



Republic of Zambia

## OFFICE OF THE AUDITOR GENERAL



**APRIL  
2020**

## PERFORMANCE AUDIT ON THE CONTROL OF WATER POLLUTION IN ZAMBIA FOR THE PERIOD 2016 TO 2019



# Table of Contents

Acronyms.....	iii
Operational Definitions .....	iv
Foreword .....	vi
Executive Summary.....	vii
Chapter One: Introduction .....	1
1.1    Background .....	1
1.2    Motivation .....	4
Chapter Two: Audit Objectives and Audit Questions .....	5
2.1    Main Objective.....	5
2.2    Audit Questions and Sub-Questions .....	5
2.3    Audit Scope.....	5
2.4    Audit Limitation .....	6
Chapter Three: Methodology .....	7
3.1    Research Design .....	7
3.2    Sample Population and Size.....	7
3.3    Sampling Technique .....	7
3.4    Data Collection Techniques .....	7
Chapter Four: Description of the Audit Area.....	10
4.1    Legal Framework.....	10
4.2    Roles and Responsibilities.....	10
4.3    Key Player in the Control of Pollution.....	11
4.3.1    Zambia Environmental Management Agency (ZEMA).....	11
4.3.2    Regulation of Effluent Discharge .....	13
4.3.3    Enforcement Provisions .....	15
Chapter Five: Criteria.....	16
5.1    Measures for Water Pollution Control .....	16
5.2    Effluent Emission Activities and Licensing.....	16
5.3    Water Pollution Control by the Ministry using ZEMA .....	17
Chapter Six: Findings.....	18
6.1    Have the Measures to Control Water Pollution from Effluent Discharging Facilities been Effectively Implemented? .....	18
6.1.1    Water Resources Standards and Guidelines on Pollution Control .....	18
6.1.2    Approved Licensed Facilities .....	18

6.1.3	Enforcement of Orders.....	20
6.1.4	Implementation of the Polluter Pays Principle .....	24
6.2	Does ZEMA assess the effluent emission activities effect on the Environment when considering License Applications? .....	25
6.2.1	Collection and Interpretation of Data from Effluent Emitting Facilities .....	25
6.2.2	Maintenance of Data for Licensing Purposes.....	25
6.3	To what Extent are Measures to Control Water Pollution undertaken by the Ministry through ZEMA? .....	27
6.3.1	Establishment of an Information System .....	27
6.3.2	Establishment of Laboratories .....	28
6.3.3	Issuance of Licenses .....	28
6.3.4	Monitoring of Facilities .....	29
6.3.5	Environmental Audits Conducted.....	31
Chapter Seven: Conclusion.....		34
Chapter Eight: Recommendations .....		37
9.0 Appendices .....		38

## **Acronyms**

EMA	Environment Management Act
WARMA	Water Resource Management Authority
MWDSEP	Ministry of Water Development Sanitation and Environmental Protection
MoU	Memorandum of Understanding
ZEMA	Zambia Environmental Management Agency
ISSAIs	International Standards for Supreme Audit Institutions
INTOSAI	International Organisation for Supreme Audit Institutions
7NDP	Seventh National Development Plan



### Operational Definitions

Term	Meaning
Ambient	Conditions prevailing in an area or environment
Bacteriological Parameters	Total coliforms and faecal coliforms
Chemical Analysis	Biochemical Oxygen Demand, Chemical Oxygen Demand, Dissolved Demand, Nitrates, Sulphates, TPH, Nitrites, Chlorides, Phosphates, Heavy metals like Copper, Lead, Mercury
Compliance Order	The Director-General may, where the Director General has reasonable grounds to believe that any condition of a licence issued under this Act has been breached, serve a compliance order on the licensee requiring the licensee to remedy the breach within the period stipulated in the order.
Cost Order	The Director-General may, where a person fails to comply with a requirement in an order, license or approval issued under the EMA, cause the required measures to be taken and may issue a cost order requiring that person to reimburse ZEMA for the cost of taking the measures.
Effluent	Waste water or other fluid of domestic, agricultural, trade or industrial origin, treated or untreated and discharged, directly or indirectly, into the aquatic environment
Emission Limits	The maximum limit, levels or concentration of a given substance permitted to be discharged into the environment
Environment	The natural or man-made surroundings at any place comprising air, water, land, natural resources, animals, buildings and other constructions
Environmental Restoration Order	An inspector shall, where there is a discharge of a contaminant or pollutant into the environment in an amount, concentration

	or manner that constitutes a risk to human health or property, or that causes or has the potential to cause adverse effects, serve an environmental restoration order.
Facilities	The different institutions licensed by ZEMA to allow them release effluent into the environment.
Physical Parameters	pH, conductivity, Total dissolved solids, Turbidity and Total Suspended Solids
Prevention Order	Where the Director-General has reasonable grounds to believe that a person is, or will be, conducting an activity, or is or will be in possession or control of a substance or thing that may result in an adverse effect, the Director-General may serve a prevention order on that person
Protection Order	The Director-General may, where he considers that it is necessary to conserve, protect and enhance the environment and natural resources in an area, serve a protection order

## **Foreword**

In accordance with the Provision of Article 250 of the Constitution of Zambia (Amendment) Act No. 2 of 2016, Public Audit Act No. 13 of 1994 and the Public Finance Management Act No. 1 of 2018, I am mandated to carry out Performance Audits in Ministries, Government Departments and Statutory Corporations. I am pleased to present to you the Performance Audit Report on the Control of Water Pollution in Zambia. The audit focused on activities and programmes implemented by the Ministry of Water Development, Sanitation and Environmental Protection through the Zambia Environmental Management Agency as regards Control of Water Pollution.

Management of water is not only restricted to tap water but all water resources, surface and underground. For sustainability to be achieved, water resources must be safeguarded from pollution and depletion. Zambia has incorporated the SDGs in the national planning specifically the Seventh National Development Plan, (7NDP) 2017-2021 to address improvement of water resources and management in order to minimize their adverse impacts on human health and the environment by 2030 through SDG 6- Ensuring Access to Clean Water and Sanitation.

I therefore, present to you this Performance Audit Report together with recommendations, which if implemented by the Ministry of Water Development, Sanitation and Environmental Protection will bring about improvements in the control of water pollution.

I wish to take this opportunity to thank the management and staff of the Ministry of Water Development, Sanitation and Environmental Protection and Zambia Environmental Management Agency for the co-operation and assistance rendered to my team during the audit.



**Dr. Dick Chellah Sichembe**

**Auditor General**

## Executive Summary

Wastewater has become more and more a real worrying source of pollution. This is due to the negative effects resulting, among other factors, from the urbanization, the rapid growth of cities and the unsustainable industrialization. According to the United Nations World Water Development Report (2017), up to 80 % of the global wastewater is being discharged untreated into the world's waterways.

Control of water pollution has reached primary importance in developed and a number of developing countries. The United Nations Agenda 2030 aspires to attain a 100 percent access to clean water supply to all by 2030 through a fully integrated and sustainable water resource management. It has also set targets to achieve environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks.<sup>1</sup>

Further, appropriate wastewater collection and treatment helps also to protect the water quality both underground and in river basins thereby significantly reducing the number of people exposed to water-related diseases<sup>2</sup>. The prior licensing of wastewater discharges by competent authorities have become key elements of successful policies for preventing, controlling and reducing inputs of hazardous substances, nutrients and other water pollutants from point sources into aquatic ecosystems<sup>3</sup>

Zambia which is party to the UN Agenda has incorporated the SDGs in the national planning specifically the vision 2030 and the Seventh National Development Plan, (7NDP) 2017-2021 to address improvement of water resources and management.

The Ministry of Water Development, Sanitation and Environment Protection is mandated to address water pollution and its consequences through the Zambia Environment Management Agency (ZEMA) which employs measures to prevent and control harmful contamination of water by way of licensing the effluent emitting facilities.

In Zambia, most of the water resources are still pristine, but this is changing in areas like Lusaka and the Copperbelt where industrial activities such as mining, agriculture and

---

<sup>1</sup> Vision 2030 - 4.2 Social development trends – section 4.2.9 and Annex 1 Sector visions and targets/goals

<sup>2</sup> INTOSAI Exposure Draft page 10

<sup>3</sup> water pollution control UNEP

manufacturing have started posing a big threat to the water resources through pollution. Further, surface and ground water resources are threatened by pollution from dumping of solid waste and release of dissolved substances including heavy metals as well as oils from industrial activity, into rivers, wetlands and aquifers.

The audit covered the period 2016 to 2019 with an objective of assessing the effectiveness of the measures put in place to control water pollution from effluent discharging facilities by the Ministry through ZEMA.

The audit examined the effectiveness of the licensing system which is a measure put in place by ZEMA to control the levels of pollution in the effluent discharged by the licensed facilities before the effluent is released into the environment.

### **Summary of Findings**

- i. The Ministry of Water Development, Sanitation and Environmental Protection through ZEMA did not ensure that the licensed effluent emitters adhered to the set standards when releasing the effluent into the water resources and had failed to license all effluent emitting facilities.
- ii. ZEMA did not assess the effluent emission activities' effect on the environment when considering License Applications such that licenses were issued to facilities without considering the load capacity of the effluent recipient (water resources). To this effect ZEMA did not have an information management system to ensure that information on pollution was kept for future references.
- iii. ZEMA did not put measures in place to ensure the control of water pollution in that it did not establish a central information system. The central information system showed an aggregated position of the incidences of pollution and did not carry out expected environmental audits which delayed the process to approve environmental licenses.

### **Conclusion**

The aim of the water pollution control process through the licensing system is to prevent pollutants of water resources, however the fact that pollutants were being repeatedly released into the water resources indicates that the measures put in place to control water pollution by effluent discharging facilities were not effective and ZEMA has failed to put measures in



place which limit excess pollutants from being emitted into the environment. Although measures may seem to have been implemented on paper in reality there were no effective measures in place to control water pollution. Despite ZEMA having authority to take punitive measures against defaulters, it has not done so, resulting into the facilities being reluctant to put measures in place which prevent excess pollution in the effluent they discharge into the water resources.

### **Recommendations**

The Ministry of Water Development Sanitation and Environmental Protection should put measures in place to ensure prevention of excess pollutants from entering the water resources and ensure the pollution emitting facilities adhere to the developed effluent standards.

ZEMA should put systems in place which will identify effluent emitting facilities before they commence with their operations and give them conditions to which they are supposed to adhere.

The Ministry through ZEMA should improve on the monitoring activities and environmental audits on licensed facilities to allow for timely discovering of non-compliant facilities and further stiffen the punitive measures against defaulters so as to discourage excess pollution from licensed facilities.

