and collaboration for enhanced natural heritage management and protection<sup>86</sup>;
- Undertake timely rescue operations to safeguard loss of natural heritage<sup>87</sup>;
- Negotiate with the holder of the land to arrange for preservation, restoration, rehabilitation and reconstruction of the heritage<sup>88</sup>;
- Define boundaries for enhanced protection of these areas<sup>89</sup>;
- Ensure that all public properties are secured with title deeds<sup>90</sup>; and

<sup>80</sup> National Forestry Policy 2009 Chapter 5 Plan of action, Monitoring and Evaluation, 6.1 Monitoring and Evaluation, Pg. 41

<sup>81</sup> Forest Act No 4 of 2015 12(d) and 19(b)

<sup>82</sup> Forest Act No 4 of 2015 12(d) and 19(b)

<sup>83</sup> Forests Act No 4 of 2015 Section 40 (3) – Content of Management Plan

<sup>84</sup> Heritage Conservation Policy (2018), Objective 3, pp.22

<sup>85</sup> Heritage Conservation Policy (2018), Objective 2 (f), pp.21

<sup>86</sup> Heritage Conservation Policy 2018, pp.21, Objective 2(b)

<sup>87</sup> Heritage Conservation Policy (2018), Objective 2 (d), pp.21

<sup>88</sup> The National Heritage Conservation Commission Act, Chapter 173, Section 48 (a)

<sup>89</sup> Heritage Conservation Policy (2018), Objective 2 (a), pp.21

<sup>90</sup> Section 41(4) of the Public Finance Management Act, No. 1 of 2018

- Undertake land audit and boundary marking of all-natural heritage sites to define boundaries for enhanced protection of the sites<sup>91</sup>.

### 5.2.3.3 Ministry of Lands

To ensure sustainability of water resources, the MoL shall:

- Ensure an integrated management of wetlands through various enabling Acts. Ministries and Agencies of government will be expected to review their legislation in order to effectively contribute to sustainable management of wetlands<sup>92</sup>;
- Protect the wetlands and their catchment areas and improve the resilience of wetland systems to natural and anthropogenic shocks<sup>93</sup>; and
- Protect the wetlands and their catchment areas and improve the resilience of wetland systems to natural and anthropogenic shocks by reviewing existing information on wetlands, where necessary, undertake further studies in order to develop guidelines for their proper utilisation.

## 5.2.4 To What Extent Was There Collaboration of Different Stakeholders to Ensure Sustainability of Water Resources?

### 5.2.4.1 WARMA's Collaboration with Local Authorities, ZEMA, Forest Department, NHCC

- WARMA shall use participatory approaches to create awareness on important water issues to mobilise support from the general public and policy and decision makers on the best practices for management and development of the water resources.<sup>94</sup>
- WARMA shall liaise, consult, collaborate and cooperate with all the relevant appropriate authorities in the management, development and use of water resources and may, for such purposes, have joint programmes, plans, strategies and policies.<sup>95</sup>

<sup>91</sup> Heritage Conservation Policy (2018), pp.21

<sup>92</sup> National Policy on Wetlands 2018

<sup>93</sup> National Policy on Wetlands 2018

<sup>94</sup> National Water Policy 2010, pp. 38

<sup>95</sup> Water Resources Management Act No. 21 of 2011 Section 10

#### **5.2.4.2 Coordination between National Heritage Conservation Commission and Other Government Agencies**

The NHCC shall promote stakeholder participation to enhance protection and utilisation of natural heritage resources by undertaking stakeholder mapping to ensure effective participation and collaboration in natural heritage conservation.<sup>96</sup>

#### **5.2.4.3 Coordination and Alignment of Integrated Development Plans of Local Planning Authority**

The Provincial Local Planning Authority shall facilitate the coordination and alignment of the Integrated Development Plans of Local Planning Authorities within the Province<sup>97</sup>.

#### **5.2.4.4 Collaboration between Provincial Local Planning Authorities and ZEMA**

Local Authority may enter into partnerships for the benefit of the general public for purposes of plan preparation, implementation, operation and maintenance related to areas covered by an Integrated Development Plan or Local Area Plan.<sup>98</sup>

#### **5.2.5 WARMA's Involvement of Communities**

To ensure sustainability of water resources, the WARMA should:

- Conduct ten (10) community sensitisation and awareness programmes across the catchments;
- Provide mechanisms and facilities for enabling the public and communities to participate in managing the water resources within each catchment<sup>99</sup>; and
- Recommend to the MWDS the constitution of a water users association for any area of a catchment.

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<sup>96</sup> Heritage Conservation Policy (2018), Objective 6 (a), pp. 23

<sup>97</sup> Urban and Regional Planning Act No. 3 of 2015

<sup>98</sup> Ibid

<sup>99</sup> WRM Act No 21 of 2011 - 31 (3) d

## CHAPTER SIX: FINDINGS

### 6.0 Introduction

This chapter highlights the findings of the audit, which were generated by comparing the observations to set criteria or standards, verifying performance problems and their causes.

### 6.1 Management of Water Resources to ensure Sustainability.

#### 6.1.1 National Water Resources Strategy and Plan

The Authority shall formulate a national water resources strategy and plan for the management, use, development, conservation, preservation, protection, control and regulation of water resources<sup>100</sup>. One of the objectives of the MWDS is the preparation of the National Water Resource Strategy and Plan (NWRSP) by December 2021<sup>101</sup>.

The NWRSP is supposed to set out the principles, objectives, procedures and institutional arrangements of WARMA for the management, use, development, conservation, preservation, control and regulation of water resources within each catchment, including possible financing requirements.<sup>102</sup>

Interviews and document review revealed that WARMA had been developing the NWRSP for four (4) years from 2018 to October, 2022 when it was subsequently launched. It was further noted that the target completion plan of December 2021 was not met. It was further established that in the absence of the Plan, WARMA used the National Water Policy of 2010, National Water Resources Master Plan of 1995 and the Integrated Water Resources Management/Water Use Efficiency Plan (2008 to 2030). Despite this, it was noted that the National Water Policy expired in 2020 and did not address key matters such as activities to be implemented and targets to be achieved. Further, a review of the Authority's Annual Work Plans 2019 to 2022 revealed that WARMA neither planned nor budgeted for the development of the National Water Resources Strategy and Plan. Interviews revealed that WARMA delayed to complete the development of the Plan due to inadequate resources. Failure to formulate a NWRSP as planned may contribute to unjustifiable or inadequately informed national developments taking place in strategic and sensitive freshwater areas

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<sup>100</sup> Water Resources Management Act No 21 of 2011 para 31 (1)

<sup>101</sup> MWDS 2018 – 2021 Strategic Plan, Objective 2

<sup>102</sup> Water Resources Management Act No 21 of 2011 para 31 (3)(b)



such as headwaters and groundwater recharge areas, haphazard management of water resources as certain areas which need attention for example, conservation of water resources may be omitted from the Plan. This may have resulted in encroachments and illegal development activities being undertaken on water resources buffer zones.

### 6.1.2 Functional Catchments

Water resource management and development shall be carried out on the basis of catchment boundaries<sup>103</sup>. WARMA planned to have six catchments fully functional by end of 2021<sup>104</sup>.

Document review of WARMA's Annual Report for 2020 revealed that three (3) Statutory Instruments to operationalize the decentralization of Catchment Councils, Sub catchment Councils and Water Users Associations were under development. However, interviews with WARMA representatives and document reviews revealed that the Authority operationalized four (4) out of the required six (6) Catchments namely; Zambezi, Chambeshi, Luangwa and Kafue while two (2) namely; Luapula and Tanganyika catchments were not operational, however, interviews further revealed that activities in the two (2) catchments were undertaken by the Chambishi Catchment Office. Interviews revealed that the two (2) catchments were not operationalized due to inadequate technical staff and financial resources. Further, interviews with settlers close to the Chongwe River revealed that there were activities in the Chongwe River buffer zone such as cutting of trees, gardening and construction of dwellings. In response to the OAG Management Letter dated 6<sup>th</sup> January 2023, WARMA stated that a satellite office in Mansa had been opened to carry out WARMA activities in the Luapula Catchment.

The non - operationalisation of the catchments may lead to illegal activities such as infrastructure development, mining and agriculture.

### 6.1.3 Catchment and Sub Catchment Operationalisation Plans

WARMA was supposed to develop an operational plan to operationalise and establish the six (6) catchments across the country by April 2020.<sup>105</sup> In addition, the sub-catchment council within the area for which it is constituted and for the purposes of the water resources in that area is supposed to develop sub catchment plans<sup>106</sup>. For the purposes of

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<sup>103</sup> 2010 National Water Policy

<sup>104</sup> Strategic Plan -2017 to 2021 on Strategic Objective 3, Intermediate Result 3.9

<sup>105</sup> WARMA Work plan and Budget – 2020 activity 1.5.1

<sup>106</sup> Water Resource Management Act No 21 of 2011 para 20 (1) (e)

ensuring the optimum management, development and utilisation of water resources, the Authority and Catchment Councils should prepare catchment management plans.<sup>107</sup>

Interviews with WARMA officials revealed that among the six (6) catchments, only the Kafue Catchment developed a draft Catchment Management Plan. However, the other five (5) catchments namely; Tanganyika, Luangwa, Chambishi, Zambezi and Luapula were developed without operationalisation plans. WARMA in its response to the management letter revealed that plans were not developed due to inadequate resources and the absence of the NWRSP which was still under development. The NWRSP was supposed to inform the development of Catchment Management Plans. WARMA further stated that the Catchment Councils and Sub catchment councils had not yet been established as the regulations that were supposed to establish them were not yet in place. In addition, WARMA stated that they prepared the documents and presented them to the Ministry of Justice through the MWDS in December 2021. The absence of catchment plans was indicative that the Authority did prioritise their preparation. For example, field visits to the Kafubu River in Ndola, Copperbelt Province revealed that there were illegal activities such as construction, sand mining and cutting down of trees taking place within the water resources buffer zone.

Failure to formulate the operationalisation plans in the five (5) catchments may have contributed to the challenges such as encroachments on water resources buffer areas that were reported in the catchments. In addition, failure to develop the catchment and sub-catchment plans may result in uncontrolled abstraction of water which may choke water resources and may result in the depletion of water resources.

#### **6.1.4 Identification, Declaration and Protection of Groundwater Resources Areas**

WARMA is supposed to identify and protect potential sources of freshwater supply<sup>108</sup> and identify fifteen (15) ground water recharge zones in all the six (6) catchments<sup>109</sup>.