# Chapter One

## Introduction

### 1.0 Overview

In Zambia, development programmes are using environmental resources at an increasing rate and as such, water has played a critical role in the socio-economic development and sustenance of all forms of life in the country. It has been reported, however, how the unsustainable exploitation and utilisation of water resources especially in densely populated areas and industrial estates have had an impact on quality of water in the country.<sup>4</sup>

Wastewater has become more and more a real worrying source of pollution. This is due to the negative effects resulting, among other factors, from the urbanization, the rapid growth of cities and the unsustainable industrialization. According to the United Nations World Water Development Report (2017), up to 80 % of the global wastewater is being discharged untreated into the world's waterways. Appropriate wastewater collection and treatment helps to protect the water quality in river basins and the goods and services that these provide, while significantly reducing the number of people exposed to water-related diseases. The risks and impacts related to the infiltration of the wastewater in waterways are very significant for both human health, biological diversity of aquatic ecosystems and economic opportunities. It is for this reason that policies have been developed to control pollution from industrial waste.<sup>5</sup>

### 1.1 Background

Control of water pollution has reached primary importance in developed and a number of developing countries. The prevention of pollution at source, the precautionary principle and the prior licensing of wastewater discharges by competent authorities have become key elements of successful policies for preventing, controlling and reducing inputs of hazardous substances, nutrients and other water pollutants from point sources into aquatic ecosystems.<sup>6</sup> In order to attain the aspiration of 100 percent access to clean water supply to all by 2030 and have a fully integrated and sustainable water resource management.<sup>7</sup> The United Nations

---

<sup>4</sup> National Water Policy, 2010.

<sup>5</sup> INTOSAI Exposure Draft page 10

<sup>6</sup> water pollution control UNEP

<sup>7</sup> Vision 2030 - 4.2 Social development trends – section 4.2.9 and Annex 1 Sector visions and targets/goals

2030 Agenda which Zambia is a party, set targets to achieve environmentally sound management of chemicals and all wastes throughout their life cycle. Zambia has incorporated the SDGs in the national planning specifically the Seventh National Development Plan, (7NDP) 2017-2021 to address improvement of water resources and management in order to minimize their adverse impacts on human health and the environment by 2030.

To address the water pollution and its consequences, Zambia employed measures to prevent and control harmful contamination of water that ranged from development and revision of laws, statutory instruments and policies in the water sector. The Ministry of Water Development, Sanitation and Environment Protection is mandated to manage and protect ground and surface water from pollution and monitor water quality through Zambia Environmental Management Agency (ZEMA) who are mandated to control pollution.

The creation of the Zambia Environmental Management Agency (ZEMA) is to ensure the sustainable management of natural resources, protection of the environment and the prevention and control of pollution. In order to control pollution, ZEMA licenses and monitors all facilities which release contaminants into the environment.

As at 2017, the Zambian population was 16,405,229<sup>8</sup> out of which 5,643, 087 representing 34% of the total population are served by the water utility companies<sup>9</sup>. This therefore signifies that 10, 762, 142 people which is 66% of the population are not connected to the water supply system from the water utilities and rely on either under- ground or surface water (rivers, lakes and others) resources for their water needs.

Surface and ground water resources are threatened by pollution from dumping of solid waste and release of dissolved substances including heavy metals as well as oils from industrial activity, into rivers, wetlands and aquifers. Cement waste, molasses and bagasse, soap stock textile sediment sludge, petroleum, paint and lime sludge from industries in Lusaka, Kafue and the Copperbelt, all continue to find their way into water systems through direct discharge, seepage or overflow to underground and surface water courses. The use of any water depends on the quantity and quality of water available at any one time.

---

<sup>8</sup> Zambia in Numbers 2018

<sup>9</sup> Urban and Peri-Urban Water Supply and Sanitation Sector Report 2017

In Zambia, most of the water resources are still pristine, but this is changing in areas like Lusaka and the Copperbelt where industrial activities such as mining, agriculture and manufacture have started posing a big threat to the water resources through pollution. Water quality has been a major concern on the Kafue River, mainly because the river supports over 40 percent of the population of Zambia whose economic activities are mining, agriculture and industry.

Ground water quality is also a major concern in localised areas particularly in urban and Peri-urban areas. For instance, the groundwater resources of Lusaka are at risk of pollution due to inadequate piped sewerage systems, which have resulted in an increase of the use of septic tanks<sup>10</sup> and also in Kafue district where roughly 15 percent of the town's residential areas are connected to the sewerage treatment plant, while the rest use pit latrines and septic tanks<sup>11</sup> Further statistics have also shown that 56% of Zambia's population do not have access to safer water supply with 90% not having access to satisfactory sanitation facilities.<sup>12</sup>

According to the Zambia Integrated Water Resources Management and Water Efficiency Implementation Plan it was noted that there is very little information on water quality and that sedimentation in major rivers is not routinely monitored.<sup>13</sup>

The occurrence of harmful substances in the water has had negative economic and health effects to humans and other living organisms in Zambia. Zambia has had recurring occurrences of water bone diseases with the latest outbreak of cholera which was declared on October 6, 2017. As of 12<sup>th</sup> May, 2018, the outbreak had affected seven (7) of the ten (10) provinces in Zambia, with 5,905 suspected cases and a case fatality rate (CFR) of 1.9%. Among the suspected cases, a total of 5,414 (91.7%), including 98 deaths (CFR = 1.8%) was due to contaminated water supplies and cost the Government and Donors colossal sums of resources to contain the outbreak.<sup>14</sup> Further, deteriorating water quality as a result of increased heavy metals has led to increased treatment costs of potable and industrial process

---

<sup>10</sup> Zambia Integrated Water Resources Management And Water Efficiency Implementation Plan Section 2.7, Page 26,27 of 169

<sup>11</sup> Water In The Zambian Economy Exploring shared risks and opportunities in the Kafue Flats WWF 2016 Water in the Zambian Economy Report page 53

<sup>12</sup> National Policy on Environment, 2007.

<sup>13</sup> Zambia Integrated Water Resources Management And Water Efficiency Implementation Plan Section 2.7, Page 26,27 of 169

<sup>14</sup> Tuesday, 20 February, 2018 Ministerial Statement On The Outbreak Of Cholera In The Country  
[Http://www.Parliament.Gov.Zm/Sites/Default/Files/Images/Publication\\_Docs/MINISTERIAL%20STATEMENT%20-%20BY%20THE%20MINISTER%20OF%20HEALTH.Pdf](http://www.Parliament.Gov.Zm/Sites/Default/Files/Images/Publication_Docs/MINISTERIAL%20STATEMENT%20-%20BY%20THE%20MINISTER%20OF%20HEALTH.Pdf)

water, and decreased agricultural yields due to increased salinity of irrigation water. Therefore, there is need to manage water quality because the effects of polluted water on human health, on the aquatic ecosystem and on various sectors of the economy including agriculture, industry and recreation can be disastrous.

## **1.2 Motivation**

Motivation of this audit was drawn from the following:

- i. The Minister of Water Development, Sanitation and Environmental Protection in his Ministerial Statement of 21<sup>st</sup> June, 2017 on Water Sources Pollution in Zambia resulting from mining activities stated that water pollution continues to be an environmental problem and that the mining sector has continued to be a major source of pollution. He stated that studies in the Kafue river basin showed that there has been some environmental effect in some parts of the country's water resources which were highly linked to pollution as a result of industrialisation. The Upper Kafue on the Copperbelt was particularly affected by mining activities from metal pollutants such as copper and cobalt while that of the middle course of the Kafue River was affected by pollutants from manufacturing industries such as food processing and detergent manufacturing.<sup>15</sup>
- ii. A study by Oxford Policy Management revealed that the Lusaka aquifer was at a heightened risk of pollution and over abstraction for agricultural use. The study also indicated that both surface water and underground water were found to be at risk of pollution from dumping of solid waste, the release of dissolved substances from industrial activities and poor sanitation. Further, population growth in urban centres has already put pressure on groundwater resources by increased pollution and over-abstraction.<sup>16</sup>
- iii. The report of the Auditor General on Management of Environmental Degradation Caused by Mining Activities in Zambia (July 2014) reported that mining companies were not complying with the environmental rules, laws, regulations and environmental licensing conditions set by Government and that measures put in place to reduce environmental degradation were not effective.<sup>17</sup>

---

<sup>15</sup> Ministerial Statement on Water Sources Pollution In Zambia Resulting From Mining Activities By The Hon. Minister Of Water Development, Sanitation And Environmental Protection, Mr Kaziya 21<sup>st</sup> June 2017

<sup>16</sup> Climate Finance and Water Security: Zambia case study 2015 – Part 2

<sup>17</sup> Report of the Auditor General The mining companies are not complying with the environmental rules, laws, regulations and environmental licensing conditions set by Government



## Chapter Two

### Audit Objectives and Audit Questions

#### 2.0 Introduction

This section outlines audit objectives and audit questions. It comprises of one main objective, one specific objective and one audit question. It further includes sub audit questions within the main question.

#### 2.1 Main Objective

To assess the effectiveness of the measures put in place to control water pollution from effluent discharging facilities by the Ministry of Water Development, Sanitation and Environmental Protection through ZEMA.

##### 2.1.1 Specific Objective

To determine whether the measures put in place by ZEMA to control water pollution from effluent discharging facilities have been effectively implemented.

#### 2.2 Audit Questions and Sub-Questions

The audit answered the following question and sub questions:

2.2.1 To what extent have the measures put in place by ZEMA to control water pollution from effluent discharging facilities been effectively implemented?

2.2.1.1 Does ZEMA assess the effluent emission activities' effect on the environment when considering license applications?

2.2.1.2 To what extent are the measures to control water pollution undertaken by the Ministry through ZEMA?

#### 2.3 Audit Scope

The audit examined whether measures put in place by the Ministry through ZEMA were effective to control water pollution from effluent discharged by the licensed facilities before the effluent is released into the environment.

The institutions audited were the Ministry of Water Development, Sanitation and Environment Protection, Zambia Environmental Management Agency, Local Authorities and Licensed Facilities. Data was only requested for, from the Water Utilities and Water Resources Management Agency.

A three (3) year period from 2016 to 2019 was covered to enable the audit have a wide span and encompass the process of effluent discharge into the environment.

The audit covered selected licensed facilities, community and water utilities in four (4) provinces namely Lusaka, Central, Copperbelt and Southern in Zambia. See ***Appendix 1***. The audit was conducted between March 2018 to December 2019.

#### **2.4 Audit Limitation**

The audit was limited by the flow of information from the client and also insufficient resources to increase the districts to be visited in order to have a representative sample.

## Chapter Three

### Methodology

#### 3.0 Introduction

This chapter describes the methodology that was used to achieve the objective of the audit. The audit was conducted in accordance with the International Standards of Supreme Audit Institutions (ISSAIs) 3000. The methodology includes an explanation and justification of the research design. It further explains the sample population, sample size, sampling techniques, instruments for data collection and methods of data analysis.

#### 3.1 Research Design

This was a case study design that utilized a mixed method that included qualitative and quantitative approaches. The two approaches were used because of relevance to the study as they provided a basis for data analysis by comparing interpretations in the audit. Whilst the research was designed to be qualitative and quantitative in nature, it also adopted a descriptive approach so as to simplify data interpretation.