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<sup>107</sup> Water Resources Management Act No 21 of 2011 para 32 (1)

<sup>108</sup> Water Resource Management Act No.21 of 2011 para 8(2)a

<sup>109</sup> WARMA Work plan and Budget – 2020 activity 1.4.5

A review of the Authority's Annual Report for 2020 and the 2021 Report on Mapping of Candidate Water Resources Protection Areas revealed that the Authority did not meet the target of identifying fifteen (15) ground water recharge zones as only six (6) were identified as shown in table 6.1 below:

**Table 6.1: Identified or Known Sensitive Groundwater Resources Areas**

Serial No.	Groundwater Resource Areas	Water Resources Area Location	Action taken
1	Kakontwe Limestone Aquifer (Misundu wellfield)	Copperbelt – Ndola (Kafue Catchment)	Identified & Mapped
2	Makululu Dolomite Aquifer	Central Province-Kabwe (Luangwa Catchment)	Identified & partially Mapped
3	Mpongwe Dolomite Aquifer	Copperbelt – Mpongwe (Kafue Catchment)	Mapped under Groundwater Resources Management Support Programme (GReSP)
4	Chisamba/ Chibombo Dolomite Aquifer	Central Province Luangwa/Kafue Catchments	Identified but yet to be mapped
5	Bwana Mkubwa Dolomite Aquifer	Copperbelt – Ndola (Kafue Catchment)	Identified but yet to be mapped
6	Kifibwa/ Kabitaka & College wellfields	Copperbelt – Solwezi (Kafue Catchment)	Identified & mapped under GreSP

**Source: WARMA's 2021 Report on Mapping of Candidate Water Resources Protection Areas**

Document review of the 2021 Candidate Report and interviews with the Authority revealed that the process of mapping water resources was underway. Further, document<sup>110</sup> reviews revealed that WARMA carried out water resource identification activities in four (4) out of six (6) catchments namely; Chambeshi, Luangwa, Kafue and Luapula. In addition, WARMA carried out both ground and surface water resource identification in Luangwa and Kafue catchments while surface water identification was done in Luapula and Chambishi catchments. However, the Authority did not provide information on work carried out in the Tanganyika and Zambezi catchments as at December 2022. A visit to

Kafubu and Magoye rivers in Ndola and Mazabuka respectively revealed that the natural flow of the water resources was affected as some parts of the river were drying up due to encroachments and other human activities such as sand mining and agricultural activities. WARMA in its response to the management letter stated that for both the Kafubu and Magoye cases, WARMA was working with stake holders to address the risks to water resources in the areas. The Authority further explained that both areas were identified for protection in the strategic plan (2022-2026) and in the 2023 work plan.

Failure to identify water resources may defeat the objective of protecting water resource buffer zones from human activities which may result in depletion and destruction of water resources. Further, failure to identify and map recharge zones may lead to development activities in the zones which may compromise water quality, threatening the existence of water resources.

#### **6.1.5 Declaration of Water Resource Protection Areas**

WARMA is supposed to recommend to the Minister the declaration of water resource protection areas around groundwater, re-charge areas and abstraction sources.<sup>111</sup> Further, WARMA in its 2020 Annual Work Plan, planned to recommend through the Minister to gazette and protect ground water recharge zones.

Interviews with representatives of WARMA revealed that the recommendation was not done and therefore water resources were not gazetted. Further, interviews with WARMA representatives revealed that the process of gazetting was a multi-sectorial approach in which the Authority was in the process of carrying out an assessment to identify priority areas. It was reported that the assessment exercise would enable recommendations for the declaration and gazetting of water resource protection areas. A visit to Mass Media Wellfields in Lusaka revealed that the well field was encroached upon and dwelling structures constructed on the wellfield land. Interviews with WARMA representatives also revealed that the wellfields were not gazetted and as a result was not protected. WARMA in its response to the management letter explained that gazetting an area as a Water Resource Protection Area (WRPA) is the out-come of the process from identification to issuing of the gazette. It is worth noting that most of the developments cited were implemented prior to WARMA's existence.

Failure to gazette water resource for protection may contribute to the rising number of illegal activities which may compromise the sustainability of water resources.

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<sup>111</sup> Water Resources Management Act No 21 of 2011 93 (b)

### 6.1.6 Delineation of Water Resources

According to the National Strategy for Reduced Deforestation and Degradation, the Authority among others shall delineate watershed areas based on the ecological connectivity among forests, water resources and wildlife conservation.<sup>112</sup>

A review of documents revealed that the Authority carried out identification and mapping of water resources between 2017 and 2019 and had two (2) potential groundwater recharge zones delineated for Lusaka region and upper Kafubu catchment<sup>113</sup>. Further, interviews revealed that water resources in the country were not delineated due to: limited tools and equipment for conducting mapping, field assessments and delineation of sites as candidate WRPAs; limited financial resources to support country-wide assessment and delineation of candidate WRPAs; inadequate technical staff which stood at forty-four (44) out of a total of eighty-eight (88) staff, assessment and delineation of WRPAs; and capacity building in technical assessment which was financially costly. The Authority was still in the process of mapping water resource areas as at December 2022. In response to the OAG Management Letter dated 6<sup>th</sup> January 2023, WARMA stated that delineation and ultimately gazettement an area as a Water Resource Protection Area (WRPA) was dependent on detailed studies and a process of stakeholder consultation. Failure to delineate water resources has resulted in continued encroachment of water resources buffer zones.

### 6.1.7 Protection of Wetlands, Dambos, Marshlands and Headwaters

WARMA is supposed to conserve, preserve and protect wetlands, quarries, dambos, marshlands and headwaters.<sup>114</sup> Further, a person shall not, on any area of land within a distance of fifty (50) meters of a bank of any public stream, cultivate or permit the cultivation of any crops, cut any tree, excavate any sand or in any manner conduct any activity likely to loosen the soil or diminish the quantity of water flowing in any part of a public stream<sup>115</sup>. Further watershed areas are supposed to be delineated based on the ecological connectivity among forests, water resources and wildlife conservation<sup>116</sup>

The audit established that apart from Forest 26 (a water recharge area) which was well secured against illegal access by wire fencing, the Authority did not protect the water resources such as wetlands, dambos and headwaters. Physical inspections in: Lusaka's

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<sup>112</sup> National Strategy for Reduced Deforestation and Degradation 1.1.1

<sup>113</sup> Report on Mapping of Candidate Water Resources Protection Areas in Zambia for 2021

<sup>114</sup> Water Resource Management Act No 21 of 2011 8(2)b

<sup>115</sup> SI No. 1 of 2000 – Water Regulations (3)

<sup>116</sup> National Strategy for Reduced Deforestation and Degradation 1.1.1



Mass Media well fields; Shaft Five (5); Forest 27; Kabwe's Shamabanse and Lukanga dambos, the Kalulu/Mukobeko wellfields; Kabushi River in Ndola; Lake Chilengwa in Masaiti; and Makoma Dam in Luanshya revealed the following;

**i. Practicing of Agricultural Activities on the River Systems**

It was observed during the field visit of Kafubu River in Ndola that there were agricultural activities along the river banks as shown in the figure 6.1 below:

**Figure 6.1: Farming on the Kafubu River**



**Source: Performance Audit Field Visit 2022**

The continued agricultural activities in some dry sections of the river may result in the presence of chemicals in water which in turn may impact the quality of water in the aquatic system. This ultimately affects the provision essential benefits such as clean drinking water, recreation, transport, food, and aesthetics.

**ii. Construction Activities on Water Resource Areas**

It was observed that construction activities were prevalent within fifty (50) meters radius of river systems and dambos. Some structures were completed and occupied with sewer

systems installed within the river system. Furthermore, it was observed that occupants encroached water resource areas to pursue construction activities on land that did not legally belong to them. For instance, during field visits, the following were established:

- a. The Mass Media Wellfields and Shaft five (5) in Lusaka were encroached with structures built within the fifty (50) meters buffer zone of the water sources;
- b. Forest 27, a recharge zone for the Chongwe River, was degazetted in piecemeal under SIs No.62 of 2017, No. 59 of 2018 and No.13 of 2019 and the Ministry of Lands had allocated plots to developers who had since developed some parts of the forest. Request for documents to show whether the degazation procedure was followed and an EIA was conducted were not provided by the Authority, Forest Department, Ministry of Lands and ZEMA as at December 2022. Consequently, there is a risk that degazation was done without following the required process. There is also a risk of ground water depletion and contamination;
- c. The Kabushi Stream in Ndola was encroached upon with structures such as pit latrines built in the dry section of the stream;
- d. The Itawa Spring in Ndola was also encroached upon. Interviews with the NHCC revealed that the spring buffer area was encroached as the NHCC did not have title deeds to claim ownership and therefore NHCC had limited control over the spring; and
- e. The banks of the Kafubu River in Ndola had construction activities along the banks with many complete and occupied houses either on the river banks or inside the dry surface land of the river, a situation which posed a great danger on the sustainability of the river and safety of occupants. In this regard, Ndola City Council reported that some occupied houses around the Kafubu River were flooded during the 2021/2022 rain season and as a result were inhabitable as shown in figures 6.2 and 6.3(a) and (b) below:

**Figure 6.2: Flooding in a House Built on the Kafubu River Bank**



Source: Ndola City Council - 2022



**Figure 6.3a: Agricultural activities along the Kafubu Riverbanks**



**Figure 6.3b: Agricultural activities along the Kafubu Riverbanks**



Source: Ndola City Council July 2022

During interviews with Ndola City Council, it was reported that the LA did not allocate plots within the Kafubu River system and that most occupants acquired the land through political connections. It was further noted that the LA failed to enforce laws to prevent land illegalities or demolish structures built within the river system.

Consequently, due to failure by the LA to regulate and stop construction activities in Kafubu River buffer zone, the sustainability of the river system was compromised thereby affecting the provision of important ecosystem services such as drinking water, irrigation, flood control, recreation, and habitat for fish and wildlife. This in turn has resulted in a number of adverse effects on river water quality which include erosion, ecological damage, sedimentation and urban storm water runoff.

### iii. Dumping of Waste on River Banks

During the field visit, it was observed that there was dumping of waste in the river and along the banks of the river. For example, at Kafubu River, there was a heap of comingled waste dumped along the river bank with some waste spilling into the river as shown in figure 6.4 below:

**Figure 6.4: Dumping of Waste along the Kafubu River Banks**



**Source: Performance Audit 2022**

Interviews with Ndola City Council revealed that some Ndola residents were in a habit of avoiding paying for garbage collection and resorted to illegally dumping their waste along the Kafubu river bank, which in turn may pollute the water resource.

### iv. Sand and Gravel Mining from River Systems

Physical inspections along Kafubu River bank in Ndola revealed the presence of sand and black soil mining as can be seen in figure 6.5 (a) and 6.5 (b) below:

**Figure 6.5 a: Black Soil Mining along Kafubu**



**Figure 6.5 b: Sand Mining along Kafubu**



**Source: Performance Audit 2022**

Ndola City Council indicated that concerns were increasing regarding the impact of sand and soil mining (aggregate mining) to the human health and ecosystems that depended on the river. This led to loss of habitats, physical changes to river system, water quality changes affecting physical or chemical conditions and hydraulic changes affecting movement of fish and habitat availability. Consequently, unsustainable sand and soil mining may result in riverbank collapse, deepening of river beds, sinking deltas and erosion as well as biodiversity loss thereby degrading the environment and destroying water sources.

#### **v. Onsite Sanitation**

A field visit at Kafubu River revealed that residents constructed septic tanks in the water resource buffer zone as shown in figure 6.6 (a) below:



**Figure 6.6(a): Septic Tank along the Riverbank - Source: Performance Audit –2022**



As can be seen from the pictures above, Ndola City Council did not halt the construction activities in their initial stages. Consequently, this has raised serious sanitation concerns posing health risks resulting from seepage of effluent into the river. This may negatively impact water quality due to discharges of untreated wastewater which may result into waterborne diseases.

#### **6.1.8 Water Quality Assessments**

The Authority shall protect ground water, in collaboration with any appropriate or conservancy authority, by preventing the pollution of aquifers through the regulation of toxic substances that permeate the ground and recommending to the Minister the declaration of water resource protection areas around groundwater, re-charge areas and abstraction sources<sup>117</sup>.

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<sup>117</sup>Water Resources Management Act No 21 of 2011

Further, the Authority was supposed to carry out routine water quality monitoring in all operational catchments which were planned to be conducted on a quarterly basis so as to allow the measurement of the worst, as well as the average condition in the water<sup>118</sup>

The audit established that the Authority developed a program of carrying out both surface and ground water quality sampling and monitoring in all the six (6) Catchments of the country. Document reviews of the Authority's Trend Report for the Period 2011–2020 revealed that WARMA did not protect water resources from pollution and in this regard, the following were observed;

#### **6.1.8.1 Assessment of Parameters in the Six Catchments**

WARMA in its 2020 Trend Report for the period 2011-2020 reported having conducted assessments for twenty-five (25) elements which included; pH, redox potential, Electrical conductivity, Dissolved oxygen, Total dissolved solids, Temperature, Total Hardness, Calcium Hardness, Magnesium Hardness, Calcium, Magnesium, Alkalinity, Bi-carbonates, Sulphates, Iron, Lead, Zinc, Manganese, Sodium, Potassium, Nitrates, Chlorides and Fecal and Total Coliforms. In 2022, the Authority reported to have measured six (6) parameters which were: pH; Turbidity; Electrical Conductivity; Redox Potential; and Total dissolved solids.

The audit established that the Authority was supposed to carry out a total of 38, 850 tests on all the 111 surface water monitoring points in the six (6) catchments, for the fourteen (14) quarters in the period under review. An analysis of the 2020 Trend Report revealed that the Authority only carried out less than one (1) % of the required assessments in Zambezi, Luangwa and Kafue Catchments while it assessed less than 5% in Luapula, Tanganyika and Chambeshi Catchments. A further analysis of the tested elements revealed that the Authority tested 0.3% of the required elements as shown in table 6.2 below.

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<sup>118</sup> 2011 – 2020 WARMA Trends Report para 1

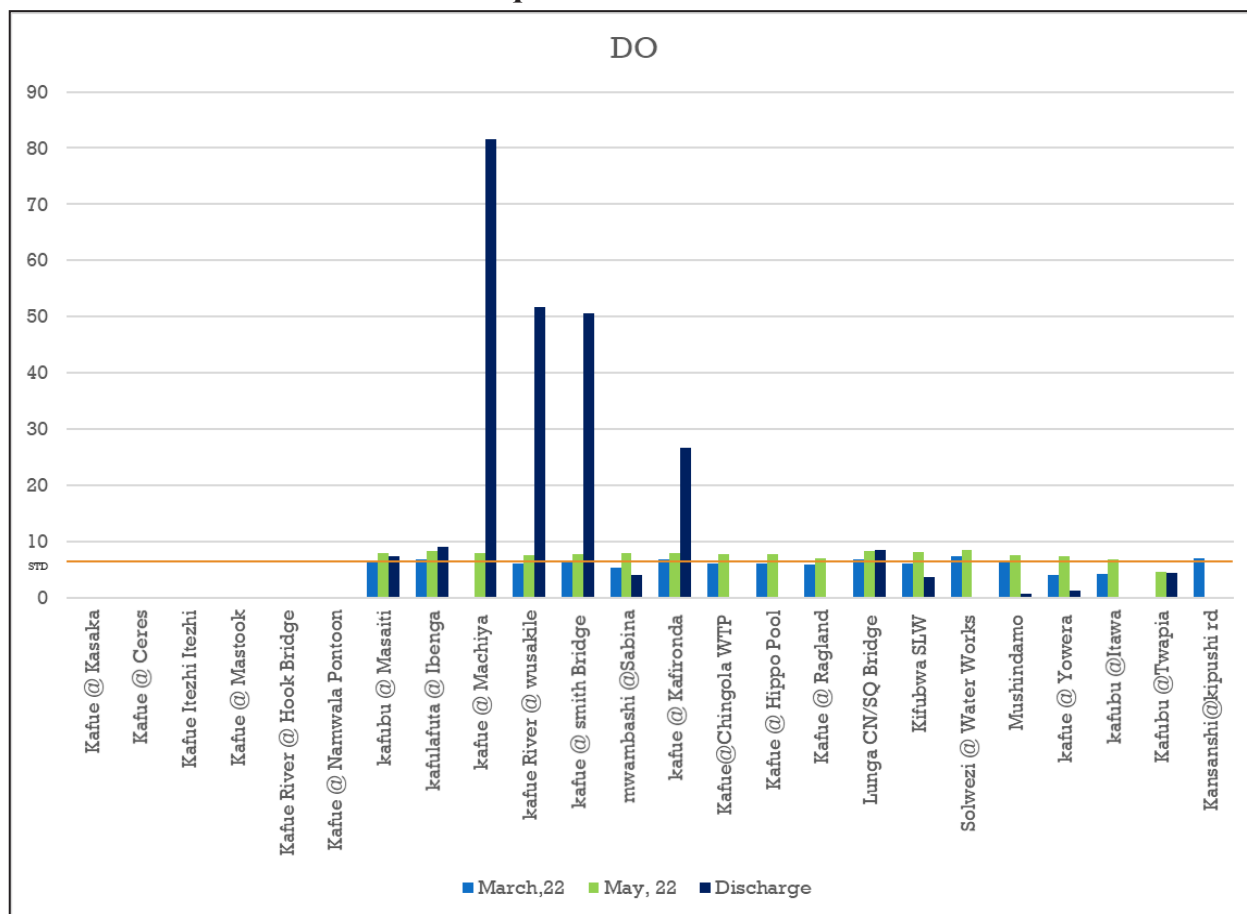
**Table 6.2: Yearly Water Elements Tests undertaken.**

Catchment	Year	Expected tests on elements (25*No of Quarters)	Total No. of Surface Water monitoring points	Expected tests on elements	Actual test undertaken	% Test undertaken against expected
Kafue	2022	50	38	1900	10	0.5
	2021	100	38	3800	0	0.0
	2020	100	38	3800	0	0.0
	2019	100	38	3800	6	0.2
<b>Total</b>		<b>350</b>	<b>152</b>	<b>13300</b>	<b>16</b>	<b>0.7</b>
Luapula	2022	50	4	200	0	0.0
	2021	100	4	400	0	0.0
	2020	100	4	400	0	0.0
	2019	100	4	400	15	3.8
<b>Sub Total</b>		<b>350</b>	<b>16</b>	<b>1400</b>	<b>15</b>	<b>3.8</b>
Tanganyika	2022	50	6	300	0	0.0
	2021	100	6	600	0	0.0
	2020	100	6	600	0	0.0
	2019	100	6	600	24	4.0
<b>Sub Total</b>		<b>350</b>	<b>24</b>	<b>2100</b>	<b>24</b>	<b>4.0</b>
Luangwa	2022	50	14	700	2	0.3
	2021	100	14	1400	1	0.1
	2020	100	14	1400	0	0.0
	2019	100	14	1400	8	0.6
<b>Sub Total</b>		<b>350</b>	<b>56</b>	<b>4900</b>	<b>11</b>	<b>0.9</b>
Zambezi	2022	50	40	2000	14	0.7
	2021	100	40	4000	0	0.0
	2020	100	40	4000	0	0.0
	2019	100	40	4000	0	0.0
<b>Sub Total</b>		<b>350</b>	<b>160</b>	<b>14000</b>	<b>14</b>	<b>0.7</b>
Chambeshi	2022	50	9	450	5	1.1
	2021	100	9	900	4	0.4
	2020	100	9	900	0	0.0
	2019	100	9	900	22	2.4
<b>Sub Total</b>		<b>350</b>	<b>36</b>	<b>3150</b>	<b>31</b>	<b>4.0</b>
<b>Grand Total</b>		<b>2100</b>	<b>444</b>	<b>38850</b>	<b>111</b>	<b>0.3</b>

**Source: Performance Audit -2022**

An additional analysis of the 2022 Trend Report revealed that Dissolved Oxygen (DO) in Kafue Catchment was above the minimum required standards in fourteen (14) out of twenty-four (24) points sampled by the Authority. Management in their response to the management letter indicated that high dissolved oxygen is desirable and shows a health natural aquatic environment which should be above 5mg/l. See Chart 6.1 below:

**Chart 6.1: Elements above the Required Standards in Kafue Catchment**



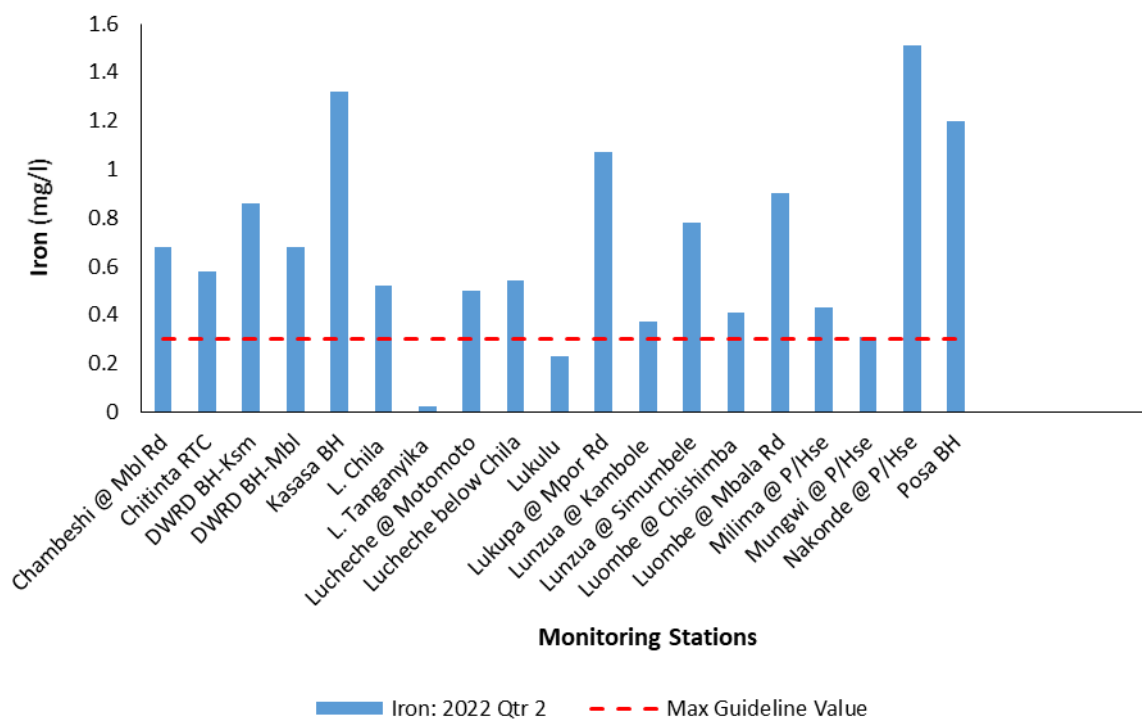
Source: 2022 Trend Report

The report also indicated that Iron in Chambeshi catchment was high in sixteen (16) out of nineteen (19) points.



See chart 6.2 below:

**Chart 6.2: Elements above the Required Standards in Chambeshi Catchment**



Source: WARMA 2022 Second Quarter Water Quality Trends

#### 6.1.8.2 Assessments in all the Reporting Quarters

In its 2020 Annual Work Plan, the Authority planned to conduct monitoring of water quality on an annual basis to allow the measurement of the worst, as well as the average condition in the water. Document review of the 2020 Trend Report revealed that although the Authority was reported to have conducted assessments on water quality for the period 2017 to 2020, the report did not have data on assessments carried out in the year 2020. Further, the Authority did not carry out the annual assessments in all the six (6) catchments as required. It was also established that the annual monitoring was not done in accordance with quarterly plans as the Authority had only carried out 11 out of the planned 2070 tests representing 0.5%.

See the table 6.3 below:

**Table 6.3: Yearly Water Quality Assessments Undertaken**

Catchment	Year	Expected tests	Actual tests undertaken	% Test undertaken against expected
Kafue	2022	50	10	20
	2021	100	0	0
	2020	100	0	0
	2019	100	6	6
Sub Total		350	16	5
Luapula	2022	20	0	0
	2021	100	0	0
	2020	100	0	0
	2019	100	15	15
Sub Total		320	15	6
Tanganyika	2022	50	0	0
	2021	100	0	0
	2020	100	0	0
	2019	100	24	24
Sub Total		350	24	7
Luangwa	2022	50	2	4
	2021	100	1	1
	2020	100	0	0
	2019	100	8	8
Sub Total		350	11	3
Zambezi	2022	50	14	28
	2021	100	0	0
	2020	100	0	0
	2019	100	0	0
Sub Total		350	14	4
Chambeshi	2022	50	5	10
	2021	100	4	4
	2020	100	0	0
	2019	100	22	22
Sub Total		350	31	9
Grand Total		2070	111	5

**Source: Performance Audit 2022**

In Table 6.3 above, it can be seen that no tests were carried in some years. For example, in Zambezi catchment, there were no testing of elements in the years 2019 to 2021. Similarly, there was no testing of elements in Kafue catchment in 2020 and 2021.