#### 3.2 Sample Population and Size

The sample was drawn from ZEMA, Local Authorities and Water Utility Companies. The Local Authorities selected to be visited were strategically to include licensing and effluent discharge facilities. Out of one hundred and three (103) local authorities only eight (8) local authorities were visited in Lusaka, Kabwe, Kapiri Mposhi, Kafue, Ndola, Kitwe, Mazabuka and Choma. The audit further selected water utilities found in the selected areas which were licensed and had effluent discharging activities. The list of selected facilities is as shown in the *Appendix 1*.

#### 3.3 Sampling Technique

The audit used purposive sampling as a technique to arrive at the sites to be visited in the audit. In order to ensure validity and reliability of data collection, the selection was based on the utility company presence in an area and the number of licensed effluent emitting facilities.

#### 3.4 Data Collection Techniques

The data collection techniques used in the audit included interviews through the use of assisted questionnaires and observation through physical site inspections. The latter were used to collect **Primary data** while the document review through analysis of statistical data

focused on collecting **Secondary data**. The main techniques of **primary** data collection were as detailed below:

**i. Interviews**

Interviews were held to supplement evidence collected through document reviews and physical inspections. Staff from the Ministry and ZEMA were interviewed in order to appreciate what activities were conducted during inspections. Further Local authorities' Environmental Planners and Health Inspectors were interviewed to determine the extent to which the Local Authorities were being engaged by ZEMA in the fight against water pollution. Interviews were also conducted with licensed facilities to determine the levels of adherence to the set conditions and whether ZEMA inspected their facilities. The number of interviewees was fifty three (53).

In addition, forty two (42) members of the community which use water from the Kafue River were interviewed in Kafue from the Kafue River Bridge and the Zambia Compound Communities to collaborate the reports on the pollution of water in the Kafue River. See *Appendix 2*.

**ii. Physical Inspections**

Physical inspections were conducted to make observations of the exit points that release effluent into the environment as regards the colour of effluent, the surrounding environment and confirm adherence to the ZEMA specified conditions by the facilities. Inspections also included telemetric monitoring points and monitoring boreholes which were installed by WARMA to monitor both ground and surface water condition.

**iii. Questionnaires**

Self-administered questionnaires were administered to forty two (42) community members who drew their domestic water from the Kafue River. Data on their sources of water, colour of water, effects of water on their health, and whether ZEMA visited them was also collected.

The main technique of **secondary data** collection was as detailed below:

**iv. Document Review**

Documents from ZEMA were collected and reviewed in order to assess the extent to which ZEMA was implementing the water pollution control measures. Licensed facility files were

reviewed to check if ZEMA followed the licensing process when issuing the licenses, whether ZEMA monitored or audited the facilities and took any action on the findings, determine the validity of their licenses and adherence to the conditions and whether they were filing bi-annual returns.

ZEMA monthly and quarterly reports were reviewed to determine the number of facilities licensed, the activities undertaken in order to monitor the effluent discharging facilities for compliance purposes and whether the water standards in the water resources were maintained. Further the reports were reviewed in order to assess the adequacy of measures taken on polluting facilities to ensure adherence to set conditions. See ***Appendix 3.***



## **Chapter Four**

### **Description of the Audit Area**

#### **4.0 Introduction**

This Chapter describes the role of government entities, other stakeholders in this area, details the systems and how the audited systems and activities are expected to operate. The descriptions make it clear who is responsible for what and how the system should work.

#### **4.1 Legal Framework**

The Ministry of Water Development, Sanitation and Environmental Protection is the Ministry mandated to provide policy guidance in the water and environment sectors. The Ministry is guided by the National Environment Policy of 2007 and the Environmental Management Act No. 12 of 2011.

The Ministry is designated as the focal point for all environmental management issues in the country and is responsible for facilitating and coordinating the development and implementation of policies, programmes and projects on the environment in order to ensure sustainable management and conservation of the environment.

The Ministry performs such functions through Environment Management Department whose functions include among others development of Environmental Policy, Environmental Protection and Pollution Control, Environmental Research and Training.

#### **4.2 Roles and Responsibilities**

The Ministry has a number of roles and responsibilities that relate to control of pollution which include among others:

- to coordinate the development and implementation of policies, programmes and plans in environment and natural resources management to ensure protection of environment and sustainable utilisation of natural resources.
- conduct environmental monitoring and evaluation by providing a “clean and healthy environment” as well as “clean and safe water” to all by ensuring that the water resources are sustainable in both quantity and quality.
- collaborate with ZEMA and other statutory bodies’ related to environmental management.

### **4.3 Key Player in the Control of Pollution**

#### **4.3.1 Zambia Environmental Management Agency (ZEMA)**

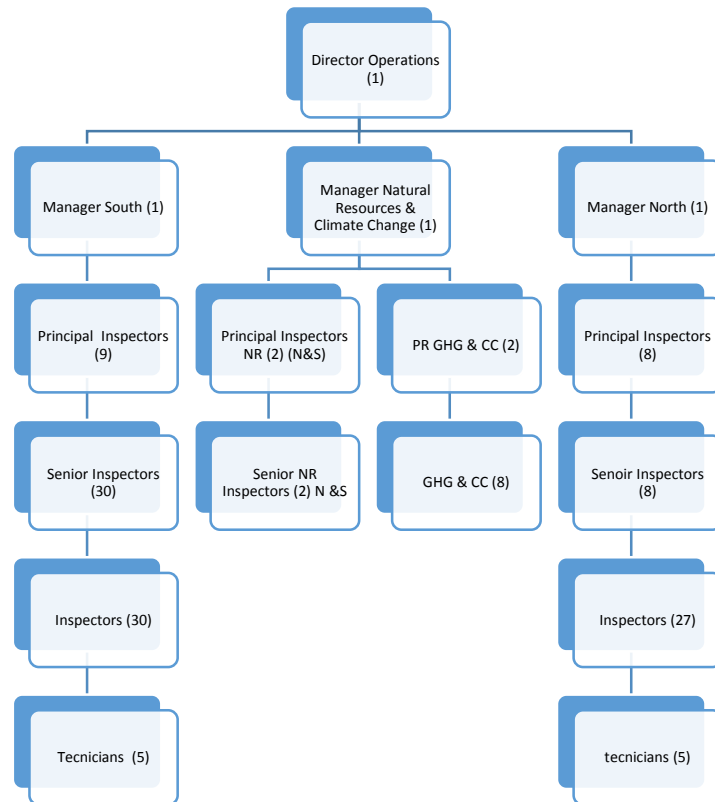
Zambia Environmental Management Agency (ZEMA) is mandated to control pollution and is governed by the Environmental Management Act No. 12 of 2011 which states that it shall ensure the sustainable management of natural resources and protection of the environment, prevention and control of pollution. Its key functions include:

- develop, in liaison with the relevant appropriate authority, standards and guidelines relating to the protection of air, water, land and other natural resources and the prevention and control of pollution, the discharge of waste and the control of toxic substances, review environmental impact assessment reports and strategic environmental assessment reports.
- monitor trends of natural resources, their use and impact on the environment and make necessary recommendations to the appropriate authority;
- collaborate with Government agencies, appropriate authorities and other bodies and institutions to control pollution and protect the environment;
- request information on projects proposed, planned or in progress and advise stakeholders on projects, programmes, plans and policies for which environmental assessments are necessary;
- collaborate with such local and international agencies they consider necessary for the purposes of this Act;
- publicise information on any aspect of the environment and facilitate public access to information on the environment; and
- carry out any other activities relating to environmental management and the prevention and control of pollution, which are necessary or conducive to the better performance of its functions under this Act.

ZEMA is divided into the southern and northern regions. The control of water pollution is managed by the operations department. The Operations Department is the one charged with the responsibility of carrying out the functions described in the systems description. The department is headed by the Director of Operations who is assisted by three Managers namely; Natural Resources and Climate Change, one for the Northern region and the other for the Southern Region. Each region is staffed by a Manager, Principal Inspectors, Senior Inspectors and Inspectors. See organisational structure of the

operations department in figure 1 below showing the job title and required number of staff.

**Figure 1: Organisation Structure of ZEMA's Operations Department**



***Source: ZEMA 2018 - 2021 Strategic Plan.***

ZEMA operates a decentralised licensing system and approval and signing of licenses are done by the regional offices. It receives grants from government and donors to manage its operations, conduct licensing activities and monitoring. Table 1 below refers.

**Table 1: Funding Details for the Period 2016 - 2019**

Year	ZEMA Budget (K)	Actual Funding		Total Actual Funding (K)	Total Underfunding	Percentage of GRZ funding compared to Budget
		GRZ (K)	Cooperating Partners (K)		(ZEMA Budget less Total Actual funding)	(Actual funding/Budget) *100 (%)
2016	54,717,764	40,903,237	3,115,510	44,018,747	10,699,017	80
2017	64,675,287	24,603,239	3,106,857	27,710,096	36,965,191	43
2018	67,139,931	25,833,401	12,611,832.07	38,445,233.07	28,694,698	57
2019	59,163,123	32,680,275	20,410,280	53,090,555	6,072,568	90
Total	245,696,105	124,020,152	39,244,479	163,264,631	82,431,474	51

*Source: ZEMA Data 2016-2019*

The table above shows the budget and funding details from both GRZ and Cooperating Partners for ZEMA for the period 2016 to 2019. As can be seen in the table above, ZEMA has been under funded for the period 2016 to 2019 with GRZ funding releases reducing from 80 percent in 2016 to 57 percent in 2018 and increasing to 90 percent of the total budget in 2019. This translates to ZEMA working at a deficit of 51 percent of the budget in the period under review.

#### **4.3.2 Regulation of Effluent Discharge**

The Environmental Management (Licensing) Regulations, 2013 under Part II section 4 requires a person who intends to emit or discharge a pollutant or contaminant into the environment to apply to the ZEMA for an emission license using Form I. The following are the stages followed:

- application is filled in by the applicant and submitted to ZEMA who opens a file for each facility.

- a desk review of the submitted application is carried out to understand the nature of the project the environment will operate in.
- where the applicant satisfies the set conditions, a field verification inspection is carried out to confirm if what is in the application matches with what is on the ground.
- an assessment form is developed, then sent to accounts to prepare a quotation, after which the client makes payment and the license is processed.
- once a license is issued, it has conditions and requirements of compliance attached to it as regards effluent discharge. *See Appendix 4 - ZEMA limits for effluent*

The license indicates the parameters within which the facilities are supposed to discharge their effluent, the period of validity for the license and gives conditions that the facility collects samples of the effluent periodically and submits biannual returns on 15<sup>th</sup> of January and July every year.

Further, facilities carrying out different activities which release waste water from their processes are expected to install at their premises the waste water monitoring facilities to ensure that the waste released is within the specified ZEMA parameters.

Each facility may have one or more discharge points which are licensed individually by ZEMA. For each licensed point, samples are collected for testing and results are submitted to ZEMA biannually on 15<sup>th</sup> of January and 15<sup>th</sup> July every year, after which ZEMA analyses the submitted returns, gives feedback and takes required action where necessary.