The Authority acknowledged inconsistencies in carrying out the assessments due to limited human and financial resources. An analysis of the staff establishment revealed that out of the required 170 staff, eighty-eight (88) positions were filled leaving eighty-two (82) positions unfilled. Document review further revealed that the absence of resources contributed to failure to analyse important parameters such as DO as there was inadequate equipment or reagents at the time of sample analysis. Management in its response to the management letter stated that the context and correctness of the stated indicator need to be clarified. According to WARMA, if each test on a parameter is what constitutes a ‘test’ (i.e. 2070 tests) then much more tests were achieved annually by WARMA than what was depicted. In addition, it was stated that Each Catchment does more than 2100 tests per year. However, WARMA did not provide evidence to support their response.

Failure to carry out required assessments at the scheduled times may expose users of water to health and safety risks. Furthermore, lack of and untimely assessments may hinder decision makers from making timely informed decisions on water resources.

#### **6.1.8.3 Ambient Water Quality Standards and Protection of Water Resources against Pollution**

WARMA shall, in collaboration with the Zambia Environmental Management Agency, recommend to the Zambia Bureau of Standards ambient water quality standards and ensure that the standards are maintained to monitor the resource quality and control the pollution of any water resource<sup>119</sup>. The Authority shall liaise, consult, collaborate and cooperate with all the relevant appropriate authorities and conservancy authorities in the management, development and use of water resources and may, for such purposes, have joint programmes, plans, strategies and policies<sup>120</sup>.

A review of the WARMA 2020 Annual Report revealed that the Authority in conjunction with other stakeholders completed the development of the Ambient Water Quality Standards (DZS 1182) and Guidelines (DZS 1183) for raw water whose aim was to protect water against deterioration from pollution. Further, a review of the 2020 Surface and Ground Water Quality Trends Report revealed that the Authority and ZEMA did not control the pollution of water resources as the sampled returns indicated that some of the

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<sup>119</sup> WRM Act No 21 of 2011 47 (2)

<sup>120</sup> WRM Act No. 21 of 2011 (10)

parameters assessed were above the ZABS standards. An analysis of effluent returns from eight (8) companies revealed that six (6) did not adhere to the ZEMA/ZABS standards in some of the elements as shown in table 6.4 below:

**Table 6.4: Companies with Effluent Exceeding ZEMA Limits**

Company	Date of Tests	Element	ZEMA Standards	Test Results	No of times more than the standard	Comment
Lusaka Water and Sanitation Company	09.07.2020	Chemical Oxygen Demand	50	121	2.4	An average figure for results collected from different points
		Total Coliforms	25,000	1,356,667	54.3	An average figure for results collected from different points
		Faecal Coliform	5,000	755,000	151.0	An average figure for results collected from different points
		Turbidity	15	94	6.3	An average figure for results collected from different points
Southern Water and Sanitation	05.02.2021	Turbidity	15	217	14.5	Sinazongwe Gordana Ponds
		Suspended Solids	100	219	2.2	Sinazongwe Gordana Ponds
		Phosphorous	6	20.18	3.4	Sinazongwe Gordana Ponds

Nitrogen Chemicals of Zambia	30.06.2020	Ammonium	13	374	28.8	SW11
		Ammonium	13	47	3.6	
Lee Yeast	28.02.2022	Conductivity	4,300	7,150	1.7	
		Total Dissolved Substances	3,000	3,570	1.2	
		Total Suspended Solids	100	1,714	17.1	
		Ammonia	10	254	25.4	
		Chemical Oxygen Demand	50	39,000	780.0	
		Nitrites	90	62,000	688.9	
Zambeef	11.09.2020	Conductivity	4,300	19,350	4.5	Pond 2
		Turbidity	15	1,227	81.8	
		Biochemical Oxygen Demand	50	1,960	39.2	
		Chlorides	800	6,840	8.6	
		Total Coliforms	25,000	69,000	2.8	

**Source: Performance Audit –2022**

As can be seen from table 6.4 above, effluent exceeded expected standards by between 1.2 to 780 times. The audit established that this was due to the Authority's failure enforce the law on effluent emitting companies. WARMA in its response to the management letter stated that the function was under ZEMA. WARMA further questioned how it was linked to the observation and further explained that the entities by law pay effluent discharge fees

to ZEMA who are responsible for enforcing effluent standards. Failure by the Authority to ensure that effluent released by corporations is within the acceptable limits expose the water resources to pollution leading of degradation of water quality.

### 6.1.9 Conservation of Water Resources

The Authority is supposed to manage and conserve water resources in the public interest.<sup>121</sup> A review of WARMA's Report on Mapping of Candidate Water Resources Protection Areas in Zambia issued in September 2021 revealed that the Authority did not conserve all headwaters, due to them not being gazetted as water resources protection areas.

The report further revealed that the Kapiri-Mposhi river system in Central Province was under pressure due to developmental projects such as construction of large dams, physical alterations made in the headwater areas by diverting river course or straightening them, abstraction of river water for agricultural purposes, pollution, industrial development, timber harvesting, mining and unsustainable natural resource use like deforestation for charcoal burning, housing/shelter construction and firewood. In addition, the report revealed that the Authority did not conserve all the surface and ground water resources which were identified during the study in that all the water resources identified in four (4) catchments namely; Kafue, Luangwa, Chambishi and Luapula had challenges such as encroachments and stream bank cultivation. **See Appendix V (a) to (f).**

Further, a review of the 2020, 2021 and 2022 Annual Work Plans revealed that the Authority planned to carry out conservation activities in the years 2021 and 2022 while there were no planned activities in 2020. The 2020 Annual Report did not provide details as to why activities to conserve water resources under threat were not planned for while the 2019 and 2021 Annual Reports were not provided as at December 2022.

An analysis of the plans revealed that some of the activities scheduled to be undertaken included to:

- conduct water pricing valuation study;
- prepare hydrological yearbook;
- develop bankable project proposals;
- develop a water quality information system;
- develop water resources information management of water resources information dissemination;

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<sup>121</sup> Water Resource Management Act No.21 of 2011 26(f)

- facilitate for surface water e-flows capacity building; and
- undertake water research collaboration and development of a Concept Note for early warning system for floods and drought.

The audit established that there was no plan to address illegal activities along the water resources buffer zones.

A visit to the Lukanga/Shamabanse dambos in Kabwe, in the Central Province, University of Zambia dambos in Lusaka Province and Kafubu River in Ndola, Copperbelt Province revealed that there were infrastructural development activities that had taken place in the dambos and river which may cause flooding in the rain seasons as water passages were blocked.

Failure to conserve and protect water resources may lead to continuous encroachments on the water resources, which threatens the sustainability of the water resources.

## **6.2 Stakeholder Management of Water Resources to ensure Water Resources Protection**

### **6.2.1 Ministry of Green Economy and Environment- Department of Forestry**

#### **6.2.1.1 Protection of Water Recharge Points in Forest Protection Areas.**

The forests reserves are also home to water sources, head waters and recharge zones. According to the Forest Act No. 4, 2015, all land comprised in a National Forest shall be used for the management of major water catchments and head waters, subject to the Water Resources Management Act No. 21 of 2011.<sup>122</sup>

A review of the Annual Reports for the period 2019 to 2021 revealed that some forest reserves were threatened with human activities such as allocation of land, construction, mining and agricultural activities. Furthermore, interviews with officials and field visits revealed that encroachment activities caused the drying of the Masansa River in Luanshya and that most of the trees around the water recharge zones were cut down.

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<sup>122</sup> The Forests Act No. 4 of 2015, 81, Part Iii Forest Management and Development, National Forest, No.12, (d)



See figures 6.7a &b and 6.8 below;

**Figure 6.7(a): Beacons Indicating Illegal Land Allocation in Masansa Forest Reserve 6.7(b)**



Source: Audit Field Visit - 2022

**Figure 6.8(a): Agricultural Activities at the Source of Kasongo River 6.7(b)**



Source: Audit Field Visit - 2022

Interviews with officials from the Forestry department also revealed that the main cause of illegal activities in protected areas was lack of collaboration with LAs as land was allocated to citizens despite the forests being gazetted. There is a risk that the water resources may be disturbed thereby affecting the biodiversity and water eco system, which may cause drought as rivers may dry.

### **6.2.1.2 Management of Settlers in Forest Reserves.**

The Ministry of Green Economy is expected to manage the impact of human activities on the environment that include management of water resources<sup>123</sup>. Further, the Forestry

<sup>123</sup> National Policy on Environment - 2007

Department is mandated to conduct patrols and serve eviction notices to illegal settlers within forest reserves.<sup>124</sup>

The audit established that there were illegal settlers within forest reserves who were not issued with eviction notices. For example, a review of the Central Province Monitoring Report for 2022 revealed that the Mulembo Local Forest, FR No. 210 which is 19,395 hectares in extent and home to six (6) river sources had an influx of illegal settlers who were allocated land by the traditional leadership. It was further revealed that settlers cleared trees by setting fires on the tree base which were later used to construct makeshift structures. See figure 6.9, 6.10 and 6.11 below:

**Figure 6.9: Makeshift Structure in Mulembo Forest**



Source: Performance Audit - 2022

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<sup>124</sup> National Forestry Policy 2009 Chapter 5 Plan of action, monitoring and evaluation, 6.1 Monitoring and evaluation, Pg. 41



**Figure 6.10 Trees Burnt on the Bases**



Source: Performance Audit – 2022

**Figure 6.11: Forest Reserve Area Cleared to Pave Way for Farming Activities**



Source: Performance Audit -2022

Interviews with Forestry Department officials revealed that the department conducted monitoring and patrolling activities during the period under review to ensure that there were no illegal activities taking place in the forest reserves. However, a review of the Forestry Department's Annual Reports for 2018 to 2021 and interviews with representatives of the Department revealed that they faced challenges with enforcing the

law against illegal settlers because the law was not clear on how to govern the administration of customary land located within the forest reserves. In addition, interviews revealed that there was lack of sensitisation of traditional leaders on the need to conserve and protect forest reserves.

Allowing developmental activities in forest reserves which house water resources may lead to forest degradation and deforestation which may there after reduce the recharge of ground water and have a negative impact on climate.

### **6.2.1.3 Forest Management Committees**

The Forestry Department in consultation with a local community and with the approval of the Minister should facilitate the formation of a joint forest management committee for the forest reserves. The role of the committee is to develop and implement management plans, manage and develop joint forest management areas and distribute the benefits amongst the local communities in the forest areas. The Forest Management Committees are supposed to comprise of a person appointed by the Chief in that area and one representative from each of the following institutions: Departments of Agriculture; Water; Lands; and Fisheries in the respective area.<sup>125</sup>

Interviews with Forestry Department officials revealed that the Forestry Department established only two (2) Forest Management Committees in Kabwe District, out of the 116 districts countrywide because the Department did not prioritise the formulation of the Committees in the remaining 115 districts. Further, the two (2) established Committees were non-functional as of July 2022 as the Department had just completed preparing the forest management plans and were awaiting approval.

A further review of the Annual Reports for 2018 to 2021 revealed that despite patrols being conducted in some areas, the department was limited in undertaking forest patrols due to large geographical extents of forests thereby posing logistical challenges such as transport, fuel and inadequate patrol staff.

For example, out of the 10,010 Ha, it was revealed that 1,956 Ha representing 20% of the Kabwe National Forest No. 31, which forms a vital part of the Mulungushi River catchment area, was degazetted by Statutory Instrument No. 73 of 2019 due to encroachments. The degazetion resulted in the reduction of the size of forest reserve to 8,054 Ha.

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<sup>125</sup> The Forest Management Act No. 4 of 2015 Part II- 38

Further, physical inspections of the Mansansa National Forest in Luanshya, source of the Kasongo river, which feeds into the Kafue river which has a stretch of 1576 kilometres and traverses through the North-western, Copperbelt, Central, Lusaka and Southern provinces revealed that there were illegal activities such as construction of permanent and semi-permanent structures, cultivation, harvesting of forest products and gravel mining. See figure 6.12 below:

**Figure 6.12: Illegal Settlements and Agriculture Activities - Kabwe Forest Reserve Area**



Source: Performance Audit Field Visit - 2022



**Figure 6.13: Closed Sand Mine –Kabwe Forest Reserve Area 1**

Source: Performance Audit - 2022

Lack of Forest Management Committees contributed to the illegal activities in the forest reserves. This may lead to compromised water quality and depletion of water resources.

#### **6.2.1.4 The Assessment of Water, Head Waters and Water Supplies**

All land comprised in a Local Forest shall be used for the conservation and development of forests for the management of major water catchments and head waters, the protection of ecosystems, particularly the protection of land and water supplies of local strategic importance<sup>126</sup>. To do this, the Forestry Department is supposed to formulate a National Forestry Master Plan which provides a strategic framework with clear targets which will be informed by the stipulations of the Zambia Forest Action Plan. In order to implement the provisions of the National Forestry Master Plan, the Forestry Department is supposed to conduct forest resource assessments and develop Forest Management Plans every five (5) years.<sup>127</sup>

<sup>126</sup> Forest Act No 4 of 2015 12(d) and 19(b)

<sup>127</sup> National Forestry Policy 2009, Chapter 6 Plan of action, 6.1 Monitoring and evaluation, Pg. 41

The assessment provides essential information for understanding the extent of forest resources, their condition and uses and provides information into the Forest Management Plan. The content of the Management Plans includes the designation of nature reserves and areas of stabilization of watersheds<sup>128</sup>

A review of the 2018 to 2021 Forestry Department Annual Reports and interviews revealed that the Department did not carry out the forest resource assessment in the period under review. Further interviews revealed that the last assessment was conducted in 1963. It was also established that the assessment had not been undertaken due to inadequate funding.

Without a Forest Management Plan there is no benchmark against which performance can be measured. In addition, failure to carry out assessments may lead to lack of information for decision making, which may result in making decisions that threaten the existence of water resources.

## **6.2.2 National Heritage Conservation Commission**

### **6.2.2.1 Research on Heritage Sites**

The NHCC shall promote research and development in order to enhance generation of information for effective management and utilisation of natural heritage resources.

Interviews with NHCC representatives revealed that no research had been conducted on heritage water resources as research was generally expensive and no funding had been allocated despite the NHCC having planned for research in its annual work plans. As a result, the NHCC lacked data to inform action and contribute to developing knowledge in the water resources related heritage sites.

In addition, NHCC representatives believed that, the spring eye at Itawa Springs in Ndola had shifted due to gradual deterioration of the underground water system. However, no research had been carried out to establish the real cause of deterioration.

Further, interviews also revealed that there was an increased deterioration of water quantity and quality of the Zambezi river source in Mwinilunga due to continued loss of forest cover.

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<sup>128</sup> Forests Act No 4 of 2015 Section 40 (3) – Content of Management Plan



The risk of not conducting research on water related heritage sites is that there may be lack of information needed to understand the causes of the challenges surrounding the heritage site leading to uninformed decision making.

#### **6.2.2.2 Allocation of Land and Encroachments on Water Resource Heritage Sites**

NHCC shall enhance the management of natural heritage in order to ensure that they are well maintained and protected by strengthening stakeholder coordination and collaboration for enhanced natural heritage management and protection<sup>129</sup>. No one is allowed to build or conduct activities likely to loosen the soil or diminish the quantity of water flowing in any part of a public stream within a distance of fifty (50) meters from the banks of the river<sup>130</sup>.

Interviews revealed that there were developmental activities within heritage sites because Ministry of Lands did not consult NHCC before allocating land. Further, interviews revealed that, in Monze, the Ministry of Lands allocated land to a thermal power company that used water from the Gwisho and Bwanda Hot Springs, which contributed to the drying up of Bwanda hot spring and de-vegetation of water resources in the related aquatic environment. In addition, interviews revealed that Bbilili Hot Springs in Monze was not protected from unauthorised use and as a result the springs were used for both cattle and human activities. Consequently, the hot spring area was damaged and water levels reduced.

A site visit to the Itawa Springs in Ndola revealed that the springs and surrounding areas were an important water resource as it was used to supply water for domestic and industrial purposes to the city of Ndola and was one of the tributaries to the Kafubu River. Interviews with the NHCC representatives revealed that in the recent past, the springs and surrounding riparian environment had increasingly come under pressure as a result of the establishment of informal settlements, subsistence agriculture, and the introduction of exotic plants, some of which were invasive by nature, and laundry and brick making activities. There is therefore a risk of soil erosion, siltation and sedimentation of water bodies, which may threaten the existence of water related heritage sites. In addition, the use of chemicals on river banks also threatens the existence of aquatic life.

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<sup>129</sup> Heritage Conservation Policy 2018, pp.21, Objective 2(b)

<sup>130</sup> Statutory Instrument No. 1 of 2000 Water Act (Laws, Volume XII, Cap. 198)

See figure 6.14 below:

**Figure 6.14: Agricultural and Laundry Activities - Itawa Springs**



Source: Field Visit - 2022

### **6.2.2.3 Legal Protection of Natural Heritage Sites (Water Resources)**

Where a heritage site is located on land owned by any person, the Commission may negotiate with the holder of the land to arrange for preservation, restoration, rehabilitation and reconstruction of the heritage<sup>131</sup>. Further, NHCC shall enhance the management of natural heritage sites so as to define boundaries for enhanced protection of these areas<sup>132</sup>. In addition, a Controlling Officer should ensure that all public properties under the Controlling Officer's charge are secured with title deeds<sup>133</sup>.

Interviews with the NHCC representatives revealed that the land within which all water related heritage sites were located had neither title deeds nor defined boundaries for enhanced protection. The audit established that despite the NHCC including titling activities in the budgets in amounts totaling K600,000 for the period 2019 to 2021, the budget line was not funded. In addition, NHCC countrywide only had one (1) Land

<sup>131</sup> The National Heritage Conservation Commission Act, Chapter 173, Section 48 (a)

<sup>132</sup> Heritage Conservation Policy (2018), Objective 2 (a), pp.21

<sup>133</sup> Section 41(4) of the Public Finance Management Act, No. 1 of 2018

Surveyor against the over 100 national monuments as the establishment only provided for one (1) land surveyor.

A site visit to the NHCC Copperbelt regional office established that the land within which the eight (8) water related heritage sites in the province which include; the four (4) sunken lakes<sup>134</sup>, two (2) water springs, one (1) water fall<sup>135</sup> and one (1) Hippo Crew were not on title. Interviews further revealed that the land upon which Itawa Springs in Ndola was placed, belonged to Zambia Railways. As a result, the spring was not declared as a national monument despite its importance. It was further revealed that for NHCC to declare the land as a national monument there was need for Zambia Railways to surrender the aforementioned portion of land. The audit also established that the negotiation process for the surrender of the piece land began in 2016. However, NHCC did not succeed as Zambia Railways demanded for compensation in terms of land which NHCC was unable to provide. As a result, the NHCC did not have rights to protect the site from degradation and encroachment.

## **6.2.3 Ministry of Lands**

### **6.2.3.1 Protection of Water Resources from Anthropogenic Activities**

To protect the wetlands and their catchment areas and improve the resilience of wetland systems to natural and anthropogenic shocks<sup>136</sup>.

Interviews with Ministry of Lands (MoL) revealed that there were mining activities within the water resource areas within the Lochinvar National Park due to a rising demand for business in the mining sector. Interviews further revealed that the Lochinvar Plains were gazetted as a National Park in 1973 while the piece of land was given to the mine in 2004. For example, it was noted that there was a mine (Gypsum United) near the plains of the Lochinvar National Park in Southern Province. This may be attributed to non-prioritisation of wetlands. Consequently, this may lead to environmental degradation of wetlands and depletion of water resources.

### **6.2.3.2 Review of Existing Information on Wetlands**

To protect the wetlands and their catchment areas and improve the resilience of wetland systems to natural and anthropogenic shocks by reviewing existing information on

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<sup>134</sup> Lake Nampamba in Mpongwe, Lake Chilengwa in Masaiti and Lake Ishiku in Ndola and Lake Kashiba in Ndola Rural District

<sup>135</sup> Mwekera Water Falls

<sup>136</sup> National Policy on Wetlands 2018

wetlands, where necessary, the Ministry of Lands should undertake further studies in order to develop guidelines for their proper utilisation.<sup>137</sup>

A review of the Wetlands Implementation Plan of 2018 to 2028 revealed that the Ministry of Lands was supposed to review and update the status of at least eight (8) key wetlands in the country by 2020. However, interviews with representatives from the Ministry revealed that only two (2) out of eight (8) wetlands namely Lukanga Swamps and Zambezi source had their status reviewed and updated due to inadequate financial resources. As a result, there is no latest or accurate data upon which decisions can be based. Failure to review existing information on wetlands may lead to poor decision making which may affect sustainability of water resources.

### **6.3 Monitoring and Enforcement of the Law**

#### **6.3.1 Monitoring of Water Resources**

##### **6.3.1.1.1 WARMA**

According to the WARMA inspectorate handbook, the Authority must check for: changes/other activities in the river buffer-zones; and disturbances to recharge zones e.g. settlements, cultivation, soil/mud mining and deposition of any materials by human activities.<sup>138</sup> In addition, WARMA planned to conduct compliance monitoring for all identified sites.<sup>139</sup>

Water resources assessments involve measuring, collecting, and analyzing relevant water resources quantity and quality data for the purpose of sustainable management of the resource<sup>140</sup>.

A review of WARMA's 2020 Annual Work Plan and budget and the 2020 Annual Report revealed that that the Authority did not plan to monitor the activities in water resources areas neither did the report highlight any work that was undertaken by WARMA to protect the water resources. In addition, a review of the 2021 Ndola City Council report on Field Inspection and a visit to Kafubu River revealed that there were structures built in the Kafubu water resource buffer zone. Further, WARMA in its Inspectorate Manual designed tools to use in carrying out different assessments while there was no tool which assessed the activities along the water resources buffer zones. A further probe as to the action the

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<sup>137</sup> National Policy on Wetlands 2018

<sup>138</sup> WARMA Inspectorate Hand Book (9) (i)

<sup>139</sup> WARMA 2020 Work Plan and Budget

<sup>140</sup> WARMA 2020 Annual Report

Authority took against the encroachers revealed that WARMA had taken legal action against nine (9) people as compared to the number of encroachments carried out in the water resource buffer zones. The representatives of WARMA did not give the reasons for not checking the activities along the water resources buffer zones neither did they explain the omission of the tool from their manual. Failure to monitor the activities along the water resources buffer zones may have contributed to increased encroachments on the water resource buffer zones which may result in water pollution.

### **6.3.1.2 Forestry Department**

The Forestry Department is supposed to conduct monitoring and evaluation activities to regulate the harvesting of forest wood resources in concession areas.<sup>141</sup>

Interviews with the Forestry Department revealed that forests played important ecosystem services to water resources such as water purification and regulation.