In addition, ZEMA is mandated to gather, analyse and disseminate environmental information in accordance with Environmental Management Act (EMA) No. 12 of 2011, Section 86, Part VI which requires that statutory returns are submitted by all companies issued with environmental licenses. The statutory returns are submitted twice a year for the periods January to June and July to December. The statutory returns are analysed to determine compliance to limits as stated in the Environmental Management Licensing Statutory Instrument No. 112 of 2013 and approximate levels of pollution by industry.<sup>18</sup> Thereafter, an inspection is supposed to be conducted to verify the returns submitted. Two monitoring activities are supposed to be conducted in classes one (1) and two (2) facilities

---

<sup>18</sup> Source January – December 2017 returns analysis.



while those in classes three (3) and four (4) are supposed to be monitored once in the license validity period.

In addition, ZEMA is required to carry out environmental audits of all the activities that are likely to have an adverse effect on the environment.

#### **4.3.3 Enforcement Provisions**

It is the requirement of the Act that whenever a facility breaches the conditions in terms of releasing effluent which is above the required parameters to report such occurrences to ZEMA immediately. Where the facility fails to meet the specified conditions, ZEMA has the right to give different types of orders to the facilities as specified in the Act. There are five (5) types of orders that can be enforced as detailed below:

##### **i. Prevention Order**

This type of order is where the Director-General has reasonable grounds to believe that a person is/ will be conducting an activity, or is /will be in possession or control of a substance or thing that may result in an adverse effect.

##### **ii. Protection Order**

This type of order is where the Director-General considers that it is necessary to conserve, protect and enhance the environment and natural resources in an area. A protection order is to serve individuals or facilities.

##### **iii. Environmental Restoration Order**

This is a type of order which is given when there is a discharge of a contaminant or pollutant into the environment in an amount, concentration or manner that constitutes a risk to human health or property, or that causes or has the potential to cause adverse effects. An inspector is supposed to serve an environmental restoration order on the cause of the activity.

##### **iv. Compliance Order**

The Director-General may, where he has reasonable grounds to believe that any condition of a license issued under this Act has been breached, serve a compliance order on the licensee requiring the licensee to remedy the breach within the period stipulated in the order.

##### **v. Cost Order**

Where a person fails to comply with a requirement in an order, license or approval issued under the Act and the Director General causes the ZEMA to take the required measures, the Director-General shall issue a cost order, requiring the person on whom the cost order is served to reimburse the ZEMA for the cost of taking the measures.

## Chapter Five

### Audit Criteria

#### 5.0 Introduction

This chapter explains the audit criteria for which control of water pollution was assessed. The criteria were drawn from the following sources:

- Environment Management Act No. 12 of 2011 (EMA)
- ZEMA Strategic and Business Plan 2014 – 2016
- Environmental Management Licensing Regulations No 112 of 2013

The specific criteria are detailed below:

#### 5.1 Measures for Water Pollution Control

According to the Zambia Environmental Management Act No. 12 of 2011, ZEMA shall set out to develop and monitor ambient water quality standards and guidelines for pollution control.<sup>19</sup> It also states that ZEMA is authorized to issue different types of orders such as Prevention, Compliance, Restoration and the Cost to any person who breaches the environmental regulations.<sup>20</sup> Further the Act on the “Polluter pays Principle” states that the person or institution responsible for pollution or any other damage to the environment shall bear the cost of restoration and clean-up of the affected area to its natural or acceptable state.<sup>21</sup> In addition the Environmental Management Licensing Regulations No. 112 of 2013 requires ZEMA to issue an emission license to a person to emit or discharge a pollutant or contaminant into the environment. It also prohibits a person to undertake any project that may have an effect on the environment without the written approval.<sup>22</sup>

#### 5.2 Effluent Emission Activities and Licensing

ZEMA is supposed to collect and maintain data from effluent emission activities and licensing on the pre-treatment, nature and levels of effluents and interpret data on water quality and hydrology which is relevant to the granting of licenses.<sup>23</sup>

---

<sup>19</sup> The 2008 ZEMA Operational Plan Section 8.2.1, objective number 1 EMA sections 43 (k) and 48 (J)

<sup>20</sup> EMA Sections 103 – 106

<sup>21</sup> EMA section 6 (d)

<sup>22</sup> The EMA sections 29 (1), 32, 33 46 and The Environmental Management (Licensing) Regulations, 2013 under Part II section 4

<sup>23</sup> EMA Section 48(h) and (i) 66 (h)

### **5.3 Water Pollution Control by the Ministry using ZEMA**

The Act requires that ZEMA establishes and operates a central environmental information system which shall store any findings, data and statistics generated by both public and private bodies in the course of environmental observation and management.<sup>24</sup> The Act also states that, ZEMA shall, establish laboratories for the analytical services required by the inspectorate on activities discharging a contaminant or pollutant into the environment.<sup>25</sup> Additionally the Act states that, ZEMA shall, monitor and control water pollution and discharges of pollutants into the environment and ambient environmental quality in areas surrounding discharges.<sup>26</sup> It further requires that ZEMA carries out an environmental audit of all the activities that are likely to have an adverse effect on the environment with ten (10) key facilities audited annually.<sup>27</sup>

Furthermore, the licensing regulation states that, ZEMA shall, within thirty (30) days of receipt of an application approve it, if the applicant has measures and facilities in place to ensure the safe emission or discharge of a pollutant.<sup>28</sup>

---

<sup>24</sup> EMA section 87

<sup>25</sup> EMA Section 48 (1)(f)

<sup>26</sup> EMA Section 43 (1) k

<sup>27</sup> EMA Section 101(2) and ZEMA strategic and business plan for 2014 – 2016, goal number 1 output number 1.1.2

<sup>28</sup> Environmental Management (Licensing) Regulations 112 of 2013 Part II (1) (a)

## Chapter Six

### Findings

#### 6.0 Introduction

The findings of the audit are presented in this chapter. The main objective was to assess the effectiveness of the measures put in place to control water pollution from effluent discharging facilities by the Ministry through ZEMA. The specific objectives was to determine whether the measures put in place by ZEMA to control water pollution from effluent discharging facilities have been effectively implemented. The stated objectives above guided the findings through the audit questions as indicated below:

#### 6.1 Have the Measures to Control Water Pollution from Effluent Discharging Facilities been Effectively Implemented?

##### 6.1.1 Water Resources Standards and Guidelines on Pollution Control

ZEMA shall set out to develop ambient water quality standards and guidelines for pollution control.<sup>29</sup>

Interviews with ZEMA officials (Effluent and EIAs) revealed that there were no ambient standards for all the water resources and they had not developed water pollution control guidelines to establish a baseline water quality on all the major rivers in the country.

ZEMA has continued licensing facilities without setting ambient water standards and pollution control guidelines as each water resource has its own tolerable levels of contaminants. If a uniform standard is used for all the water resources there is a risk that the water will be contaminated hence people and living organisms will be adversely affected.

It is essential to hasten the establishment of ambient water resource standards and water pollution control guide in order to effectively regulate and control water pollution in different water resources in the country and also to assess the effect of contamination from pollution activities and assist in coming up with remedies to help maintain ambient standards.

##### 6.1.2 Approved Licensed Facilities

ZEMA may issue an emission license to a person to emit or discharge a pollutant or contaminant into the environment.<sup>30</sup>

---

<sup>29</sup> EMA sections 43 (k) and 48 (J) and The 2008 ZEMA Operational Plan Section 8.2.1, objective number 1

<sup>30</sup> The EMA sections 32, 33 46 and The Environmental Management (Licensing) Regulations, 2013 under Part II section 4

A review of quarterly reports for the period 2016- 2018 revealed that during the routine inspection of facilities, ZEMA discovered that there were sixteen (16) facilities that were operating without environmental licenses and a physical visitation at Lukanga Water and Sewerage Company revealed that Kabwe and Kapiri Mposhi discharge points were operating without valid licenses. See **Table 2 below**:

**Table 2: Facilities without Environmental Licenses**

Serial No.	Name of Company	District
1.	North Western Water and Sewerage Company Limited	Solwezi
2.	Kafubu Water and Sewerage Company	Ndola
3.	Ya Xiang Investments	Kitwe
4.	Mansa Municipal Council	Mansa
5.	Mansa Sugar Limited	Mansa
6.	Mutanda Farm	Solwezi
7.	Theta Engineering	Luanshya
8.	Lukanga Water and Sewerage Company	Kabwe
9.	Rokana Breweries	Kitwe
10.	Mukuba Breweries	Kitwe
11.	Mununshi Breweries	Ndola
12.	Joma Breweries Limited	Lusaka
13.	ZESCO Ltd-Lukulu	Lukulu
14.	Mongu Teachers Training College	Mongu
15.	Western Water & Sewerage	Mongu
16.	Kembe Cold Storage (HQ)	Lusaka

*Source: ZEMA Quarterly Reports (2016-2018)*

Interviews with ZEMA officials indicated that the reason for facilities operating without environmental licenses was due to their lack of physical presence in all the provinces to monitor upcoming facilities and enforce the EMA. It was also observed that ZEMA had inadequate capacity in terms of staffing, financial and logistical capacity to conduct regular inspections. This was evidenced by the current field inspection reports that ZEMA provided which showed that the last field inspections were conducted in 2016. Further interviews with ZEMA also revealed that much as there was a system to identify effluent emitting facilities, not all effluent emitting facilities were captured to be licensed.

Facilities operating without relevant environmental licenses pose a risk to the environment which may be irreversible as such facilities will not take precautionary measures to release effluent within the specified parameters and will not be accountable to anybody for their activities.

### **6.1.3 Enforcement of Orders**

ZEMA is authorized to issue different types of orders such as Prevention, Compliance, Restoration and the Cost to any person who breaches the environmental regulations.<sup>31</sup>

The audit established that ZEMA did not enforce the orders on facilities which breached the regulations. Analysis of returns and quarterly reports revealed that out of the eighty eight (88) points which indicated discharge of effluent in excess of the ZEMA standards, eight (8) points among the analysed returns were issued with an order while eighty (80) remained without being issued with orders as indicated in *Appendix 5*.

An example of one client is KCM that exceeded the ZEMA effluent parameter limits in 2016 as shown in **Table 3** below. The excess limits were observed in Copper, Iron, Manganese Cobalt and calcium for the period January to June 2016 with ZEMA limits being 1.5 for copper, 2 for Iron, 1 for Manganese, 1 for Cobalt and 100 for Calcium.

---

<sup>31</sup> EMA Sections 103 – 106

**Table 3: Excess effluent above ZEMA Limits for KCM**

	Cu	Fe	Mn	Co	Ca
January	39.27	60.60	33.40	70.8	14.9
February	52.40	92.60	29.70	66.3	13.7
March	35.60	32.8	13.30	38.7	17.0
April	38.7	67.6	11.00	n/a	20.2
May	15.47	17.20	46.90	61.8	55.5
June	40.40	62.85	34.70	36.4	51.1

*Key: Cu – Copper, Fe – Iron, Mn – Manganese, Co – Cobalt, Ca-Calcium*

As can be seen in the table above, an analysis of the number of times by which KCM exceeded the ZEMA limits showed that KCM was way above 100% in a number of limits with the highest being Iron (Fe) with 92.6 times in February and Cobalt (Co) which exceeded 70.8 times in January. This could be an indication that the deterrent measures were not strong enough to stop the facility from releasing excess effluent, consequently water resources have continued to receive pollution at a smaller scale from different facilities while the aggregated outcome from all the facilities if analysed together is a huge negative impact.