A review of Annual Reports for the period 2019- 2021 and interviews with Forestry Department officials at headquarters, provincial and district officers revealed that weekly monitoring and control activities of the forest were not consistently carried out as the Department did not have equipment such as drones, fire arms and utility vehicles. In addition, the department had challenges with the number of staff needed to conduct monitoring activities. Furthermore, officials revealed that there was lack of prioritisation in terms of funds allocation to the monitoring activity. The few monitoring activities, which were carried out by the Forestry Department, were mostly forestry related.<sup>142</sup>

Failure by the Forestry Department to consistently conduct monitoring and control activities of the forests may have given rise to illegal activities such as unsustainable harvesting practices resulting in the destruction and degradation of the forest reserves which are home to various water resources. Damaged water resources may dry up denying the communities along water resources areas access to clean water. Further, the dried water sources may contribute to conditions of drought, hunger and poverty.

### **6.3.1.3 National Heritage Conservation Commission**

One of the objectives of the NHCC is to improve efficiency and effectiveness in heritage management by enhancing monitoring and evaluation capacity of heritage programs<sup>143</sup>.

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<sup>141</sup> National Forestry Policy 2009 Chapter 6 Plan of action, monitoring and evaluation, 6.1 Monitoring and evaluation, Pg. 41

<sup>142</sup> Zambia Country Forest Note Towards a Sustainable Way of Managing Forest - 2019

<sup>143</sup> Heritage conservation policy 2018.



Interviews revealed that the NHCC on the Copperbelt was unable to carry out monitoring activities of the water resources because the office had one pool vehicle which was being used by the regional manager for the North-Western Region who was based in Solwezi. In addition, the Eastern region had one (1) motor vehicle, purchased in 1992, which had mechanical faults. As a result, most heritage sites (water resources) were encroached by people undertaking various activities such as agriculture and charcoal production. For example, some members of the community surrounding Lake Chilengwa in Masaiti district cut down trees for charcoal production. This scenario if left unchecked may result in depletion of water resources and recharge zones. See Figure 6.15 below.

**Figure 6.15: Charcoal Burning Activities - Lake Chilengwa in Masaiti District**



Source: Performance Audit –2022

### **6.3.1.4 Provincial Planning Authorities**

#### **6.3.1.4.1 Indication of Priority Areas for Protection**

According to the Urban and Regional Planning Act No. 3 of 2015, an Integrated Development Plan shall indicate priority areas for protection of ecologically sensitive areas, heritage and cultural sites

Interviews with representatives from the Provincial Planning Offices in Kabwe, Ndola and Chipata, revealed that the LAs did not prepare Integrated Development Plans (IDPs) which indicated priority areas such as water resources. Further, interviews revealed that the LAs



were still in the process of preparing the IDPs as it was a robust exercise. For example, interviews with representatives from LAs in Kabwe revealed that both the Local Authority and the Ministry of Lands allocated land for developments in the Lukanga Dambo area.

Failure to prepare IDPs may result in sensitive areas such as water resources being used for development activities instead of being preserved. This may contribute to depletion of water.

#### **6.3.1.4.2 Plot Allocation in the Water Resource Buffer Zones**

A person shall not obstruct the flow of water or place any obstruction in a stream likely to diminish the quantity or flow of water in the stream. WARMA is supposed to confiscate any tool or equipment used in the commission of the offence or destroy any unlawful obstructions or works carried out or crops grown without payment of any compensation to the offender<sup>144</sup>.

A site visitation to Kafubu and Kansenshi streams revealed that the Authority did not carry out enforcement activities to halt illegal activities around water resources buffer zones neither did it stop the Ndola City Council from allocating plots in the water resources buffer zones. In addition, the Authority did not take any action to demolish infrastructure which blocked the flow of the water resources within the fifty (50) meters buffer zone. In addition, review of the Ndola City Council Field Inspection Reports' recommendations of February 2022 revealed that the LA allocated plots in the dambo area and therefore needed to cancel the plots and find alternative plots for concerned developers.

Interviews with Ndola City Council also revealed that the LA had not developed the Local Area Plans for land use in the area therefore, developers who constructed in the water resource buffer zone had no development permission from the LAs. See Appendix 5(a) and (b).

Failure by WARMA to take an active role in ensuring that there were no developments in water resources buffer zones contributed to the LA's allocation of land in buffer zones which further attracted illegal developers.

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<sup>144</sup> SI No 1 of 2000 on buffer zone

## **6.4 Collaboration**

### **6.4.1 Ministry of Water Development and Sanitation Involvement of Stakeholder and Communities through WARMA in the Management of Water Resources**

#### **6.4.1.1 WARMA's Collaboration with Local Authorities, ZEMA, Forest Department and NHCC**

One of the main objectives of water resource management is to ensure inter-sectoral linkages in the management of the water resources to support cross-sectoral development needs.

- WARMA shall liaise, consult, collaborate and cooperate with all the relevant authorities in the management, development and use of water resources and may, for such purposes, have joint programmes, plans, strategies and policies, considering national decentralization policies with respect to water.
- MWDS shall use participatory approaches to create awareness on important water issues to mobilize support from the general public and policy and decision makers on the best practices for management and development of the water resources.
- A Planning Authority shall liaise with appropriate regulatory authorities and consider the requirements specified under the relevant laws. In addition, a person shall not undertake any project that may have an effect on the environment without the written approval of ZEMA.
- According to the Urban and Regional Planning Act No. 3 of 2015, A Local Authorities may enter into partnerships for the benefit of the general public for purposes of plan preparation, implementation, operation and maintenance related to areas covered by an integrated development plan or Local Area Plan. The Authority shall provide mechanisms and facilities for enabling the public and communities to participate in managing the water resources within each catchment.
- In addition, promote effective community participation in the management of water resources.
- The Minister may, on the recommendation of the Authority, by statutory instrument, constitute a water users association for any area of a catchment. The water users' association shall be the lowest organ for community participation. This includes water resources investigation, planning, implementation, operation and maintenance of schemes.

- WARMA in its 2020 Work plan and budget planned to carry out ten (10) community sensitisation and awareness programmes across the catchments. In order for a Government to effectively manage water resources, they must involve the users.
- There must be inclusion at all levels of governance (planners, policy makers and the communities).

Interviews and document review revealed that there was no collaboration, sectoral linkages and joint programmes between WARMA and stakeholders such as: NHCC (Ministry of Tourism); Forestry Department (Ministry of Green Economy); ZEMA; Local Authorities; and Ministry of Lands with regards to the management of water resources. WARMA in response to the management letter stated that it has a strong collaboration with ZEMA in that ZEMA does not pass any decision on a project without first consulting WARMA through EIA/EPBs which are submitted to WARMA for comment. WARMA sits on the Technical Committee of the ZEMA Board, and consults with NHCC before granting of any permit which has potential impact on any heritage site. However, the following were observed:

#### **6.4.1.1.1 Collaboration between WARMA, Ministry of Lands, Local Authorities and ZEMA**

Interviews with Kabwe Municipal Council and a field visit the Shamabanse/Luangwa dambos in Kabwe revealed that both the Ministry of Lands and the LA allocated land in the Shamabanse/Luangwa dambos in Kabwe. Further, interviews with the WARMA representative in Kabwe revealed that neither the Ministry of Lands nor Kabwe Municipal Council consulted WARMA as a regulator of water resources before plot allocation. Similarly, a site visitation to Kafubu and Kabushi streams in Ndola revealed that land was allocated in the water resources buffer zones. The audit also established that Environmental Impact Assessments (EIAs) with respect to the aforementioned buffer zones were not developed. Failure by key institutions to collaborate on water resource management may lead to poor decision making resulting in unsustainability of water resources.

#### **6.4.1.1.2 Collaboration between WARMA and Ministry of Green Economy and Environment Protection - Forestry Department**

Interviews with representatives of the Forestry Department in Kabwe, Ndola and Luanshya revealed that there was a weak approach to management of water resource areas in Zambia in that there was no integrated system to allow information sharing on water resource management. WARMA in its response to the management letter indicated that information relating to water resources is shared with various stakeholders including the Ministry of

Green Economy upon request on clearance of EIA/EPBs and Community Forestry Management Groups (CFMGs). Consequently, working in silos among stakeholders may have contributed to land allocation in the water sensitive areas and illegal activities in the water resources buffer zones, which may result in water pollution and reduce the availability of both ground and surface water.

#### **6.4.1.1.3 Collaboration between WARMA and Local Authorities**

It was established that the Authority did not collaborate with LAs in the management of water resources. Interviews with LAs in Kabwe and Ndola, Kabwe Provincial Planning Office (representing Chibombo and Chisamba Local Authorities) and Ndola Provincial Planning Office representing Masaiti and Mpongwe Local Authorities) revealed that there was no collaboration with WARMA in the management of water resources. Interviews with the Authority and document review also revealed that the Authority signed Memoranda of Understanding with thirteen (13) LAs namely Kapiri-Mposhi, Ndola, Choma, Kazungula, Mazabuka, Sinazongwe, Chirundu, Kalumbila, Masaiti, Mpongwe, Mufulira, Solwezi and Pemba. However, the Authority was unable to provide reports on activities undertaken based on the MoUs as of December 2022. Failure by the Authority to actively collaborate with all the LAs may have contributed to illegal allocation of land in the water resource buffer zones.

#### **6.4.1.1.4 Constitution of Structures at Catchment, Sub Catchment and Water Users Association**

Interviews with WARMA revealed that the Authority did not constitute structures such as the water users' associations in all the six (6) catchments. The audit also established that despite the Authority having developed content needed to operationalise the catchments, sub catchment and water users' associations the documents were still at the Ministry of Justice as of December 2022. This was attributed to the lack of presence by the Authority close to the water resources. For example, during interviews with gardeners along Ngwerere Stream in Lusaka and Chongwe River it was revealed that there were no water users' associations in their areas. In response to the management letter, WARMA responded that the Statutory Instrument which was supposed to operationalise all the structures were submitted to the Ministry of Justice through MWDS in December 2021. In addition, WARMA stated that Part III of the Water Resource Management Act No. 21 of 2011 has not been fully operationalised. Therefore, non-involvement of the water users denies WARMA the monitoring role which can be provided through water users associations. In addition, the absence of water users' associations contributes to illegal activities on water resources buffer zones which threatens the existence of water resources.

### 6.4.1.2 Community Sensitisation

WARMA in its 2020 Work plan and budget planned to carry out ten (10) community sensitisation and awareness programmes across the catchments and conduct twelve (12) radio and television programmes. In order for a Government to effectively manage water resources, they must involve the users. There must be inclusion at all levels of governance (planners, policy makers and the communities)<sup>145</sup>.

Interviews with WARMA representatives and document review revealed that the Authority carried out sensitisation activities in one (1) out of 116 Districts in 2020 in Chongwe. Further, document reviews revealed that in 2022 WARMA conducted radio and television sensitisation activities in eight (8) out of 116 districts. However, the Authority did not provide evidence to show if sensitisation activities carried out in 2019 and 2021. In addition, interviews with a group of six (6) people found on site along Ngwerere Stream in Lusaka and fourteen (14) people in Chongwe who were interviewed through telephone revealed that in spite of interactions with the Authority on the requirement to carry out development activities fifty (50) meters away from the river/stream, residents still continued to undertake activities within the buffer zone. WARMA in response to the management letter stated that it carried out sensitisation programmes through Television and Radio Programmes.

Failure to sensitise communities on the importance of buffer zones along water resources may have contributed to illegal activities which may compromise the existence of the water resources. Further, illegal activities may result in water pollution which could be harmful to human and aquatic life.