In the period January to June 2016, it was noted that only one compliance order was issued to KCM although they exceeded the limits throughout this period.

In addition, it was observed that out of the eighty eight (88) discharge points, thirty four (34) did not provide information to ZEMA on all the parameters as set in the license conditions. See **Table 4** below.

**Table 4: Parameters not Reported by Licensed Facilities**

Serial No.	Facility	Point	Parameters not monitored
1.	Kafubu Water and Sewerage Company	Lubuto, Kanini, New Kanini	Total Coliform, Faecal Coliforms
2.	Luanshya Copper Mines PLC	Station No. 702 Makoma Road Bridge	Ph, TDS, TSS, Cu, Fe, Mn, Sulphate
3.	ZCCM Investment Holdings	1	Temperature, BOD, COD, DO, Nitrates, Nitrites, Ammonia, Ammonium, Phosphorus, Sulphates, oils and grease, Total hydrocarbons, Chlorides, Heavy Metals, Uranium
4.	Chambishi Copper Smelter Ltd	Acid Drain Smelter Drain	Ph,Tcu,Tco,Tfe,TMn,DSO4,TDS,Turbidity,Conductivity
5.	Gemcanton	Effluent Discharge	Ph, Ec, TDS, TSS, Cu, Fe, Mn
6.	Kagem	Dabwisa, Lunshingwa and Lake House	Aluminium, Total Coliforms
7.	Handyman's Lime	Settling Ponds Overflow	PH, Conductivity, TDS, Turbidity, Dissolved Oxygen  BOD, TSS, Colour
8.	Lumwana Mining	GW53,GW64,GW50,GW51, GW60,GW61,GW73,GW81	DAI, Dco, Dcu, EC, Dfe, Dpd DMn, Ph, TDS, TSS, TUR, DU, DZn
		<b>January – December 2017</b>	
9.	Chambishi Copper Smelter LTD	Acid Drain Smelter Drain	Ph,Tcu,Tco,Tfe,TMn,DSO4,TDS,Turbidity,Conductivity
		<b>July – December 2018</b>	



10.	Bolo Mining Investments	Effluent monitoring	bio-chemical oxygen demand, chemical oxygen demand, dissolved oxygen, chlorides, total coliforms, fecal coliforms and e-coli
11.	Chambishi Copper Smelter 1-2	Wells No. 1 and 2, Luela up and down streams, Tailings Dam,	Cobalt, Chlorine and Arsenic
12.	Dangote	Mine, Demineralization Plant, main Drain	TSS, Total hydrocarbons, oils, turbidity, colour, BOD, and COD were not submitted during the
13.	Gemcanton	1	Colour, temperature, turbidity, Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), dissolved oxygen, nitrites, nitrates, ammonia, ammonium, phosphorus, sulphates, chlorides, Cobalt, Cd, Hg, Arsenic, Pb, Ur
14.	Golden Lay Agri Limited	Wash Bay, Facco, Broad lay egg room, Abattoir	Sulphates, oils, greases, total carbohydrates and yeast
15.	Lafarge PLC	Main Drain, Cool Drain, Quarry site, outlet overflow	All chemical and organic parameters
16.	Neelkanth	Effluent	Total hydrocarbons, oils, turbidity, colour, conductivity and temperature
17.	NFCA	Musakashi Dam, Extension outlet, Southeast ore body, water treatment point overflow, New dam overflow	Biochemical Oxygen Demand, Chemical Oxygen Demand, Ammonia, Hydrogen sulphide, Phosphates, Fats and Oils, Faecal coliforms, Total coliforms and Yeast cells, Temperature, Conductivity and Turbidity

18.	Zambezi Portland Cement – 2	Pit, Main Plant Drain	No parameter results were submitted
	<b>Total Discharge Points</b>	<b>34</b>	

Source: ZEMA Returns Analysis Reports 2017 to 2018

There was no evidence to show that ZEMA had enforced orders on any defaulting facilities as required by the Act. As long as ZEMA does not enforce the orders on defaulting facilities, the environment will continue to be polluted thereby subjecting people to diseases through use of contaminated water.

#### **6.1.4 Implementation of the Polluter Pays Principle**

Polluter pays Principle states that the person or institution responsible for pollution or any other damage to the environment shall bear the cost of restoration and clean-up of the affected area to its natural or acceptable state.<sup>32</sup>

The audit established that the polluter pays principle was not enforced on defaulting facilities. A review of the technical report on pollution at Mwambashi and Kafue Rivers indicated that on 6<sup>th</sup> December 2016, there were elevated levels of sulphate which led to Nkana Water and Sewerage Company (NWSC) shutting down the pump stations at *Garneton on the Mwambashi River; the Bulangililo and Nkana East* water abstraction points. The audit established that ZEMA carried out the assessment of the purported pollution which cost K43, 674.28 and their findings concluded that the two rivers were polluted by Konkola Copper Mines. **See Appendix 6a and 6b**

Further, the report which was provided by Nkana Water and Sewerage Company indicated that they incurred excess treatment costs totalling K4, 992,666 to treat water. There was no evidence to show that the incurred assessment and treatment costs by ZEMA and Nkana Water and Sewerage Company were transferred to KCM.

In addition, the water resources are both recipients of effluent and a source of water for the utility companies. The clean-up cost is indirectly channelled to the utility company which

---

<sup>32</sup> EMA section 6 (d)

treats the water before distribution to the public while the polluters are not penalised. Furthermore, the facility continued to discharge effluent as there were no punitive measures taken against it.

The continuous pollution of the above named streams puts the lives of 794, 906<sup>33</sup> people whose source of water is the Nkana water and Sewerage System in danger.

## **6.2 Does ZEMA assess the effluent emission activities effect on the Environment when considering License Applications?**

ZEMA is supposed to collect and maintain data from effluent emitting facilities on the pre-treatment, nature and levels of effluents and interpret data on water quality and hydrology which is relevant to the granting of licenses.<sup>34</sup> However the following were observed:

### **6.2.1 Collection and Interpretation of Data from Effluent Emitting Facilities**

In the period 2016 to 2018, there were a total of 125 facilities which had valid licenses to discharge effluent into the environment although ZEMA had not carried out any analysis of water resources. This was observed from the seven (7) randomly selected files of the southern region which did not have any reports to indicate that the interpretation of returns was conducted. **See Appendix 7.**

As of September 2019, ZEMA had continued issuing licenses to facilities to allow for their continued release of effluent into the environment without considering the load capacity of the effluent recipients (water resources). In the Annual Plans for 2016 to 2018, they had planned to consider the load capacity before authorising the licenses, however this was still not implemented.

Water resources will continue to receive increased intake of pollutants from the increased number of facilities discharging effluent into the water resources which also results in the increased aggregated quantities of toxins which will result into health risks to human beings and affect aquatic life negatively.

### **6.2.2 Maintenance of Data for Licensing Purposes**

The audit established that ZEMA had a data management system that would ensure information on pollution was kept for future reference. It was revealed that ZEMA

---

<sup>33</sup> Urban and Peri Urban Water Supply and Sanitation Sector Report 2017

<sup>34</sup> EMA Section 48(h) and (i) 66 (h)

maintained manual individual facility files where all activities relating to that facility were kept.

A review of eleven (11) individual facility files from the southern region revealed that not all documentation about the facilities were on file such as decision letters, verification tests and verification inspection reports. Only three (3) out of the eleven (11) reviewed files had decisions letters on file. See **Table 5**.

**Table 5: Individual Files Reviewed without Decision Letters, Confirmation Tests and Verification Inspection Reports**

	Name of Company	ZONE	Verification Inspection	Date Decision Letter was Issued	Confirmation Tests Results
1	Yalelo limited	1	Not on file	Decision letter on File -27.06.2017	Not on file
2	Barloworld Equipment Zambia	1	Not on file	Decision letter not on file	Not on file
3	Arlbur Zambia Limited	5	Not on file	Decision letter not on File	Not on file
4	Joint mining limited	1	Not on file	Decision letter not on File	Not on file
5	Kafue Gorge	4	Not on file	Decision letter on File - 5.05.2015	Not on file
6	OMS Medical Services	5	Not on file	Decision letter not on File	Not on file
7	Mount Meru	5	Not on file	Decision letter on File -24.05.2018	Not on file
8	Star Beef Co. Limited	1	Not on file	Decision letter not on File	Not on file
9	ZAMBEEF Products PLC	1	Not on file	Decision letter not on File	Not on file
10	Verino Country Choice	3	Not on file	Decision letter not on File	Not on file
11	National breweries PLC	5	Not on file	Decision letter not on File	Not on file

*Source: Field 2018*

In addition, as can be seen in the table above, all the individual facility files did not show test results confirming if the effluent at the point of discharge conformed to what was stated in the application and met the required standards. Interviews with ZEMA officials confirmed that they did not conduct confirmation tests and verification inspections but instead conducted desk reviews on license applications since 2016. Management attributed the failure to conduct verification inspections due to inadequate funding, delays in the treasury releasing funding and inadequate staffing. Failure to conduct tests may allow the facilities to continue with activities which result in water pollution as the systems put in place may not work as stated.

Client information may not be complete and accurate, for example a facility may not disclose the total number of discharge points they have, to avoid paying more as each discharge point is billed separately without physical verification by ZEMA thus making the source of information unreliable for decision making on licence issuance.

### **6.3 To what Extent are Measures to Control Water Pollution undertaken by the Ministry through ZEMA?**

#### **6.3.1 Establishment of an Information System**

ZEMA shall establish and operate a central environmental information system which shall store any findings, data and statistics generated by both public and private bodies in the course of environmental observation and management.<sup>35</sup>

ZEMA does not maintain a central information system as data is still in silos at regional level. A review of the statutory returns analysis and annual reports indicated that ZEMA does not maintain a central information system. This was evidenced by the inconsistencies in the statistics provided in different reports and data was given in different formats. Further, ZEMA depends on standalone reports such as monthly and quarterly reports which do not show the nationwide perspective on the control of water pollution. This showed that Head Office did not have an integrated database on the operations of the other offices as they did not establish an information system concerning their clients.

ZEMA has failed to put measures in place to compile different sources of data which give an aggregated position of the incidences of pollution, give a trend analysis of pollution levels

---

<sup>35</sup> EMA section 87

emitted by the licensed facilities, thereby compromising decision making on controlling pollution by using standalone pieces of data.

### **6.3.2 Establishment of Laboratories**

ZEMA shall establish laboratories for the analytical services required by the inspectorate on activities discharging a contaminant or pollutant into the environment.<sup>36</sup>

A review of monthly and quarterly reports for the period 2016-2019 prepared by ZEMA did not show any collected samples from the pollutant discharging facilities that were emitting effluent in excess of allowed parameters into the water resources, as there was no documentary evidence to show that samples were obtained from any facility to confirm the returns submitted.