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<sup>145</sup> Efficient-Water-Resource-Management-for-Sustainable-Social-and-Economic-Development - 2014

## CHAPTER SEVEN: CONCLUSION

This chapter highlights audit conclusions derived from the audit findings on the Sustainable Management of Water resources by the MWDS through WARMA.

The overall objective of the audit was to assess whether the MWDS through WARMA had put in place efficient and effective measures to ensure sustainable management of water resources. The sustainable management of water resources includes the sustainable development of the water resource and providing for the implementation of any catchment management plan and national water resources strategy and plan; and promoting the rational and optimal utilization, protection, conservation and control of the water resource. The audit concludes that the measures that WARMA put in place did not ensure sustainable management of water resources.

WARMA delayed the preparation of the Water Resources Management Strategy and Plan which should have helped them to track progress and milestones being achieved. In addition, WARMA's assessment of water quality did not yield any positive results as no action was taken after establishing that water resources were polluted with elements recommended the expected limits. Further WARMA did not stop, reduce or prevent encroachments of water resources buffer zones. Therefore, the monitoring activities undertaken by WARMA did not yield positive results in ensuring that water resources buffer zones were protected. In terms of collaboration among stakeholders, WARMA did not play a leading role to ensure coordination among different stakeholders that played different roles in the management of different types of water resources such as heritage sites and forest reserves. Involvement of water users by WARMA remained questionable as there were different activities ranging from agricultural activities, mining and construction of dwelling houses along the water resources buffer zones.

The stakeholders: Ministry of Green Economy- Forestry Department and ZEMA, Ministry of Tourism- NHCC, Ministry of Lands and the Ministry of Local Government- selected Local Authorities also failed to ensure that the measures they had put in place sustained water resources within their jurisdictions. The Ministry of Green Economy, which is in charge of the management of forest reserves through Forestry Department failed to protect the forest reserves, which house water resources from encroachment and illegal human activities resulting in destruction of water resources. In addition, the Ministry of Tourism through the NHCC failed to prevent the activities, which threaten the existence water resource related heritage sites.



Further, the Ministry of Lands failed to play their role in ensuring the protection of water resources because land was being allocated in water resource buffer zones.

This therefore is an indication that WARMA and its stakeholders' efforts to ensure sustainability of water resources is yet to achieve desirable results.

## CHAPTER EIGHT: RECOMMENDATIONS

This chapter presents the audit recommendations based on the findings of the audit. The recommendations if implemented may result in the required protection of water resources to ensure its use for the present and future generations in terms of quality and quantity.

The Ministry of Water Development and Sanitation being the major stakeholders in the water sector should put measures in place which will ensure collaboration of activities of different stakeholders which will lead to protection of water resources regardless of where the water resource is located.

- a.** WARMA should put measures in place that will lead to the:
  - i. Operationalisation of the whole system from having Catchment, Sub catchment and Water Users' Association Plans to having functional water users' associations to ensure real time monitoring of water resources. This will ensure that there are reference documents to help determine the extent of meeting set targets or milestones;
  - ii. Implementation of the existing Statutory Instrument in order to ensure the protection of known water resources from human activities as they carry out work to discover unidentified water resources. This will help protect water resources which have not yet suffered illegal human activities and reduce encroachments on those that have been encroached on;
  - iii. Implementation of activities that will ensure protection of water resources from pollution both at individual and corporate levels. This will lead to sustaining acceptable water quality in the water resources;
  - iv. Introduction of activities which will be a solution to the polluted water resources and encroached upon water resources to ensure sustainable water resources; and
  - v. Strengthening of stakeholder linkages which will result in coordination of activities to ensure the sustainability of water resources.
- b.** WARMA in collaboration with Ministry of Green Economy – Forestry Department should put:
  - i. In place measures that will engage traditional leaders who may also engage their subjects in protecting the forests. This will introduce a sense of ownership among the traditional leadership leading to ease management of water resources at the lowest level of the structure;

- ii. Measures to ensure that monitoring activities in the forest reserves are carried out timely or periodically. This will prevent activities that may lead to deforestation encourage the sustainability of water resources within the Forest reserves; and
  - iii. Measures in place which will incorporate the management of water resources in their jurisdiction. This will lead to harmonisation of activities with a common goal of protecting water resources in the forest reserves.
- c. WARMA in collaboration with National Heritage and Conservation Commission should ensure that:
  - i. Research and development are promoted to enhance the generation of information for effective management and utilisation of water related heritage sites;
  - ii. All water resources related heritage sites are well maintained and protected by strengthening law enforcement to protect them from illegal activities;
  - iii. It obtains title deeds for pieces of land where any natural heritage sites are located in order to enhance their management. Where the land is held by any person or government institution, the Commission should negotiate with the holder of the land to arrange for preservation, restoration, rehabilitation and reconstruction of the water related heritage site;
  - iv. Periodic monitoring of water resource related heritage sites is conducted to protect them; and
  - v. They undertake land audit and boundary marking of all-natural heritage sites so as to define boundaries for enhanced protection of these sites.
- d. WARMA in collaboration with the Ministry of Lands should ensure that:
  - i. Measures are put in place to help update and review existing information on wetlands to help reduce illegal activities in water resources buffer zones; and
  - ii. There is coordination with other stakeholders before allocating land to preserve water resources.

## APPENDICES

### APPENDIX I: Water Resources Visited

No.	Name of Water Resource	Province	District
1.	<ul style="list-style-type: none"> <li>▪ Mass Media Wellfield</li> <li>▪ Forest 27 Recharge Zone</li> <li>▪ Forest 56 Recharge Zone</li> <li>▪ Chalala Wellfield</li> <li>▪ Ngwerere Stream</li> </ul>	Lusaka	Lusaka
2.	<ul style="list-style-type: none"> <li>▪ Kalulu Forest Wellfield</li> <li>▪ Shimabanse/Lukanga Dambos</li> </ul>	Central	Kabwe
3.	<ul style="list-style-type: none"> <li>▪ Kafubu River</li> <li>▪ Itawa Spring</li> <li>▪ Chilengwaleza Sunken Lake</li> </ul>	Copperbelt	Ndola
4.	<ul style="list-style-type: none"> <li>▪ Makoma Dam</li> <li>▪ Mansansa river</li> <li>▪ Kasongo river</li> </ul>	Copperbelt	Luanshya
5.	<ul style="list-style-type: none"> <li>▪ Zambezi River</li> </ul>	Southern	Livingstone

### Appendix II: List of Interviewees

No.	District	Institution	Position
1.		Ministry of Water Development and Sanitation	<ul style="list-style-type: none"> <li>▪ Assistant Director- Water Development Department</li> <li>▪ Acting Principal Geometrics Officer- Water Department</li> <li>▪ Acting Senior Geometrics Officer- Water Department</li> <li>▪ Assistant Director- Planning</li> <li>▪ Senior Planner</li> </ul>

No.	District	Institution	Position
2.	Lusaka- HQ	Ministry of Tourism- National Heritage Conservation Commission	<ul style="list-style-type: none"> <li>Executive Director- National Heritage Conservation Commission</li> <li>Regional Director- Northern Region</li> <li>Senior Conservation Officer, NHCC, HQ</li> <li>Senior Conservation Officer, NHCC, Livingstone</li> <li>Senior Conservation Officer, NHCC, North-Western Region</li> </ul>
3.		Ministry of Mines and Minerals Development	<ul style="list-style-type: none"> <li>Chief Inspector of Mines-Mines Safety Department</li> <li>Acting Chief Mining Engineer</li> </ul>
4.		Ministry of Local Government and Rural Development	<ul style="list-style-type: none"> <li>Director Physical Planning</li> <li>Physical Planner</li> <li>Assistant Director Physical planning</li> </ul>
5.		Ministry of Lands and Natural Resources- Natural Resources Management Unit	<ul style="list-style-type: none"> <li>Natural Resources Management Officer- Natural Resources Management Unit</li> <li>Two (2) x Interns</li> </ul>
6.		Ministry of Green Economy and Environment	<ul style="list-style-type: none"> <li>Acting Director- Forestry Department</li> </ul>

No.	District	Institution	Position
7.		Zambia Environmental Management Agency	<ul style="list-style-type: none"> <li>Principal Inspector (Water, Air, and Pollution)-Operations department</li> <li>Principal Inspector (Ozone depletion substance) - Operations Department</li> <li>Principal IT Auditor - Internal Audit Department</li> <li>Senior Inspector- Operations Department</li> </ul>
8.		Water Resources Management Authority	<ul style="list-style-type: none"> <li>Acting Water Resources Operations Manager- Acting Director</li> <li>Luangwa Catchment Manager – WARMA Kabwe Office</li> <li>Senior Research and Planning Officer</li> </ul>
9.		Lusaka City Council	<ul style="list-style-type: none"> <li>Assistant Director City Planning</li> <li>Six (6) x Environmental Planner</li> </ul>
10.		Ministry of Green Economy and Environment-Forestry Department	<ul style="list-style-type: none"> <li>Forestry Officer</li> <li>Forest Technician</li> </ul>
11.		Water Resources Management Authority	<ul style="list-style-type: none"> <li>Catchment Manager/ Hydrologist</li> </ul>



No.	District	Institution	Position
	Ndola		<ul style="list-style-type: none"> <li>▪ Environmental and Water Quality</li> </ul>
12.		Ndola City Council	<ul style="list-style-type: none"> <li>▪ Director Planning</li> <li>▪ Environmental Planner</li> <li>▪ Environmental Inspector</li> <li>▪ Building Inspector</li> <li>▪ Civil Engineer</li> </ul>
13.		National Heritage Conservation Commission	<ul style="list-style-type: none"> <li>▪ Manager Dag Hammarskjöld Memorial Site- Ndola</li> </ul>
14.		Provincial Planning Office	<ul style="list-style-type: none"> <li>▪ Provincial Planner</li> </ul>
15.	Kabwe	Ministry of Green Economy and Environment-Forestry Department	<ul style="list-style-type: none"> <li>▪ Provincial Forestry Officer – central Province</li> <li>▪ District Forestry Officer</li> <li>▪ Forestry Officer</li> </ul>
16.		Provincial Planning Office	<ul style="list-style-type: none"> <li>▪ Provincial Planner</li> </ul>
17.		Kabwe Municipal Council	<ul style="list-style-type: none"> <li>▪ Director Planning</li> <li>▪ Senior Building Inspector</li> </ul>
18.		Water Resources Management Authority	<ul style="list-style-type: none"> <li>▪ Kafue Sub-catchment Manager</li> </ul>
19.	Luanshya	Luanshya Municipal Council	<ul style="list-style-type: none"> <li>▪ Director Planning</li> <li>▪ Environmental Inspector</li> </ul>