Furthermore, the audit established through interviews with the ZEMA officials that they had not established a laboratory as required by the Act, but were using portable laboratories which could only test physical and bacteriological parameters but had no capacity to conduct chemical analysis. Therefore, ZEMA used privately owned laboratories to carry out effluent sample analysis, this led to ZEMA's failure to carry out the required types of analysis as it was costly and took time to receive the results. An example to show the cost for testing different parameters is at **Appendix 8**.

ZEMA is restricted in the number of analyses it can carry out and will continue conducting business without making any recommendations for improvement in order to control water pollution. The reliability of the results submitted by the facilities is not determined and ZEMA does not have primary data on which to base their decisions in case there are new applicants who would like to release their effluent into water resources.

### **6.3.3 Issuance of Licenses**

ZEMA shall, within thirty (30) days of receipt of an application approve it, if the applicant has measures and facilities in place to ensure the safe emission or discharge of a pollutant.<sup>37</sup> The audit established that ZEMA took more than the required thirty (30) day period to approve licenses. A review of individual effluent emitting facility files and inspection reports

---

<sup>36</sup> EMA Section 15 (1) and 48 (1)(f)

<sup>37</sup> Environmental Management (Licensing) Regulations 112 of 2013 Part II (1) (a)

revealed that processing of licenses was delayed by more than sixty (60) days compared to the required time of thirty (30) days as shown in **Table 6**.

**Table 6: Delays in Issuance of Licenses**

	Name of Company	ZONE	Date License was Applied	Date License was Issued	Variance
1	Yalelo limited	1	26.06.2018	26.02.2019	240 days
2	Arlbur Zambia Limited	5	14.09.2018	9.11.2018	60 days
3	Joint mining limited	1	13.04.2016	13.04.2019	1080 days
4	OMS Medical Services	5	2.07.2014	3.06.2015	360 days
5	Verino Country Choice	3	6.10.2017	11.12.2017	60 days
6	National breweries PLC	5	12.10.2017	23.05.2018	210 days
7	Cargill Zambia (2009) Limited		15.05.2015	2.11.2016	510 days

*Source: Audit Analysis 2019*

Interviews with ZEMA officials confirmed that they could not process the licenses in the required time due to delayed funding by the treasury and also inadequate human resources.

Delays in processing licenses may lead to companies operating illegally thereby risking polluting the environment as conditions will not have been given for allowed pollution levels and possible loss of revenue by Government through uncollected license fees.

#### **6.3.4 Monitoring of Facilities**

ZEMA shall monitor and control water pollution and discharges of pollutants into the environment and of ambient environmental quality in areas surrounding discharges.<sup>38</sup>

Monitoring of a programme or intervention involves the collection of routine data that measures progress towards achieving programme objectives. It is used to track changes in programme outputs and performance over time. It provides regular feedback and early indications of progress (or lack of progress). Its purpose is to permit management and

---

<sup>38</sup>EMA section 43 (1) k

stakeholders to make informed decisions regarding the effectiveness of programmes and the efficient use of resources.<sup>39</sup>

Environmental Licensing Regulations checklist for water pollution licensing indicates that facilities are categorised into four classes (class 1, 2, 3 and 4) which are determined by the number of times critical parameters exceed ZEMA Limits. Furthermore, the checklist specifies that facilities in class 1 and 2 are supposed to be monitored twice and those in class 3 and 4 are supposed to be monitored once during the license validity period. Therefore, in the period under review ZEMA was supposed to undertake a total of 116 monitoring activities in the northern region and 90 in the southern region bringing the total number of monitoring activities to 206 as indicated in **Table 7**.

**Table 7: Number of Facilities in Classes**

<b>Class</b>	<b>Total Number of Facilities</b>	<b>Required Number of Inspections per Facility in the License Validity Period</b>	<b>Total Number of Inspections Required During the Period under Review</b>
<b>Northern Region</b>			
1 and 2	28	2	56
3 and 4	30	2	60
Subtotal	58		116
<b>Southern Region</b>			
1 and 2	23	2	46
3 and 4	44	1	44
Subtotal	67		90
<b>Grand Total</b>	<b>125</b>		<b>206</b>

<sup>39</sup><http://www.mnestudies.com>



*Source: Field 2019*

There was no evidence of ZEMA carrying out monitoring activities on these facilities. Interviews with ZEMA officials revealed that the monitoring activities were not conducted since the change of policy from a system where ZEMA was allowed to appropriate a percentage of the license fees collected, to where all the fees collected are sent to the central Government.

Without carrying out monitoring activities, ZEMA may not determine the actual performance of the facilities adherence to the prescribed conditions. In addition, no measures can be taken against defaulting facilities to curb non-adherence to license conditions.

### **6.3.5 Environmental Audits Conducted**

ZEMA shall carry out an environmental audit of all the activities that are likely to have an adverse effect on the environment with ten (10) key facilities audited annually.<sup>40</sup>

Document review of quarterly reports for the period under review revealed that there were sixty one (61) key facilities out of which thirty (30) should have had an environmental audit in the period under review. The key facilities were supposed to be audited so as to provide assurance that the effluent emission was in accordance with the set standards. However, three (3) out of the thirty (30) key facilities namely ZESCO, Neelkanth and INDENI Corporation were audited representing 10% of the facilities that needed to be audited while 90% remained unaudited in the period under review and this was also confirmed through interviews with ZEMA officials. **See Appendix 9.**

An example of the findings on two (2) audited facilities by ZEMA who were not adhering to the stipulated conditions in their licenses are highlighted below:

---

<sup>40</sup> EMA Section 101(2) and ZEMA strategic and business plan for 2014 – 2016, goal number 1 output number 1.1.2

**a. Neelkanth Expected Activities and Observations**

Expected Activities	Observations
Water pumped from the pit will be directed to settling ponds	The settling ponds have not been constructed
Silt traps will be constructed across all channels draining open pit areas	Silt traps have not been constructed and there are no channels draining the open pit areas
Water samples will be collected and analysed to determine if they contain explosive residue	Water samples were not being analysed
Fuel and oil storage will be provided with impervious surfacing and containment.	There was no storage facility for fuel and oil at the pit.

*Source: ZEMA Environmental Audit Report on Neelkanth August 2018*

**b. INDENI Expected Activities and Observations**

Expected Activities	Observations
Monitor the water quality at least twice in a year from the monitoring wells.	It was observed that there was no monitoring of the quality of water from the wells.
Install at the premises pollution control equipment for treatment of the effluent.	Not installed at the premises pollution control equipment for treatment of the effluent.
Samples shall be taken at least three times a week from the monitoring point designated by ZEMA and analysed for physical, chemical and bacteriological parameters.	a) Sulphides was 200 times more than the statutory limit of 0.10 mg/L. b) The turbidity was about twice the statutory limit of 15 NTU. c) Total hydrocarbons were about 3 times higher than the statutory limit of 10mg/L. d) Dissolve oxygen was not great than 5 as required in the statutory limit.
Report mean monthly volumetric flow rate in metric system (or any convertible system of units) of effluent discharged from the establishment into the aquatic environment.	There were no reports.
Ensure that operations of discharge of effluent are conducted in a manner that protects human health, animal or plant life and the environment from adverse effects of effluent.	Human health, animal or plant life and the environment were not protected from adverse effects of effluent- gardening and consumption of vegetables with unknown effect to humans

*Source: ZEMA Environmental Audit Report on INDENI September 2018*

It was observed from the two facilities on which environmental audits were conducted that there were levels of non-compliance by licensed facilities. This was an indication that the water resources continuously received pollutants from the licensed facilities even when conditions were known and indicated in the license.

Interviews with the ZEMA officials revealed that the facilities paid license fees and expected a service in return, however, these services as regards environmental audits were not provided. The audited facilities were not among the ones which discharged pollutants above ZEMA limits, but the audit showed non-compliance to license conditions. Therefore, this should prompt ZEMA to carry out more environmental audits as stipulated by the Act.

If audits are not carried out as required it would be difficult to identify facilities that would be emitting effluent beyond the approved limits. It would be difficult for ZEMA to come up with recommendations on how these facilities should improve their activities in order to comply with set standards. Further the extent of pollution on the water resources would not be assessed or determined. This would lead to ZEMA continuing approving licenses even where such licenses could be changed had the environment audit been undertaken.

## **Chapter Seven**

### **Conclusion**

The overall objective of the audit was to establish measures put in place by ZEMA to control water pollution from effluent discharging facilities. The country has no ambient water standards and water pollution control guidelines for all the water resources. The availability of safe water and preservation of water in a natural state is required to allow the aquatic life and human being access water without experiencing any health risk. The natural water resources should be maintained in a way that will ensure sustainability of water resources and aquatic life while supporting human life hence the importance of developing ambient and water pollution control standards. The ambient standards help guide ZEMA on what toxins should be allowed and the levels in the water resources.

Currently ZEMA uses a blanket standard for all water resources using effluent and wastewater standards for regulating effluent. These standards do not consider each resource individual needs in terms of its ability to clean itself from the effluent and how the organisms in the resource are receptive to the effluent. This poses a risk of extinction of some living organisms and health to the people using the water resource for their livelihood.

ZEMA controls water pollution from effluent emitting facilities through licensing by regulating the level of allowable pollution which should reach the water. Currently the extent to which the control of pollution is being achieved leaves much to be desired as there are many facilities which remain unlicensed. Not only are facilities operating without licenses but also those that were licensed did not follow the required conditions given.

Furthermore, facilities were not submitting returns on the emissions they were making into the environment while others exceeded the limit of emission prescribed and others did not provide full results on the parameters required in the license conditions as could be seen in the report. If facilities are not licensed it means that their activities cannot be monitored nor can their emissions be controlled and for those licensed but not adhering to licensing conditions they risk polluting the environment with excess emissions more than the required standard thereby posing a risk to the water.

The punitive measures such as cost, prevention, restoration orders and polluter pay principle that ZEMA is mandated to enforce are not being enforced effectively. This could be seen

from the recurring excess emissions which were over and above the required ZEMA threshold. ZEMA's action on the facilities that discharge effluent above the stipulated limits were more inclined with making the facilities correct the situation than ensuring that an assessment of the effects of the receiving waters were determined as regards the impact of polluting the water resources.

The current system treats both those whose discharge levels are within the parameters and those whose effluent is above the required levels equally in that all the facilities renew their licenses every three (3) years at a normal license fee without paying any additional fees for the number of times they could have released effluent exceeding required levels. The fact that facilities had recurring incidents of defaulting is an indication that the measures were not strong enough to restrain the facilities

ZEMA had not developed an information system that would have a consolidated database to assess the consolidated effect of all the effluent emitting facilities into the environment. The manual system that ZEMA was currently using was ineffective as they were not able to provide real time information on the status of water pollution in the country.

Furthermore, as a way to aid their decision making for future licensing it was key to have an updated information base on the status of the receiving body. When determining the materiality of damage to the environment, reversibility is a key factor. If the damage is irreversible, it is especially important. Habitat is another important dimension for environmental damage. Some species live in, breed in or pass through a few and restricted areas and may become extinct if these crucial areas are polluted<sup>41</sup>

A laboratory was not established by ZEMA which was key to conducting assessment on the quality of water, this made it difficult to have accurate results at the required time as currently the tests conducted with the potable laboratories were limited in the parameters to test. Timely and accurate results help in facilitating urgent decisions in case of an eventuality like excess emission of effluent.

The monitoring of licensed facilities was not adequately done as could be seen from the number of facilities that did not follow the licensing conditions. Those which were licensed

---

<sup>41</sup> [https://www.wgea.org/media/5375/wgea-waste-managemen\\_e.pdf](https://www.wgea.org/media/5375/wgea-waste-managemen_e.pdf)

continue to release high levels of pollution into the water resources. Even if the fight against water pollution may not need to be water tight to achieve 100% conformance to the licensing conditions, levels of non-adherence should be a rare eventuality and reduced to negligible levels unlike the current situations where non-conformity is recurring in most of the bi annual returns received especially from companies which release chemical and heavy metals into the water resources. A small deviation from the expected standard may be allowable, however, if deviations are more than 100% then it meant that controls were not being effected but were only on paper.

In general, risk can be defined as the probability and consequences of an unwanted incident. In keeping with this definition, government efforts at risk management can be of two different kinds. First, the government can take steps to reduce the probability that waste will have a negative impact on the environment. Secondly, risk management involves finding ways to limit the negative consequences once it is clear that waste does have an unwanted impact on the environment or public health. (*Waste management - INTOSAI*).

Relating to this statement, it can be concluded that ZEMA has failed to put measures in place which limit excess pollutants from entering the environment and although measures may seem to have been implemented on paper in reality there were no effective measures in place to control water pollution

The fight against water pollution should concern every institution and the general public if the battle against water pollution has to be won. All the stake holders who play different roles while having contact with facilities which release different forms of effluent should have one platform where effluent discharging facilities can be accessed or made visible to all the concerned parties.

## **Chapter Eight**

### **Recommendations**

The office recommends that the Ministry through ZEMA should:

- i. Put measures that will ensure prevention of excess pollutants and pollution emission into the water resources.
- ii. Ensure that they develop ambient water standards, water pollution control guidelines so as to enable them provide license facilities with appropriate conditions that would consider receiving environment conditions.
- iii. Put measures in place to identify and license all pollution emitting facilities without delay.
- iv. Strengthen enforcement measures in place and stiffen existing punitive measures to deter facilities from flouting licensing conditions.
- v. Put measures in place which will collect, maintain and interpret data for licensing so as to help them make informed decisions at all levels of control of water pollution.
- vi. Establish the laboratory to help them have reliable and timely parameter results to aid quick decision making on defaulting facilities as well as save costs incurred using private laboratories.
- vii. Put measures in place to ensure that facilities are audited in accordance with the Act.
- viii. Improve their monitoring frequency on the licensed facilities to help facilities adhere to license conditions as well as identify defaulting facilities without waiting for the facilities to submit their returns.
- ix. Put measures in place to charge punitive fees for failure to adhere to license conditions.
- x. Expedite the licensing process.

## 9.0 Appendices

### *Appendix 1: Districts and Institutions visited*

District	Facilities visited
Lusaka	Lusaka Water and Sewerage company
	Lusaka City Council
	ZEMA
	Tangy Drinks
	ZamBeef
Kafue	Kafue District Council
	Lusaka Water and Sewerage Company
	Lee Yeast Company
	Community – Zambia Compound
	Country Choice
Ndola	Kafubu Water and Sewerage Company
	Ndola City Council
	ZEMA
	Wood Processing Industries
	Puma Energy
	Lafarge Cement
	Ndola Energy
Kitwe	Sandvik Mining
	Mopani Copper Mines PLC



	Puma Energy
	Nkana Water and Sewerage company
Kabwe	Pan African Leather Limited
	Lukanga Water and Sewerage Company
	Mulungushi University
Kapiri Mposhi	Lukanga Water and Sewerage Company
Choma	ZamZam Halaal Beef Limited
	Chomil Breweries
	Southern Water and Sewerage Company
Mazabuka	Southern Water and Sewerage Company
	Zambia Sugar PLC
	Kaleya Small Holder Company Limited

*Source: Field 2019*

***Appendix 2: People Interviewed***

<b>Institution</b>	<b>Position</b>	<b>Purpose</b>
ZEMA	Two (2) Operations Managers Four (4) Principal Inspectors One Internal Auditor	To understand the measures put in place to control pollution from the licensed facilities
WARMA	One (1) Water Resources Manager One (1) Senior Environmental and Water Quality Officer	Understand their role in terms of contribution to the ZEMA licensing procedures for effluent discharging facilities
Water Utility Companies	Eight (8) Quality Assurance Managers	To understand and determine their input in the control of water pollution
Local Authorities	Eight (8) Directors – Public Health	To determine the levels of interaction or coordination between ZEMA and Local Authorities.
Licensed Companies/ Facilities	Twenty Eight (28) Company Representatives	Determine their levels of adherence to the licensing conditions
Community Members	Forty two (42) people	Assess the impact of the polluting facilities on the water resources as they are used by the community.

***Source: Audit 2019***

### Appendix 3: Documents Reviewed and Purpose

Documents	Purpose
The Zambia Environmental Management Act No. 21 of 2011,  The Water Resources Management Act No. 12 of 2011	To know the mandate of the Ministry/Institutions and use the Acts as source of criteria
The ZEMA Business and Strategic Plans for 2014	Know various strategies of the Ministries in relation the system.
ZEMA Annual, Monthly, Inspections and Returns Analysis Reports	These included annual reports/ progress reports/ M & E reports to check the operations of activities undertaken by ZEMA.
ZEMA Organisational Structure	For understanding reporting lines, and the structure of the institution at headquarters, regional and district levels. The organisation structure provided information of the approved staff levels. This was used to compare the actual staffing levels as well as ascertain whether the institutions had the adequate number of staff to conduct water pollution control activities.
Urban and Peri Urban Water Supply and Sanitation Sector Report 2017	To highlight the population connected to water and sanitation services
Zambia in figures 2018	To understand the total population in order to make comparisons to population connected to water and sanitation services

*Source: Audit 2019*

***Appendix 4: ZEMA Parameters and Limits***

<b>Parameter</b>	<b>Limit</b>
pH	6.0-9.0
Cond. (µCm)	4300
TSS	100
TDS	3000
Cu	1.5
Fe	2
Mn	1
Co	1
Ca	100
Mg	500
Sulphate	1500
Turbidity (NTU)	15
Color (Hazen)	20
Settleable Solids (mg/l)	0.5
Suspended Solids (mg/l)	100
Ammonia (mg/l)	10
Nitrate (mg/l)	50
Nitrite (mg/l)	2
T/Phosphates (mg/l)	6
T/Chlorides (mg/l)	800

Dissolved Oxygen (mg/l)	5
BOD (mg/l)	50
T/Coliforms (cells/100mls)	25000
F/Coliforms (cells/100mls)	5000
Temperature (o C)	40

*Source: Licensing Regulation of 2013*

**Appendix 5: Facilities which Discharged Effluent in Excess of ZEMA Parameters not Served with Orders**

<b>Serial No.</b>	<b>Facility</b>	<b>Discharge Points in excess of parameters</b>
	<b>January – June 2016</b>	
	<b>Northern Region</b>	
1	Atlas Copco	1
2	Konkola Copper Mines	5
3	Mopani Copper Mines	1
4	First Quantum Technology	3
5	Ndola Lime	2
6	Handyman's	1
7	African Explosives	1
8	Nkana Water and Sewerage Company	5
9	Mulonga water and sewerage Company	3
10	NFC Africa	5
11	Gourouk Industries	1
12	Lumwana Mine	9
13	Wood Processing	1

	<b>Southern Region</b>	
14	Country Choice	Pond 2, Outlet
15	Agro Fuel	1
16	Lee Yeast	1
	<b>July – December 2016</b>	
	<b>Southern Region</b>	
17	Konkola Copper Mine – Nampundwe	GW BH2, BH3, BH4
18	Nitrogen Chemicals of Zambia	1
19	Zambia Sugar	Simbotwe, 26 West, 26 East and 2512
20	Agro fuel Investment	1
	<b>January – June 2017</b>	
	<b>Northern Region</b>	
21	Bolo Mining	TD 6 Overflow, Concentrator, Combined Drain
22	FQML	BH 4B,BH 5A, and BH13A
23	Mopani Copper Mine	Not analysed
24	Chambishi Metals	Not analysed
25	Chambishi Copper Smelter	Not analysed
26	Sino Metal	Not analysed

27	Nkana Water & Sewerage Company	Chambishi, Kalulushi, Mindolo, Ndeke and Nkana East Ponds
28	Mulonga Water & Sewerage Company	Lulamba Ponds
29	NFCA	TD 6, Concentrator Drain, Combined Drain
30	Lumwana Mining	GW 50, 51, 53, 60, 61, 64, 73 and GW81
31	Handyman's	1
32	African Explosives Ltd	1
	<b>Southern Region</b>	
33	Country Choice	Pond 2, Outlet
34	Agro Fuel	1
35	Lee Yeast	1
36	Southern African Ferro Alloy Ltd	1
37	Tangy	1
	<b>July – December 2018</b>	
	<b>Northern Region</b>	
38	NFCA	1
39	Lafarge	1
40	Golden Lay	1
	<b>Southern Region</b>	
41	Zambia Sugar	1



42	Nitrogen Chemicals of Zambia	1
	<b>Total Number of Discharge Points</b>	<b>88</b>

*Source: Field 2019*

## Appendix 6 a



**ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY**

Corner Suez/Church Road  
P.O. Box 35131  
Lusaka, Zambia  
E-mail: [info@zema.org.zm](mailto:info@zema.org.zm)

**Telephone Numbers**  
Head Office: +260 211 254130  
+260 211 254023/59  
Fax: +260 211 254164

Regional Office, Jacaranda Road  
P.O. Box 71302  
Ndola, Zambia  
Telefax: +260 212 621048

**Livingstone Office**  
Plot No. 555,  
Junction of Obote / Nehru Roads  
P.O Box 60195, Livingstone  
Tel/Fax: +260 32 321 297

Chirundu Border Office,  
Lusaka Road,  
P.O.Box CRU 31,  
Chirundu, Zambia.  
Tel / Fax : +260 211 515261.

# PAYMENT VOUCHER

No. 36693

Payee: G. S. Karandi Date: 13/12/2016

Cheque Nº 131220163 E Amount: K16579.00


Amount in words: Sixteen thousand five hundred seventy nine  
Rupees only

### PAYMENT DETAILS

funds for Zone 9 and Zone 10 Water sampling program as per attached internal memo.