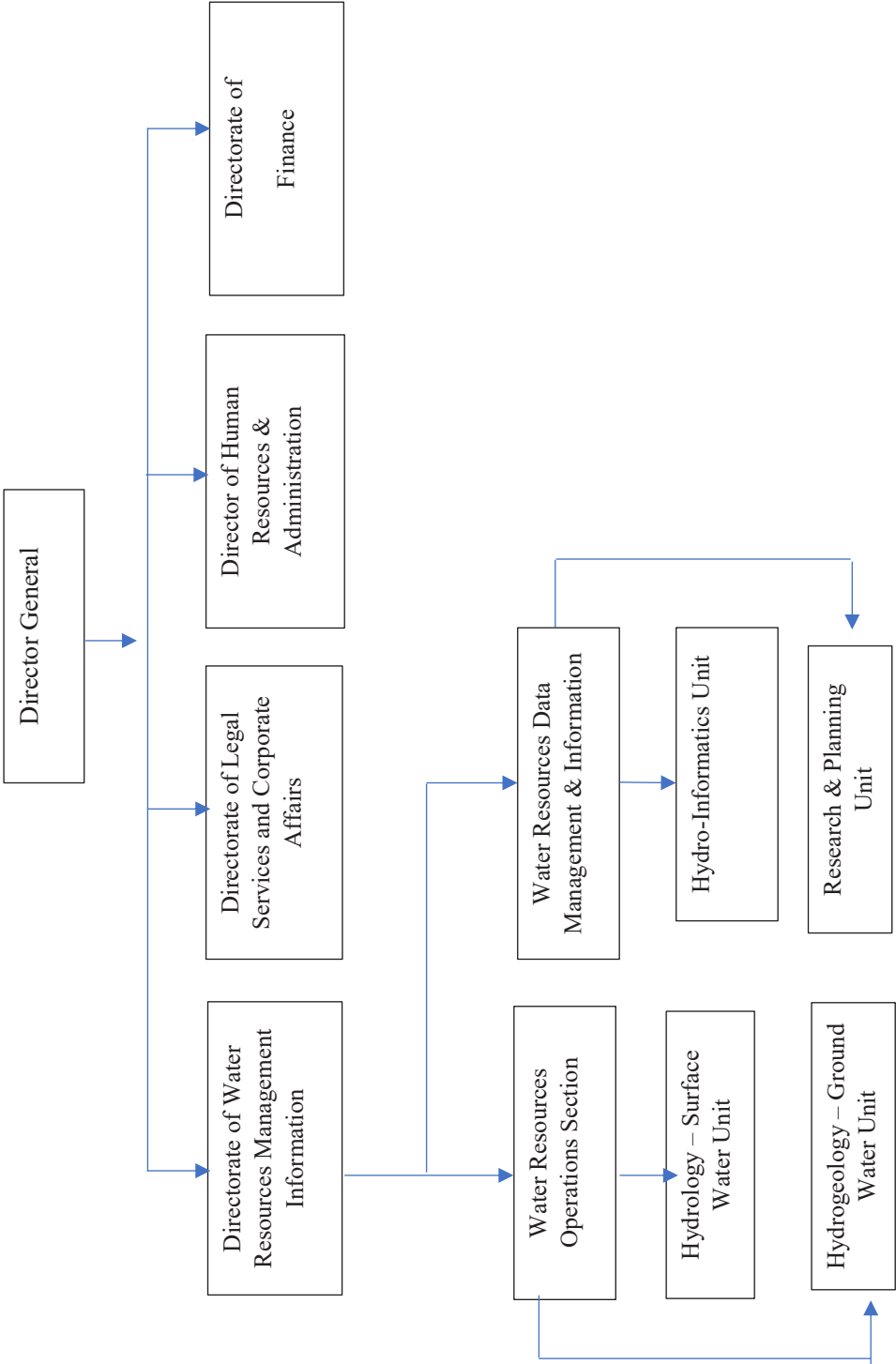
No.	District	Institution	Position
20.		Ministry of Green Economy and Environment-Forestry Department	<ul style="list-style-type: none"> <li>▪ District Forestry Officer</li> </ul>
21.	Livingstone	Water Resources Management Authority	<ul style="list-style-type: none"> <li>▪ Acting Regional Director</li> <li>▪ Senior Conservation Officer,</li> <li>▪ Conservation Officer Anthropology</li> <li>▪ Admin Officer</li> </ul>
22.		National Heritage Conservation Commission- Victoria Falls World Heritage Site	<ul style="list-style-type: none"> <li>▪ Catchment Manager</li> <li>▪ Two (2) x Hydrologist</li> </ul>
23.	Monze	National Heritage Conservation Commission- Lochinvar National Park	<ul style="list-style-type: none"> <li>▪ Site Manager</li> </ul>

**APPENDIX III: Documents Reviewed and Purpose of Review**

No.	Document Reviewed	Purpose for review
1.	National Water Policy 2010	Reviewing the National Water Policy provided a clear understanding of the policies that drive all water resources protection activities in the country.
2.	MWDS Strategic Plan 2018-2021	The Strategic Plans provided an overview of the strategies put in place by MWDS and WARMA to ensure protection of water resources.
3.	MWDS Annual Reports 2019 – 2021	Annual reports provided information on whether water resources protection activities were carried out according to the annual work plans.
4.	WARMA Strategic Plan 2017-2021	The Strategic Plans provided an overview of the strategies put in place by MWDS and WARMA to ensure protection of water resources.
5.	Monitoring and Evaluation Framework 2020-2030	The Monitoring and Evaluation framework provided information the tool that the institution used to conduct monitoring and evaluation activities during the period under review.

APPENDIX IV: Organogram

WARMA Resources Management and Information



**APPENDIX V: Non-Conserved Water Resources****(a) Surface Water Resource Protection Areas in Kafue Catchment**

No.	Sub-Catchment	Area	River/Water Body	Headwaters	Challenges
1.	Upper Kafubu River	Ndola	Kafubu, Kafulafuta,	Itawa Dambo, Kansenshi, Tusenshi, Twapia, Mishishi, Kaninin, Chinika, Kubushiwa and Kandole streams.	Encroachment on the river banks, buffer zones and riparian areas; Stream bank cultivation
2.	Upper Kafue Catchment	Kipushi	Kafue	Musaka, Chamato, Mfwembe, Kafwira, Kalilele.	Encroachment and settlement in the reserve forest
3.	Upper Kafue Catchment	Lukanga Swamps	Kafue	Lunga River, Kafue river	Loss of swamp
4.	Upper Kafue Catchment	Upper Kafue River	Kafue	Lamba Headwaters National Forest No.17, Chati and Luano National Forests, Kafue Headwater No 91, Musaka 64 Bwana Mkubwa Nos 36 and 53, Chondwe No 37, Kasamfwe No 68. Luanshya No 40, Misaka no 5, Mwekera No 6, Ngala No 15, Nsato No 15 Boarder No 50, Kamweza No 19, Dome No 21, Kafwira No 44, Mfwembe No 62,	Encroachment and settlement in the reserve forest

No.	Sub-Catchment	Area	River/Water Body	Headwaters	Challenges
				Chamato No 65, Mulenga No 57, Chimbe No 56	
5.	Lower Kafue sub-Catchment	Gwembe, Pemba, Monze (Njola area of Monze East), Mwanachin gwala area	Magoye River, Gwenzi River	Spring up stream of Gwezi River, headwater forest upstream of Magoye river	Encroachment, river bank cultivation, deforestation, sand mining, siltation, reduced water flow and river drying.



**(b) Groundwater in Kafue Catchment**

No.	Area	Wellfield/ Recharge Areas	Challenges
1.	Ndola	Misundu wellfields, Itawa Spring, Bwana Mkubwa Dolomite Aquifer	Encroachment, cultivation
2.	Lusaka	Shaft 5 wellfield, Mass media wellfield, Lusaka West Wellfields	Encroachment, build-up
3.	Solwezi	College wellfield, Kafubwa wellfields, Kabitaka wellfield	Encroachment, build-up
4.	Mpongwe	Mpongwe Dolomite Aquifer	

**(c) Surface Water Resource Protection Areas in Luangwa Catchment**

No.	Sub-Catchment	Area	River/Water Body	Headwaters	Challenges
1.	Upper Lunsemfwa basin	Lunsenfwa/Mkushi	Kashitu River and the areas along Lunsemfwa River, Tembwe, Munshiwemba, Chibefwe	North Swaka Forest Reserve (NSFR) and Mkushi Headwaters Forest Reserve,	Encroachment, cultivation
2.	Upper Lutembwe Basin	Chipata	Lutembwe River, Msandile River, Luntwere, Msambika, Defika and the Nyamseche	Hills along the Zambia-Malawi border line	Encroachment, cultivation
3.	Luangwa	Source of Luangwa River	Luangwa	Mafinga Hills, Lilonda Hills and along the headwaters of Luangwa River	encroachment, vegetation clearance for agriculture and streambank cultivation problems.

No.	Sub-Catchment	Area	River/Water Body	Headwaters	Challenges
4.	Luangwa	Katete and Lundazi	Katete and Lundazi rivers	Mphangwe Area in Katete and Upstream of Lundazi river	Dams are supported by these rivers. Siltation in dams is due to sedimentation.

**(d) Ground Water in Luangwa Catchment**

No.	Catchment	Area	Wellfield/ Recharge Areas	Challenges
1.	Luangwa	Kabwe	Kalulu-Mukobeko Wellfield	Encroachment, built-up
2.	Luangwa/Kafue	Chisamba/ Chibombo	Chisamba/ Chibombo Dolomite Aquifer	
3.	Luangwa	Nyimba, Petauke, Katete at Chanida border and Mambwe districts	Nyimba, Petauke, Katete	Encroachments

**(e) Surface Water in Chambishi Catchment**

No.	Catchment	Sub-Catchment	Area	River/Water Body	Area of Interest	Challenges
1.	Chambeshi	Lukupa Sub-Catchment	Kasama	Lukupa and Mtita Rivers	Stretch between Itinti and Mwamba villages	Encroachment, cultivation, deforestation, soil erosion, open defecation
2.	Chambeshi	Lukulu Sub-Catchment	Mpika, Chatambo	Lukulu River	Along Lukulu River	Riverbank cultivation, deforestation form chitemene system agriculture

**(f) Surface Water in Luapula Catchment**

No .	Catchment	Sub-Catchment	Area	River/Water Body	Area Of Interest	Challenges/Issues
1.	Luapula	Luwombwa Sub-Catchment	Serenje	Luwombwa River	Strech between Mwape Chimombo and Chimboli Saiyumu villages	Area is important for agriculture and game management
2.	Luapula	Kalungwishi Sub-Catchment	Kawambwa	Kalungwishi River	Strech between Mukuma and Musashika villages	Riverbank cultivation, deforestation form chitemene system agriculture

**APPENDIX VI (A): Ndola City Council Field Inspection Report**

No.	Description	
1.	<b>Purpose of Inspection</b>	To ascertain the availability and suitability of land on mine masala riverside Dambo area
2.	<b>Plot No.</b>	14/ 199 and 14/200 Masala
3.	<b>Zoning</b>	Riverside Dambo area
4.	<b>Area (Location)</b>	Mine Masala
5.	<b>Coordinates</b>	Nil
6.	<b>Status of Development</b>	Undeveloped area and gardens with various vegetables and maize are present.
7.	<b>Comments</b>	<ul style="list-style-type: none"> <li>▪ An inspection was conducted on 14<sup>th</sup> February, 2022 to ascertain the status of the area in Mine Masala Dambo area. The findings revealed that the area lies within the Dambo which serves as a flood flow retardation and attenuation which prevents damage to the road infrastructure, housing units and other major installations like the main water lines found around the same area. The dambo area also acts as a recharge and discharge zone.</li> <li>▪ The plots are located in an ecologically highly sensitive area. There are ten (10) active springs, seeps and sedges in the same area which visible to anyone on the ground.</li> </ul>
8.	<b>Recommendations</b>	<ul style="list-style-type: none"> <li>▪ The water from these springs present around mine masala flow into Kafubu River which also flows into Kafue river. It is well known that Kafue water is used for domestic, agriculture, industrial and hydropower generation. Killing this dambo area means killing many activities that depend on the river.</li> <li>▪ The Statutory instrument No. 1 of 2000 Water Act (Laws, volume XII, Cap. 198) does not allow anyone to build or conduct activities likely to loosen the soil or diminish the quantity of water flowing in any part</li> </ul>

		<p>of a public stream within a distance of fifty meters from the banks of the river.</p> <p>The plots must be cancelled and the people must be given alternative plots in another suitable area or they can get refund for the payments they made towards the plots.</p>
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Source: Extract from Ndola City Council Field Inspection Report – February 2022

## APPENDIX VI (b): Offer Letter for Plot in Ndola – Kabushi Stream