### ACCOUNT ALLOCATION

A/C CODE	ACCOUNT HEAD	DEBIT	CREDIT
2/2500	160/261/364/350	14400	
2/2500	160/261/364/350	475	
5/6000	160/752/1180	1704.00	

 Prepared by _____ Checked by _____ Received by (Full Names) _____ Signature: _____ ID: _____	13/12/2016 (Date) _____ (Date) _____ (Date)	Authorisation 1. _____ (Signature) Date: _____ 2. _____ (Signature) Date: _____
---	--	---

COPY DISTRIBUTION:

*Original - Accounts*

*Pink - Client*

*Blue - Book*

# Appendix 6b

Alfred H. Wright ID No. 140783	Date: 23-12-16 Amount: K27,095.28	in words: Twenty seven thousand ninety five and 28/100 pence note: twenty eight pence
PAYMENT DETAILS being payment for analysis of samples as per attached quotation		

ACCOUNT ALLOCATION		
JOB	ACCOUNT HEAD	CREDIT
	Sample analysis	27,095.28

Prepared by: <u>W. C.</u> Date: <u>23-12-16</u>		Authorisation:	
Checked by: <u>W. C.</u> Date: <u>23/12/2016</u>	1. <u>[Signature]</u> Date: <u>23/12</u>	2. <u>[Signature]</u> Date: <u>23/12/16</u>	3. <u>[Signature]</u> Date: <u>23/12/16</u>
Signed by (Full Name): _____ Date: _____		Date: _____	

REBUTION
Copied - Accounts
Per - Clerk
Run - Book

**Appendix 7: Licensed Facilities**

<b>S/N</b>	<b>Name of Facility</b>	<b>No. of Discharge Points</b>
1	AFRICAN EXPLOSIVES	1
2	Astro Quarries Ltd	1
3	Atlas Copco (Z) Limited	1
4	Avantech Limited-Lumwana	1
5	Barlow World Equipment	1
6	Bolo Mining Investments	1
7	Chambishi Metals Plc	2
8	Chat Breweries-Kitwe	1
9	Chat Breweries-Luanshya	1
10	Chibuluma Mines PLC	1
11	CNMC Luanshya Copper Mines	1
12	Dangote Limited	1
13	Epiroc Zambia Limited	1
14	G&G Bakery	1
15	Gemcanton Investments Limited	1
16	Global Industries Limited	1
17	Gemfields Holdings (Z) Limited	1
18	Golden Lay Agri Limited	1
19	Handyman's Lime Ltd	1
20	Hazida Motors Limited	1

21	Indeni Petroleum Refinery ltd	1
22	Kafubu water and Sewerage Co	12
23	Kagem Mining Limited	1
24	KANKOYO BREWERIES LTD	1
25	KCM Plc - Nkana IBU	2
26	KCM Plc - Konkola IBU	3
27	KCM Plc - Nchanga IBU	6
28	KCM Plc - Nampundwe IBU	2
29	Lafarge Cement	2
30	Lubambe Copper Mine Ltd	2
31	Lublend Limited	1
32	Maple Breweries Ltd	1
33	Mining Haulage	1
34	Mopani Copper Mines Mufulira	4
35	Mulonga Water and Sewerage Company	14
36	Ndola Lime Company Limited	1
37	Neelkanth Lime Limited	1
38	NFCA Zambia	5
39	Nkana Water and Sewerage Co Ltd	5
40	Puma Energy-Ndola	1
41	Puma Energy-Zambia	1
42	Quattro Company Ltd	1

43	SAMFUEL limited	1
44	Sandiv Mining & Construction	1
45	SGC Investments Ltd	1
46	Tazama Pipelines Limited	2
47	Tazama Pipelines Limited (BMT)	1
48	Tongxin Metals Company Limited	1
49	Toyota Zambia Limited	1
50	Volcano Breweries Ltd	1
51	Weir Minerals Central Africa Ltd	1
52	Wezi Breweries Limited	1
53	Wood Processing Industries	1
54	ZAFFICO limited	1
55	Zalawi Haulage	1
56	Zambezi Portland Cement	2
57	Zengbang Deheng Investments	1
58	Zhongbao Copper Company Ltd	1
		107
	<b>Southern Region</b>	
1	Speciality Emergency Service Limited Livingstone	1
2	Agro Fuels Investment Limited	1
3	(Zesco) Kariba North Bank	4

4	Barloworld Equipment Co. Ltd	2
5	Best Pack Limited	1
6	Yutian Paper Company	1
7	Zambeef Mumbwa	1
8	Zambeef Mongu	1
9	Zambeef Senanga	1
10	Nitrogen Chemical of Zambia (NCZ)	3
11	Lee Yeast (z)	3
12	Southern Water Sewerage Company, Livingstone, Monze, Choma & Kalomo.	11
13	Collum Coal Mine Ltd Sinazeze	3
14	Kaliolio Crocodile Farms	1
15	ALLER AQUA	1
16	Kaleya Small Holding Company Limited	1
17	Tata Zambia Limited- Lusaka	1
18	Wonderful Industry Z CO Limited	1
19	Dayow Beef Company Ltd (Kembe Limulunga (Mongu)	1
20	Zam Halaal Abattoir	1
21	CFAO Zambia –Livingstone	1
22	Batoka Sky ltd-Livingstone	1
23	Zamso Abattoir-Batoka	1
24	Croc Hide Ltd-Sinazeze	1

25	Clipper Line Limited Livingstone	2
26	Puma Zambia Plc	1
27	Southern Chickens	1
28	Yalelo	1
29	(Zesco) Kafue Gorge	6
30	National Airports Corporation	1
31	Verino Agri- Industries Ltd	1
32	Lusaka Water and Sewerage	7
33	Savanna Beef	1
34	Tiangu Zambia Limited	1
35	Consolidated Farming Limited	1
36	Parmalat	1
37	Star Beef Company Limited	1
38	Dayow Beef Company Ltd	1
39	Nasla Halaal Beef – Senanga	1
40	Maamba Collieries Ltd	3
41	Railway Systems of Zambia- Livingstone	1
42	Dayow- Chobro Abattoir-Zimba	1
43	Chomil Breweries- Choma	1
44	Gordana Crocodiles and Fish Farm. Sinazeze	2
45	Zambia Sugar PLC	5



46	Kennedy Mubanga Lodge	1
47	Machembere Lodge	1
48	Chipeco High School	1
49	SKY VIEW	1
50	Kiambi Safaris	1
51	Ana Tree Lodge	1
52	River Grand Lodge	1
53	Savanah Streams	1
54	Palabana	1
55	Conservation Lower Zambezi	1
56	Lake Kariba Inns	1
57	Zimba High School	1
58	Kalomo High School	1
59	Kobil (Z) Ltd	1
60	Tata Zambia Limited	1
61	Lukanga Water and Sewerage-Kabwe	2
62	Mulungushi University	1
63	TAZARA-Kapiri Mposhi - 0966 311 577	1
64	Hi-Qwalime( Davies Musumbulwa)	1
65	Nanga Farms PLC	7
66	Zambian Breweries, P.O. Box 31293, Mungwi Road, Heavy Industrial Area. Lusaka	1

67	Kasanka Breweries (Peli Breweries)	1
		113

*Source: Field 2019*

## Appendix 8

*Paid*





**ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY**

Corner Suez/Church Roads  
P.O. Box 35131  
Lusaka, Zambia  
Email: info@zema.org.zm

Telephone Numbers  
HQ Office: +260 211 254130  
+260 211 254023 / 59  
Fax: +260 211 254164

---

**Cheque Payment Voucher**

Payee :	Cliff Nwata	Voucher Number :	PAY93
Address :		Date :	4/17/2019
Voucher Type :	Citibank Ozone Projec (ZMK) Cheque Payment Voucher	Cheque Number :	17042019

Bank Account :	Fin/Cash and Bank/Current Assets/Banks/Citibank Ozone ZMK (Project Acc)	Currency :	ZMW
Bank Account Number :	6/5000/650/754/875	Exchange Rate :	1

Description : DDAC- Effluent and tailing discharge AHK

Particulars	Account	Amount	Cashbook Amount
H.R.A/Assets/Current Assets/Imprest/Ngwata Cliff	5/6000/650/752/1023	2,521.84	2,521.84
Home Currency Total			2,521.84
Total			2,521.84

Total in words

Prepared By: <i>or Kap</i>	Date: 17.04.19	Authorisation
Checked By: <i>sk</i>	Date: 17/4/19	1. Signature: <i>[Signature]</i>
Received By: _____	Date: _____	Date: 17.04.19
(Full Names)		2. Signature: <i>[Signature]</i>
Signature: _____	N.R.C. _____	Date: 17.04.2019

*[Signature]*

**Appendix 9: Facilities Rated as Key by ZEMA**

Serial No.	Facility
	<b>Northern Region</b>
1	Bolo Mining Investments
2	Chambishi Metals Plc.
3	Chibuluma Mines PLC
4	CNMC Luanshya Copper Mines
5	Dangote Limited
6	Gemcanton Investments Limited
7	Global Industries Limited
8	Golden Lay Agri Limited
9	Handyman's Lime Ltd
10	Indeni Petroleum Refinery ltd
11	Kafubu water and Sewerage Co
12	Kagem Mining Limited
13	KCM Plc
	KCM Plc
	KCM Plc
	KCM Plc
14	Lafarge Cement
15	Lubambe Copper Mine Ltd
16	Mopani Copper Mines, Mufulira

17	Mulonga Water and Sewerage Company
18	Ndola Lime Company Limited
19	Neelkanth Lime Limited
20	NFCA Zambia
21	Nkana Water and Sewerage Co Ltd (X5)
22	Tazama Pipelines Limited
23	Tazama Pipelines Limited (BMT)
24	ZAFFICO limited
25	Zambezi Portland Cement
	<b>Southern Region</b>
1	Engen Marketing
2	University Teaching Hospital (UTH)
3	Zambeef Mumbwa
4	Western Water & Sewerage
5	Zambeef Mongu
6	Zambeef Senanga
7	Southern Water Sewerage Company, L/stone, Monze, Choma & Kalomo.
8	Collum Coal Mine Ltd Sinazeze
9	Kaliolio Crocodile Farms
10	Chengelo Secondary School
11	Kaleya Small Holding Company Limited

12	Sirocco Enterprises limited
13	Wonderful Industry Z CO Limited
14	Dayow Beef Company Ltd (Kembe Limulunga (Mongu)
15	Zam Halaal Abattoir
16	Croc Hide Ltd-Sinazeze
17	Clipper Line Limited Livingstone
18	Puma Zambia Plc
19	(Zesco) Kafue Gorge
18	National Airports Corporation
19	Verino Agri- Industries Ltd
20	Lusaka Water and Sewerage
21	Savanna Beef
22	Parmalat
23	Star Beef Company Limited
24	Dayow Beef Company ltd
25	Nasla Halaal Beef – Senanga
26	Maamba Collieries Ltd
27	Railway Systems of Zambia- Livingstone
28	Chomil Breweries- Choma
29	Gordana Crocodiles and Fish Farm. Sinazeze
30	Zambia Sugar PLC

31	Kobil (Z) Ltd
32	Lukanga Water and Sewerage-Kabwe
33	Mulungushi University
34	Lukanga Water and Sewerage-Kapiri Mposhi
35	(Zesco) Kariba North Bank
36	ZESCO Ltd-Lukulu
<b>Total 61</b>	

*Source: Field 2019*





